FILE HISTORY

US 7,945,021

PATENT:	7,945,021
INVENTORS:	Shapiro, Edward G. Seppi, Edward J. Pavkovich, John M. Munro, Peter Johnsen, Stanley W. Colbeth, Richard E.
TITLE:	Multi-mode cone beam CT radiotherapy simulator and treatment machine with a flat panel imager
APPLICATION NO:	US2002324227A
FILED:	18 DEC 2002
ISSUED:	17 MAY 2011
COMPILED:	22 APR 2015

7,945,021

MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

Transaction History

Date	Transaction Description
12-18-2002	Information Disclosure Statement (IDS) Filed
12-18-2002	Information Disclosure Statement (IDS) Filed
12-18-2002	Initial Exam Team nn
01-02-2003	IFW Scan & PACR Auto Security Review
01-27-2003	IFW Scan & PACR Auto Security Review
03-20-2003	Information Disclosure Statement (IDS) Filed
03-20-2003	Information Disclosure Statement (IDS) Filed
03-20-2003	Cleared by L&R (LARS)
03-28-2003	Notice Mailed--Application Incomplete--Filing Date Assigned
05-30-2003	Additional Application Filing Fees
05-30-2003	A statement by one or more inventors satisfying the requirement under 35 USC 115, Oath of the Applic
11-06-2003	Application Dispatched from OIPE
11-06-2003	Application Is Now Complete
11-20-2003	Rescind Nonpublication Request for Pre Grant Publication
12-05-2003	IFW TSS Processing by Tech Center Complete
01-05-2004	Case Docketed to Examiner in GAU
01-05-2004	Reference capture on IDS
04-19-2004	Reference capture on IDS
04-19-2004	Information Disclosure Statement (IDS) Filed
04-19-2004	Information Disclosure Statement (IDS) Filed
07-26-2004	Information Disclosure Statement (IDS) Filed
07-26-2004	Information Disclosure Statement (IDS) Filed
08-16-2004	Non-Final Rejection
08-17-2004	Mail Non-Final Rejection
02-22-2005	Response after Non-Final Action
02-22-2005	Request for Extension of Time - Granted
02-22-2005	Miscellaneous Incoming Letter
03-09-2005	Date Forwarded to Examiner
05-09-2005	Final Rejection
05-10-2005	Mail Final Rejection (PTOL - 326)
06-01-2005	Information Disclosure Statement considered
06-01-2005	Information Disclosure Statement (IDS) Filed
07-11-2005	Response after Final Action
07-18-2005	Date Forwarded to Examiner
08-01-2005	Advisory Action (PTOL-303)
08-02-2005	Mail Advisory Action (PTOL - 303)
11-14-2005	Information Disclosure Statement considered
11-14-2005	Reference capture on IDS
11-14-2005	Information Disclosure Statement (IDS) Filed
11-14-2005	Information Disclosure Statement (IDS) Filed
11-14-2005	Request for Continued Examination (RCE)
11-14-2005	Request for Extension of Time - Granted
11-14-2005	Workflow - Request for RCE - Begin
11-16-2005	Information Disclosure Statement considered
11-16-2005	Information Disclosure Statement (IDS) Filed
11-17-2005	Date Forwarded to Examiner
11-17-2005	Date Forwarded to Examiner
11-17-2005	Disposal for a RCE / CPA / R129
12-08-2005	Non-Final Rejection

12-09-2005	Mail Non-Final Rejection
12-12-2005	Information Disclosure Statement considered
12-12-2005	Reference capture on IDS
12-12-2005	Information Disclosure Statement (IDS) Filed
12-12-2005	Information Disclosure Statement (IDS) Filed
05-12-2006	Response after Non-Final Action
05-12-2006	Request for Extension of Time - Granted
05-19-2006	Information Disclosure Statement considered
05-19-2006	Information Disclosure Statement (IDS) Filed
05-19-2006	Information Disclosure Statement (IDS) Filed
05-24-2006	Date Forwarded to Examiner
07-14-2006	Correspondence Address Change
08-14-2006	Final Rejection
08-16-2006	Mail Final Rejection (PTOL - 326)
01-16-2007	Response after Final Action
01-16-2007	Request for Extension of Time - Granted
01-31-2007	Advisory Action (PTOL-303)
01-31-2007	Date Forwarded to Examiner
02-01-2007	Mail Advisory Action (PTOL - 303)
02-07-2007	Request for Continued Examination (RCE)
02-07-2007	Workflow - Request for RCE - Begin
02-22-2007	Date Forwarded to Examiner
02-22-2007	Date Forwarded to Examiner
02-22-2007	Disposal for a RCE / CPA / R129
03-01-2007	Non-Final Rejection
03-05-2007	Mail Non-Final Rejection
07-23-2007	New or Additional Drawing Filed
07-23-2007	Response after Non-Final Action
07-23-2007	Request for Extension of Time - Granted
07-25-2007	Date Forwarded to Examiner
10-01-2007	Final Rejection
10-10-2007	Mail Final Rejection (PTOL - 326)
03-19-2008	Affidavit(s) (Rule 131 or 132) or Exhibit(s) Received
03-19-2008	New or Additional Drawing Filed
03-19-2008	Request for Continued Examination (RCE)
03-19-2008	Request for Extension of Time - Granted
03-19-2008	Workflow - Request for RCE - Begin
03-28-2008	Date Forwarded to Examiner
03-28-2008	Date Forwarded to Examiner
03-28-2008	Disposal for a RCE / CPA / R129
05-24-2008	Non-Final Rejection
05-27-2008	Mail Non-Final Rejection
08-27-2008	Information Disclosure Statement considered
08-27-2008	Reference capture on IDS
08-27-2008	Information Disclosure Statement (IDS) Filed
08-27-2008	Information Disclosure Statement (IDS) Filed
10-17-2008	Correspondence Address Change
10-27-2008	Response after Non-Final Action
10-27-2008	Request for Extension of Time - Granted
11-05-2008	Date Forwarded to Examiner
02-02-2009	Final Rejection
02-04-2009	Mail Final Rejection (PTOL - 326)
05-04-2009	Request for Continued Examination (RCE)
05-04-2009	Workflow - Request for RCE - Begin
05-05-2009	Information Disclosure Statement considered
05-05-2009	Reference capture on IDS
05-05-2009	Information Disclosure Statement (IDS) Filed
05-05-2009	Information Disclosure Statement (IDS) Filed

05-05-2009	Date Forwarded to Examiner
05-05-2009	Date Forwarded to Examiner
05-05-2009	Disposal for a RCE / CPA / R129
08-27-2009	Non-Final Rejection
08-28-2009	Mail Non-Final Rejection
01-28-2010	Affidavit(s) (Rule 131 or 132) or Exhibit(s) Received
01-28-2010	New or Additional Drawing Filed
01-28-2010	Response after Non-Final Action
01-28-2010	Request for Extension of Time - Granted
03-03-2010	Date Forwarded to Examiner
04-16-2010	Non-Final Rejection
04-19-2010	Mail Non-Final Rejection
06-10-2010	Examiner Interview Summary Record (PTOL - 413)
06-15-2010	Mail Examiner Interview Summary (PTOL - 413)
08-23-2010	Affidavit(s) (Rule 131 or 132) or Exhibit(s) Received
08-23-2010	Response after Non-Final Action
08-23-2010	Request for Extension of Time - Granted
08-23-2010	Request for Extension of Time - Granted
09-02-2010	Date Forwarded to Examiner
10-28-2010	Final Rejection
11-01-2010	Mail Final Rejection (PTOL - 326)
12-29-2010	Response after Final Action
01-07-2011	Date Forwarded to Examiner
01-19-2011	Examiner Interview Summary Record (PTOL - 413)
01-21-2011	Notice of Allowance Data Verification Completed
01-21-2011	Case Docketed to Examiner in GAU
01-21-2011	Examiner's Amendment Communication
01-21-2011	Document Verification
01-24-2011	Mail Examiner's Amendment
01-24-2011	Mail Examiner Interview Summary (PTOL - 413)
01-24-2011	Mail Notice of Allowance
02-16-2011	Response to Reasons for Allowance
03-17-2011	Information Disclosure Statement considered
03-17-2011	Information Disclosure Statement (IDS) Filed
03-21-2011	Mail PUB Notice of non-compliant IDS
03-21-2011	PUB Notice of non-compliant IDS
04-05-2011	Response to Reasons for Allowance
04-05-2011	Issue Fee Payment Verified
04-05-2011	Issue Fee Payment Received
04-06-2011	Application Is Considered Ready for Issue
04-07-2011	Dispatch to FDC
04-27-2011	Issue Notification Mailed
05-17-2011	Recordation of Patent Grant Mailed
05-17-2011	Patent Issue Date Used in PTA Calculation

Issue Classification

Application/Control No.	Applicant(s)/Patent Under Reexamination
10324227	SHAPIRO ET AL.
Examiner	**Art Unit**
Allen C Ho	2882

ORIGINAL	
CLASS	SUBCLASS
378	65

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
378	19	196	197		

INTERNATIONAL CLASSIFICATION					
CLAIMED					NON-CLAIMED
A	6	1	N	5 / 10 (2006.01.01)	
H	0	5	G	1 / 64 (2006.01.01)	
A	6	1	B	6 / 03 (2006.01.01)	

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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19	16	41	32	56	48	52	64	62	80						

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	77	
/Allen C. Ho/ Primary Examiner.Art Unit 2882	01/20/2011	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Index of Claims

Application No.	Applicant(s)	
10/324,227	SHAPIRO ET AL.	
Examiner	**Art Unit**	
Allen C. Ho	2882	

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	8/13/04
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Application No.	Applicant(s)
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Allen C. Ho	2882

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	8/13/04
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√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
Final	Original	5/5/05								
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√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
Final	Original	12/7/05								
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10/324,227	SHAPIRO ET AL.
Examiner	**Art Unit**
Allen C. Ho	2882

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Claim		Date							
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Claim		Date							
Final	Original								
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Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/324,227	SHAPIRO ET AL.
Examiner	**Art Unit**
Allen C. Ho	2882

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
Final	Original	8/11/06								
	(1)	√								
	2	√								
	3	√								
	4	√								
	5	√								
	6	√								
	7	√								
	8	√								
	9	√								
	10	√								
	11	√								
	12	√								
	13	√								
	(14)	√								
	15	√								
	16	√								
	17	√								
	18	√								
	19	√								
	20	√								
	(21)	√								
	22	√								
	23	√								
	24	√								
	25	√								
	26	√								
	27	√								
	28	√								
	29	√								
	30	√								
	31	√								
	32	√								
	33	√								
	(34)	√								
	35	√								
	36	√								
	37	√								
	38	√								
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	40	√								
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	43	√								
	44	√								
	(45)	√								
	46	√								
	47	√								
	48	√								
	49	√								
	50	√								

Claim		Date								
Final	Original	8/11/06								
	51	√								
	52	√								
	53	√								
	(54)	√								
	55	√								
	56	√								
	57	√								
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	(61)	√								
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Claim		Date								
Final	Original									
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Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
10/324,227	SHAPIRO ET AL.
Examiner	**Art Unit**
Allen C. Ho	2882

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date
Final	Original	2/27/07
	1	√
	2	√
	3	√
	4	√
	5	√
	6	√
	7	√
	8	√
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	11	√
	12	√
	13	√
	14	√
	15	√
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	17	√
	18	√
	19	√
	20	√
	21	√
	22	√
	23	√
	24	√
	25	√
	26	√
	27	√
	28	√
	29	√
	30	√
	31	√
	32	√
	33	√
	34	√
	35	√
	36	√
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	38	√
	39	√
	40	√
	41	√
	42	√
	43	√
	44	√
	45	√
	46	√
	47	√
	48	√
	49	√
	50	√

Claim		Date
Final	Original	2/27/07
	51	√
	52	√
	53	√
	54	√
	55	√
	56	√
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Claim		Date
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA. ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/30/2007								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
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	15	✓								
	16	✓								
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	30	✓								
	31	✓								
	32	✓								
	33	✓								
	34	✓								
	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/30/2007								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								
	44	✓								
	45	✓								
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	68	✓								
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	72	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/30/2007								
	73	✓								
	74	✓								
	75	✓								
	76	✓								
	77	✓								
	78	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/23/2008								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
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	8	✓								
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	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/23/2008								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
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	42	✓								
	43	✓								
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	05/23/2008								
	73	✓								
	74	✓								
	75	✓								
	76	✓								
	77	✓								
	78	✓								
	79	✓								
	80	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/02/2009								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
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	8	✓								
	9	✓								
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/02/2009								
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	38	✓								
	39	✓								
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	44	✓								
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/02/2009								
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	74	✓								
	75	✓								
	76	✓								
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	83	✓								
	84	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/26/2009								
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	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/26/2009								
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	38	✓								
	39	✓								
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/26/2009								
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	74	✓								
	75	✓								
	76	✓								
	77	✓								
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	79	✓								
	80	✓								
	81	✓								
	82	✓								
	83	✓								
	84	✓								
	85	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/15/2010								
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	35	✓								
	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/15/2010								
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	38	✓								
	39	✓								
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	67	✓								
	68	✓								
	69	✓								
	70	✓								
	71	✓								
	72	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	04/15/2010								
	73	✓								
	74	✓								
	75	✓								
	76	✓								
	77	✓								
	78	✓								
	79	✓								
	80	✓								
	81	✓								
	82	✓								
	83	✓								
	84	✓								
	85	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/27/2010								
	1	✓								
	2	✓								
	3	O								
	4	O								
	5	✓								
	6	O								
	7	O								
	8	O								
	9	O								
	10	✓								
	11	O								
	12	O								
	13	✓								
	14	✓								
	15	✓								
	16	✓								
	17	O								
	18	✓								
	19	✓								
	20	✓								
	21	=								
	22	=								
	23	=								
	24	=								
	25	=								
	26	=								
	27	=								
	28	=								
	29	=								
	30	=								
	31	=								
	32	=								
	33	=								
	34	=								
	35	=								
	36	=								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/27/2010								
	37	=								
	38	=								
	39	=								
	40	=								
	41	O								
	42	O								
	43	✓								
	44	=								
	45	=								
	46	=								
	47	=								
	48	=								
	49	=								
	50	=								
	51	=								
	52	=								
	53	=								
	54	✓								
	55	✓								
	56	✓								
	57	O								
	58	✓								
	59	O								
	60	O								
	61	✓								
	62	✓								
	63	✓								
	64	=								
	65	O								
	66	=								
	67	=								
	68	=								
	69	=								
	70	=								
	71	=								
	72	=								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Ho, Allen C	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/27/2010								
	73	=								
	74	=								
	75	=								
	76	=								
	77	=								
	78	=								
	79	✓								
	80	=								
	81	✓								
	82	O								
	83	=								
	84	=								
	85	=								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	**Art Unit**
	Allen C Ho	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/20/2011								
1	1	=								
	2	-								
11	3	=								
12	4	=								
2	5	=								
13	6	=								
	7	-								
3	8	=								
4	9	=								
5	10	=								
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35	26	=								
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39	30	=								
40	31	=								
41	32	=								
42	33	=								
46	34	=								
47	35	=								
48	36	=								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Allen C Ho	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/20/2011								
49	37	=								
50	38	=								
43	39	=								
44	40	=								
27	41	=								
28	42	=								
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54	46	=								
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61	52	=								
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	61	-								
8	62	=								
25	63	=								
52	64	=								
16	65	=								
63	66	=								
64	67	=								
65	68	=								
66	69	=								
68	70	=								
69	71	=								
70	72	=								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	**Art Unit**
	Allen C Ho	2882

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/20/2011								
72	73	=								
73	74	=								
74	75	=								
75	76	=								
76	77	=								
77	78	=								
9	79	=								
62	80	=								
10	81	=								
29	82	=								
67	83	=								
71	84	=								
45	85	=								

Search Notes	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

SEARCHED			
Class	Subclass	Date	Examiner
378	19	8/13/2004	ACH
	65		
	98.8		
250	367		
	370.09		
	370.11		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST BRS	8/14/2004	ACH

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination
10/324,227	SHAPIRO ET AL.
Examiner	**Art Unit**
Allen C. Ho	2882

SEARCHED			
Class	Subclass	Date	Examiner
378	9	5/3/2005	ACH
	65		
	98.8		
250	367		
	370.09		
	370.11		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST BRS	5/3/2005	ACH
EAST BRS	5/4/2005	ACH
Consulted with David Bruce	5/5/2005	ACH
EAST BRS	5/5/2005	ACH

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

SEARCHED			
Class	Subclass	Date	Examiner
378	65	12/7/2005	ACH

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST BRS	12/7/2005	ACH

Elekta_000000051

Search Notes	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

SEARCHED			
Class	Subclass	Date	Examiner
378	65	8/9/2006	ACH
	209		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST BRS	8/9/2006	ACH
Consulted with Cassandra C. Spyrou on 101 rejections	8/10/2006	ACH

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
10/324,227	SHAPIRO ET AL.	
Examiner	**Art Unit**	
Allen C. Ho	2882	

SEARCHED			
Class	Subclass	Date	Examiner

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST BRS	2/27/2007	ACH

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Allen C Ho	2882

SEARCHED			
Class	Subclass	Date	Examiner
378	65	05/23/2008	ACH

SEARCH NOTES		
Search Notes	Date	Examiner
EAST BRS	05/23/2008	ACH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Allen C Ho	2882

SEARCHED			
Class	Subclass	Date	Examiner
378	65	02/02/2009	ACH

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Allen C Ho	2882

SEARCHED			
Class	Subclass	Date	Examiner
378	65	08/25/2009	ACH

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Allen C Ho	2882

SEARCHED			
Class	Subclass	Date	Examiner
378	65	04/14/2010	ACH

SEARCH NOTES		
Search Notes	Date	Examiner
EAST BRS	04/15/2010	ACH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	Art Unit
	Allen C Ho	2882

SEARCHED			
Class	Subclass	Date	Examiner
378	65	10/27/2010	ACH

SEARCH NOTES		
Search Notes	Date	Examiner
EAST BRS	10/27/2010	ACH

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10324227	SHAPIRO ET AL.
	Examiner	**Art Unit**
	Allen C Ho	2882

SEARCHED

Class	Subclass	Date	Examiner
378	15	01/18/2011	ACH
	19	01/18/2011	ACH
	65	01/18/2011	ACH
	196	01/18/2011	ACH
	197	01/18/2011	ACH
250	370.09	01/18/2011	ACH

SEARCH NOTES

Search Notes	Date	Examiner
EAST BRS	01/18/2011	ACH

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
	Interference Search History Printout	01/18/2011	ACH

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	6298	(cesium ADJ iodide) OR CsI	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:04
2	BRS	L2	50362	amorphous ADJ silicon	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:04
3	BRS	L3	440	1 AND 2	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:05
4	BRS	L4	395925	epoxy	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:30
5	BRS	L5	79	3 AND 4	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:05

08/14/2004, EAST Version: 1.4.1

	Type	L #	Hits	Search Text	DBs	Time Stamp
6	BRS	L6	19540	epoxy WITH powder	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:35
7	BRS	L7	1	5 AND 6	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:34
8	BRS	L8	50805	scintillat$3	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:34
9	BRS	L9	63	epoxy WITH powder WITH reflecti$4	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:35
10	BRS	L10	1	8 AND 9	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:35

08/14/2004, EAST Version: 1.4.1

	Type	L #	Hits	Search Text	DBs	Time Stamp
11	BRS	L11	19540	epoxy WITH powder	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:35
12	BRS	L12	80	8 AND 11	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2004/08/14 13:36

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	313630	(compute$5 ADJ2 tomograph$2) OR CT OR CAT	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:22
2	BRS	L2	167946	((non ADJ uniform$3) OR nonuniform$3 OR uneven$2 OR varying OR changing) WITH (angle OR angular OR spac$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:32
3	BRS	L3	7465	1 AND 2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:31
4	BRS	L4	26191	"378"/$.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:31

	Type	L #	Hits	Search Text	DBs	Time Stamp
5	BRS	L5	417	3 AND 4	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:31
6	BRS	L6	22186	((non ADJ uniform$3) OR nonuniform$3 OR uneven$2) WITH (angle OR angular OR spac$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:41
7	BRS	L7	84	5 AND 6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:33
8	BRS	L8	25451	((non ADJ uniform$3) OR nonuniform$3 OR uneven$2) WITH (angle OR angular OR spac$3 OR interval OR arc)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:41

	Type	L #	Hits	Search Text	DBs	Time Stamp
9	BRS	L9	1289	1 AND 8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:41
10	BRS	L10	96	4 AND 9	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/05 09:41

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	304335	(compute$5 ADJ2 tomogaph$2) OR CT OR CAT	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 13:57
2	BRS	L2	120876	continuous$2 WITH rotat$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 13:57
3	BRS	L3	4661	1 AND 2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 13:57
4	BRS	L4	571659	conic$2 OR cone OR conebeam OR pyramid$2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 13:59

	Type	L #	Hits	Search Text	DBs	Time Stamp
5	BRS	L5	870	3 AND 4	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 14:00
6	BRS	L6	26176	"378"/$.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 14:00
7	BRS	L7	257	5 AND 6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 14:45
8	BRS	L8	46090	(flat ADJ panel) OR flatpanel OR FPD OR FPI	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 14:46

	Type	L #	Hits	Search Text	DBs	Time Stamp
9	BRS	L9	34	7 AND 8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/04 14:47

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	45491	(flat ADJ panel) OR flatpanel OR FPD	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:34
2	IS&R	L2	510	(378/65).CCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 12:30
3	BRS	L3	31	1 AND 2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 12:30
4	BRS	L4	2174853	continuous$2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 12:44

	Type	L #	Hits	Search Text	DBs	Time Stamp
5	BRS	L5	6	3 AND 4	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 12:45
6	BRS	L6	313233	(compute$5 ADJ2 tomograph$2) OR CT OR CAT	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:05
7	BRS	L7	2218	1 AND 6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:05
8	BRS	L8	120876	continuous$2 WITH rotat$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:06

	Type	L #	Hits	Search Text	DBs	Time Stamp
9	BRS	L9	88	7 AND 8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:06
10	BRS	L10	471	((flat ADJ panel) OR flatpanel OR FPD) WITH continuous$2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:34
11	BRS	L11	33	6 AND 10	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	2005/05/03 13:35

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	243	((((compute$5 ADJ2 tomograph$2) OR CT OR CAT) WITH (cone OR conic$2 OR pyramid$2 OR conebeam OR volume$4) OR CBCT OR (CB ADJ CT)) WITH (plan OR treatment OR simulator OR therapy OR therapeutic)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/12/07 16:35

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	732330	(compute$5 ADJ2 tomograph$2) OR CT OR CAT OR CBCT	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:19
2	BRS	L2	976696	cone OR conebeam OR conic$4 OR pyramid$4 OR trapezoid$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:21
3	BRS	L3	72622	1 AND 2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:21
4	BRS	L4	62787	(flat ADJ panel) OR FPD OR FPI	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:22

	Type	L #	Hits	Search Text	DBs	Time Stamp
5	BRS	L5	695	3 AND 4	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:22
6	BRS	L6	198758	rotat$3 WITH continuous$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:22
7	BRS	L7	91	5 AND 6	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:22
8	BRS	L8	181461	((stop NEAR2 shoot) OR step OR stepwise$2) WITH continuous$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:23

	Type	L #	Hits	Search Text	DBs	Time Stamp
9	BRS	L9	42	5 AND 8	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:23
10	BRS	L10	765500	helix OR helical$2 OR spiral$2	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:23
11	BRS	L11	184	5 AND 10	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:24
12	BRS	L12	20864	fluoroscop$2 OR fluoroscopically	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:24

	Type	L #	Hits	Search Text	DBs	Time Stamp
13	BRS	L13	16	11 AND 12	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2006/08/09 14:24

	L #	Hits	Search Text	DBs	Time Stamp
1	L1	755714	(compute$5 ADJ2 tomograph$2) OR CT OR CAT	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	2007/02/27 15:11
2	L2	871475	cone OR conic$2 OR pyramid$2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	2007/02/27 15:11
3	L3	68508	1 AND 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	2007/02/27 15:11
4	L4	69524	(flat ADJ panel) OR FPD OR FPI	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	2007/02/27 15:12

	L #	Hits	Search Text	DBs	Time Stamp
5	L5	750	3 AND 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	2007/02/27 15:12

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	810106	(compute$5 ADJ2 tomograph$2) OR CT OR CAT OR CBCT	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:09
L2	86200	(flat ADJ panel) OR FPI OR FPD	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:10
L3	5520	1 AND 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:10
L4	15896	(cone OR conic $4 OR pyramid $2) NEAR5 beam	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:10
L5	431	3 AND 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:11
L6	18638	MeV OR megavolt$3 OR ((mega OR million) ADJ2 volt$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:12
L7	483	2 AND 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:14

L8	178295	"378"/$.ccls. OR "250"/$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:16
L9	173	7 AND 8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:17
L10	784521	spiral$2 OR helical$2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:54
L11	66348	1 AND 10	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 17:54
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L16	92492	rotat$3 NEAR3 continuous$2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/05/23 18:12
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L3	963	1 AND 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/10/27 17:13
L4	5630	(cone ADJ2 beam) OR CBCT	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/10/27 17:16
L5	207	3 AND 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/10/27 17:16

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L4	19812	(cone OR conic $4 OR pyramid $2) NEAR5 beam	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/18 17:02
L5	978	3 AND 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/18 17:02
L6	98499	radiotherap$5 OR ((treatment OR therapy) NEAR5 (radiation OR plan OR planning))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/18 17:02
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L12	398	10 AND 11	USPAT; UPAD	OR	ON	2011/01/18 17:05
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US007945021B2

(12) **United States Patent**
Shapiro et al.

(10) **Patent No.: US 7,945,021 B2**
(45) **Date of Patent: May 17, 2011**

(54) **MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/324,227**

(22) Filed: **Dec. 18, 2002**

(65) **Prior Publication Data**

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A61B 6/03 (2006.01)

(52) **U.S. Cl.** **378/65**; 378/19; 378/196; 378/197

(58) **Field of Classification Search** 378/19, 378/65, 98.8, 9, 209, 15, 196, 197; 250/367, 250/370.09, 370.11
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,133,227 A 5/1964 Brown et al.
3,144,552 A 8/1964 Schonberg
3,193,717 A 7/1965 Nunan
4,149,247 A 4/1979 Pavkovich et al.
4,149,248 A 4/1979 Pavkovich
4,208,675 A 6/1980 Bajon et al.
4,209,706 A 6/1980 Nunan
4,521,808 A 6/1985 Ong et al.
4,593,967 A 6/1986 Haugen
4,675,731 A 6/1987 Takasu et al.
4,679,076 A 7/1987 Vikterlof et al.
4,726,046 A 2/1988 Nunan
4,741,621 A 5/1988 Taft et al.
4,825,393 A 4/1989 Nishiya
4,853,777 A 8/1989 Hupp
4,868,844 A 9/1989 Nunan
(Continued)

FOREIGN PATENT DOCUMENTS

DE 42 23 488 A1 1/1994
(Continued)

OTHER PUBLICATIONS

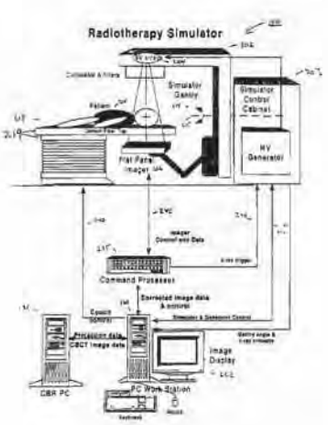
J. H. Siewerdsen and D. A. Jaffray, Med. Phys. 26, 2635-2647 (1999).*
(Continued)

Primary Examiner — Allen C. Ho
(74) *Attorney, Agent, or Firm* — Blakely, Sokoloff, Taylor & Zafman LLP

(57) **ABSTRACT**

A multi-mode cone beam computed tomography radiotherapy simulator and treatment machine is disclosed. The radiotherapy simulator and treatment machine both include a rotatable gantry on which is positioned a cone-beam radiation source and a flat panel imager. The flat panel imager captures x-ray image data to generate cone-beam CT volumetric images used to generate a therapy patient position setup and a treatment plan.

77 Claims, 4 Drawing Sheets



Elekta_000000086

U.S. PATENT DOCUMENTS

5,014,292	A *	5/1991	Siczek et al.	378/196
5,027,818	A	7/1991	Bova et al.	
5,039,867	A	8/1991	Nishihara et al.	
5,080,100	A	1/1992	Trotel	
5,099,505	A	3/1992	Seppi et al.	
5,117,445	A	5/1992	Seppi et al.	
5,168,532	A	12/1992	Seppi et al.	
5,247,555	A	9/1993	Moore et al.	
5,262,649	A *	11/1993	Antonuk et al.	250/370.09
5,335,255	A	8/1994	Seppi et al.	
5,394,452	A	2/1995	Swerdloff et al.	
5,438,991	A	8/1995	Yu et al.	
5,471,516	A	11/1995	Nunan	
5,537,452	A	7/1996	Shepherd et al.	
5,661,773	A	8/1997	Swerdloff et al.	
5,692,507	A	12/1997	Seppi et al.	
5,751,781	A	5/1998	Brown et al.	
5,949,811	A *	9/1999	Baba et al.	378/108
5,956,382	A *	9/1999	Wiener-Avnear et al.	378/98.8
5,999,587	A *	12/1999	Ning et al.	378/4
6,031,888	A	2/2000	Ivan et al.	
6,041,097	A	3/2000	Roos et al.	
6,104,778	A	8/2000	Murad	
6,104,780	A	8/2000	Hanover et al.	
6,144,875	A	11/2000	Schweikard et al.	
6,222,901	B1	4/2001	Meulenbrugge et al.	
6,292,526	B1 *	9/2001	Patch	378/4
6,307,914	B1	10/2001	Kunieda et al.	
6,325,537	B1	12/2001	Watanabe	
6,325,758	B1	12/2001	Carol et al.	
6,370,421	B1	4/2002	Williams et al.	
6,381,302	B1	4/2002	Berestov	
6,385,286	B1	5/2002	Fitchard et al.	
6,429,578	B1	8/2002	Danielson et al.	
6,463,122	B1 *	10/2002	Moore	378/65
6,480,565	B1 *	11/2002	Ning	378/37
6,508,586	B2	1/2003	Oota	
6,590,953	B2	7/2003	Suzuki et al.	
6,661,870	B2	12/2003	Kapatoes et al.	
6,744,848	B2 *	6/2004	Stanton et al.	378/55
6,842,502	B2	1/2005	Jaffray et al.	
6,865,254	B2 *	3/2005	Nafstadius	378/65
6,888,919	B2 *	5/2005	Graf	378/65
6,914,959	B2	7/2005	Bailey et al.	
2001/0001807	A1	5/2001	Green	
2001/0008271	A1	7/2001	Ikeda et al.	
2003/0007601	A1 *	1/2003	Jaffray et al.	378/65

FOREIGN PATENT DOCUMENTS

DE	196 14 643	A1	10/1997
EP	0062941	B1	9/1984
EP	0205720	A1	12/1986
EP	0480035	B1	11/1994
FR	2 269 745		11/1975
FR	2 551 664		3/1985
GB	1328033		8/1973
JP	63294839		12/1988
JP	5057028		3/1993
WO	WO 85/03212	A1	8/1985
WO	WO 9014129		11/1990
WO	WO 9200567		1/1992
WO	WO 9220202		11/1992

OTHER PUBLICATIONS

J. H. Siewerdsen and D. A. Jaffray, Med. Phys. 26, 1624-1641 (1999).*

D. A. Jaffray et al., SPIE vol. 3659, 204-214 (1999).*

Ruola Ning et al., SPIE vol. 3659, 192-203 (1999).*

Ning et al., "Flat Panel Detector-Based Cone-Beam Volume CT Angiography Imaging: System Evaluation," IEEE Transactions on Medical Imaging, vol. 19, No. 9, Sep. 2000, 949-963.*

Ragan, "Correction for Distrotion in a Beam Outline Transfer Device in Radiotherapy CT-Based Simulation", Med. Phys. 20 (1), Jan./Feb. 1993, pp. 179-185.

Hara et al., "Radiotherapeutic System", 00480035/EP-B1, Citation from World Patent, 1994, 1 page.

"Advanced Workstation for Irregular Field Simulation and Image Matching", Copyright 1999, MDS Nordion, 7 pages.

Balter, James M. et al., "Daily Targeting of Intrahepatic Tumors for Radiotherapy," Int. J. Radiation Oncology Biol. Phys., vol. 52, No. 1 (2002), pp. 266-271.

Swindell, William et al., "Computed Tomography With a Linear Accelerator With Radiotherapy Applications," Med. Phys., vol. 10, No. 4, Jul./Aug. 1983; pp. 416-420.

Mosleh-Shirazi, Mohammad Amin et al., "A Cone-Beam Megavoltage CT Scanner for Treatment Verification in Conformal Radiotherapy," Radiotherapy and Oncology, vol. 48 (1998), pp. 319-328.

Midgley, S. et al., "A Feasibility Study for Megavoltage Cone Beam CT Using a Commercial EPID," Phys. Med. Biol., vol. 43 (1998), pp. 155-169.

Ruchala, K.J. et al., "Megavoltage CT on a Tomotherapy System," Phys. Med. Biol., vol. 44 (1999), pp. 2597-2621.

Nakagawa, Keiichi, M.D. et al., "Megavoltage CT-Assisted Sterotactic Radiosurgery for Thoracic Tumors: Original Research in the Treatment of Thoracic Neoplasms," Int. J. Radiation Onocology Biol. Phsy., vol. 48, No. 2, (2000), pp. 449-457.

Groh, B.A. et al., "A Performance Comparison of Flat-Panel Imager-Based MV and kV CT," Med. Phys., vol. 29, No. 6, Jun. 2002, pp. 967-975.

Uematsu, Minoru et al., "Daily Positioning Accuracy of Frameless Stereotactic Radiation Therapy With a Fusion of Computed Tomography and Linear Accelerator (FOCAL) Unit Evaluation of Z-Axis with a Z-Marker," Radiotherapy and Oncology, vol. 50, No. 3, Mar. 1999, pp. 337-339.

Uematsu, Minoru, M.D. et al., "A Dual Computed Tomography Linear Accelerator Unit for Stereotactic Radiation Therapy: A New Approach Without Cranially Fixated Stereotactic Frames," Int. J. Radiation Oncology Biol. Phys., vol. 35, No. 3 (1996), pp. 587-592.

Uematsu, Minoru, M.D. et al, "Intrafractional Tumor Position Stability During Computed Tomography (CT)-Guided Frameless Stereotactic Radiation Therapy for Lung or Liver Cancers With a Fusion of CT and Linear Accelerator (FOCAL) Unit," Int. J. Radiation Oncology Biol. Phys., vol. 48, No. 2 (2000), pp. 443-448.

Jaffray, David A., Ph.D. et al., "A Radiographic and Tomographic Imaging System Integrated Into a Medical Linear Accelerator for Localization of Bone and Soft-Tissue Targets," Int. J. Radiation Oncology Biol. Phys., vol. 45, No. 3 (1999), pp. 773-789.

Pisani, Laura, M.S. et al., "Setup Error in Radiotherapy: On-line Correction Using Electronic Kilovoltage and Megavoltage Radiographs," Int. J. Radiation Oncology Biol. Phys., vol. 47, No. 3 (2000), pp. 825-839.

Drake, D.G. et al, "Characterization of a Fluoroscopic Imaging System for kV and MV Radiography," Med. Phys., vol. 27, No. 5, May 2000, pp. 898-905.

Jaffray, D.A. and Siewerdsen, J.H., "Cone-Beam Computed Tomography with a Flat-Panel Imager: Initial Performance Characterization," Med. Phys., vol. 27, No. 6, Jun. 2000, 1311-1323.

Fahrig, R. and Holdsworth, D. W., "Three-Dimensional Computed Tomographic Reconstruction Using a C-Arm Mounted XRII: Image Based Correction of Gantry Motion Nonidealities," Med. Phys., vol. 27, No. 1, Jan. 2000, pp. 30-38.

Feldkamp, L.A. et al. "Practical Cone-Beam Algorithm," J. Opt. Soc. Am. A., vol. 1, No. 6, Jun. 1984; pp. 612-619.

Siewerdsen, Jeffery H. and Jaffray, David A., "Optimization of X-Ray Imaging Geometry (With Specific Application to Flat-Panel Cone-Beam Computed Tomography)," Med. Phys., vol. 27, No. 8, Aug. 2000, pp. 1903-1914.

Siewerdsen, Jeffery H. and Jaffray, David A., "Cone-Beam Computed Tomography With a Flat-Panel Imager: Magnitude and Effects of X-Ray Scatter," Med. Phys., vol. 28, No. 2, Feb. 2001, pp. 220-231.

Cho, Paul S. et al., "Cone-Beam CT for Radiotherapy Applications," Phys. Med. Biol., vol. 40 (1995), pp. 1863-1883.

Masahiro et al., "Patient Beam Positioning System Using CT Images", Phys. Med. Biol., 1982, vol. 27, No. 2, pp. 301-305, printed in Great Britain.

Midgley, S., et al., "A Feasibility Study for Megavoltage Cone Beam CT Using a Commercial EPID," Phys. Med. Biol. 43, United Kingdom, 1998, pp. 155-169.

Kudo et al., "Feasible cone beam scanning methods for exact reconstruction in three-dimensional tomography," J. Opt. Soc. Am. A; 7, 2169 (1990).

Rizo et al., "Comparison of two three-dimensional x-ray cone-beam-reconstruction with circular source trajectories," J. Opt. Soc. Am. A, 10, 1639 (1991).

Yan et al., "Derivation and analysis of a filtered backprojection algorithm for cone beam projection," IEEE Trans. Medical Imaging, 10, 462 (1991).

Andrew, JW, et al., "A video-based patient contour acquisition system for the design radiotherapy compensators," Abstract, Med Phys, May-Jun. 1989, vol. 16(3), pp. 425-430.

Brewsterfuauf, L, et al., "Automatic generation of beam apertures," Abstract, Medical Physics, 1993, vol. 20, pp. 1337, 1342.

Elliott, PJ, et al., "Interactive image segmentation for radiation treatment planning," Abstract, IBM Systems Journal, 1992, vol. 31, No. 4, pp. 620-634.

Gademann, G, et al., "Three-dimensional radiation planning. Studies on clinical integration," Abstract, Strahlenther Onkol, 1993, vol. 169(3), pp. 159-167.

Jaffray, DA, et al., "Cone-beam CT: applications in image-guided external beam radiotherapy and brachytherapy," Engineering in Medicine & Biology Society, Proceedings of the 22nd Annual International Conference of the IEEE, Jul. 2000, vol. 3, p. 2044.

Keys, D, "A CCTV-microcomputer biostereometric system for use in radiation therapy (topography, medical physics, tissue compensators)," Abstract, Energy Science and Technology, 1984, vol. 45-12B, pp. 3857.

Kuhn, MH, "AIM Project A2003: COmputer Vision in RAdiology (COVIRA)," Abstract, Computer Methods and Programs in Biomedicine, Oct. 1994, vol. 45, No. 1-2, pp. 17-31.

Kushima, T, et al., "New development of integrated CT simulation system for radiation therapy planning," Abstract, Kobe J Med Sci, Dec. 1993, vol. 39, No. 5-6, pp. 197-213.

Kutcher, GJ, et al., "Three dimensional radiation treatment planning," Abstract (1988), Dosimetry in radiotherapy. vol. 2. Proceedings of an international symposium held in Vienna, Austria, Aug.-Sep. 1987.

Mohan, R, et al., "Intersection of shaped radiation beams with arbitrary image sections," Abstract, Comput Methods Programs Biomed, Jun. 1987, vol. 24, pp. 161-168.

Ning, R, et al., "Image intensifier-based volume tomographic angiography imaging system: system evaluation," SPIE , Medical Imaging 1995, vol. 2432, pp. 280-290.

Redpath, AT, et al., "Use of a simulator and treatment planning computer as a CT scanner for radiotherapy planning," Abstract, Proceedings—Eighth International Conference on the Use of Computers in Radiation Therapy held in Toronto, Canada, 1984, pp. 281-287, IEEE, New York, New York.

Reynolds, RA, et al., "An algorithm for three-dimensional visualization of radiation therapy beams," Abstract, Med Phys, Jan.-Feb. 1988, vol. 15(1), pp. 24-28.

Jaffray, David A. et al., "Flat-Panel Cone-Beam Computed Tomography for Image-Guided Radiation Therapy", Int. J. Radiation Oncology Biol. Phys. vol. 53 No. 5 (2002), pp. 1337-1349.

* cited by examiner

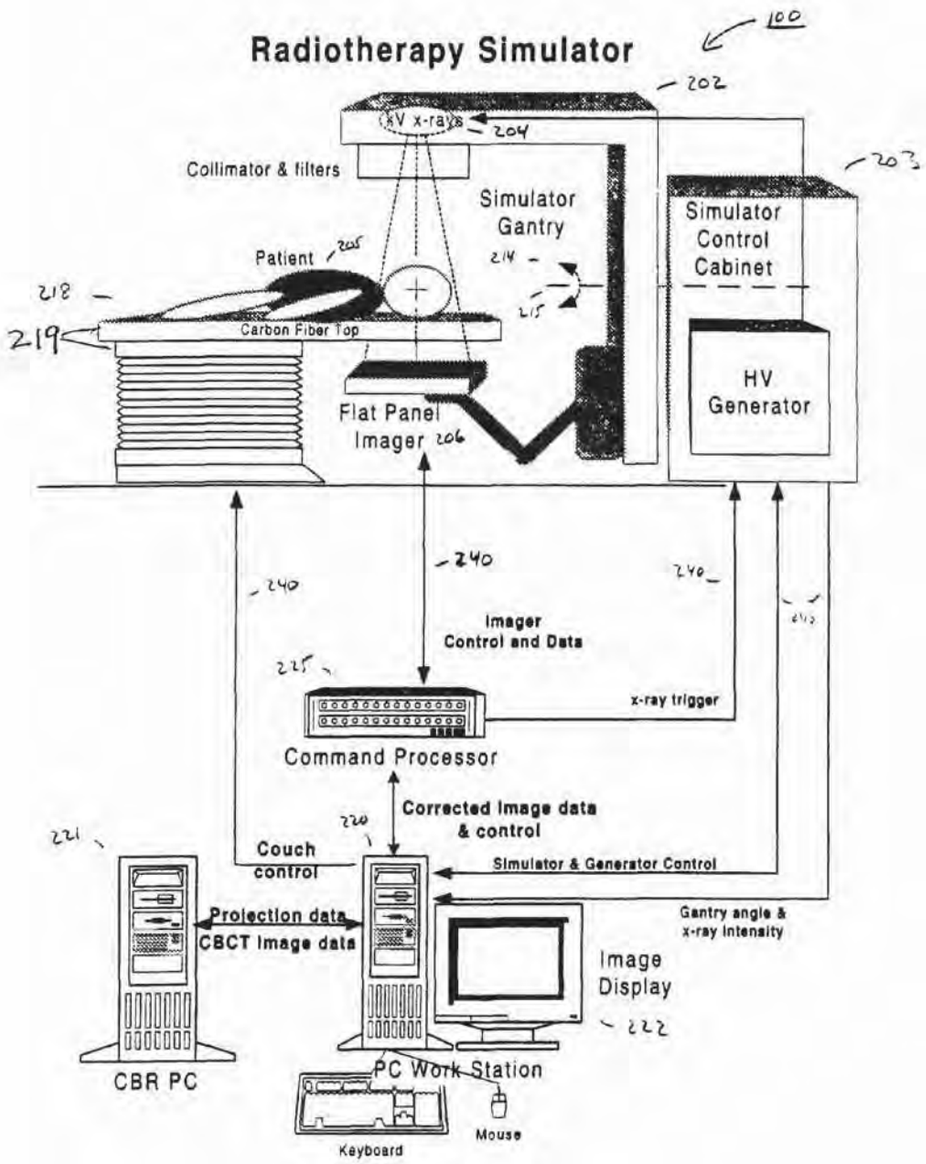


Figure 1- Simulator kV Cone Beam CT Diagram

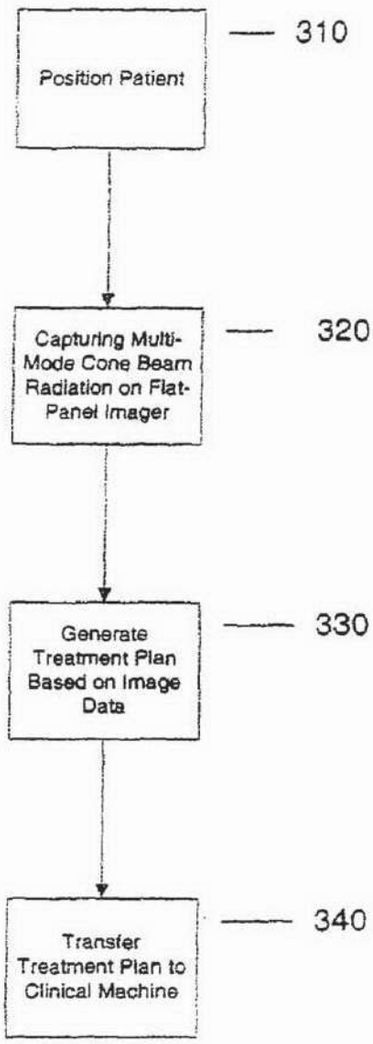

Position Patient
310
Capturing Multi-Mode Cone Beam Radiation on Flat-Panel Imager
320
Generate Treatment Plan Based on Image Data
330
Transfer Treatment Plan to Clinical Machine
340

Figure 2

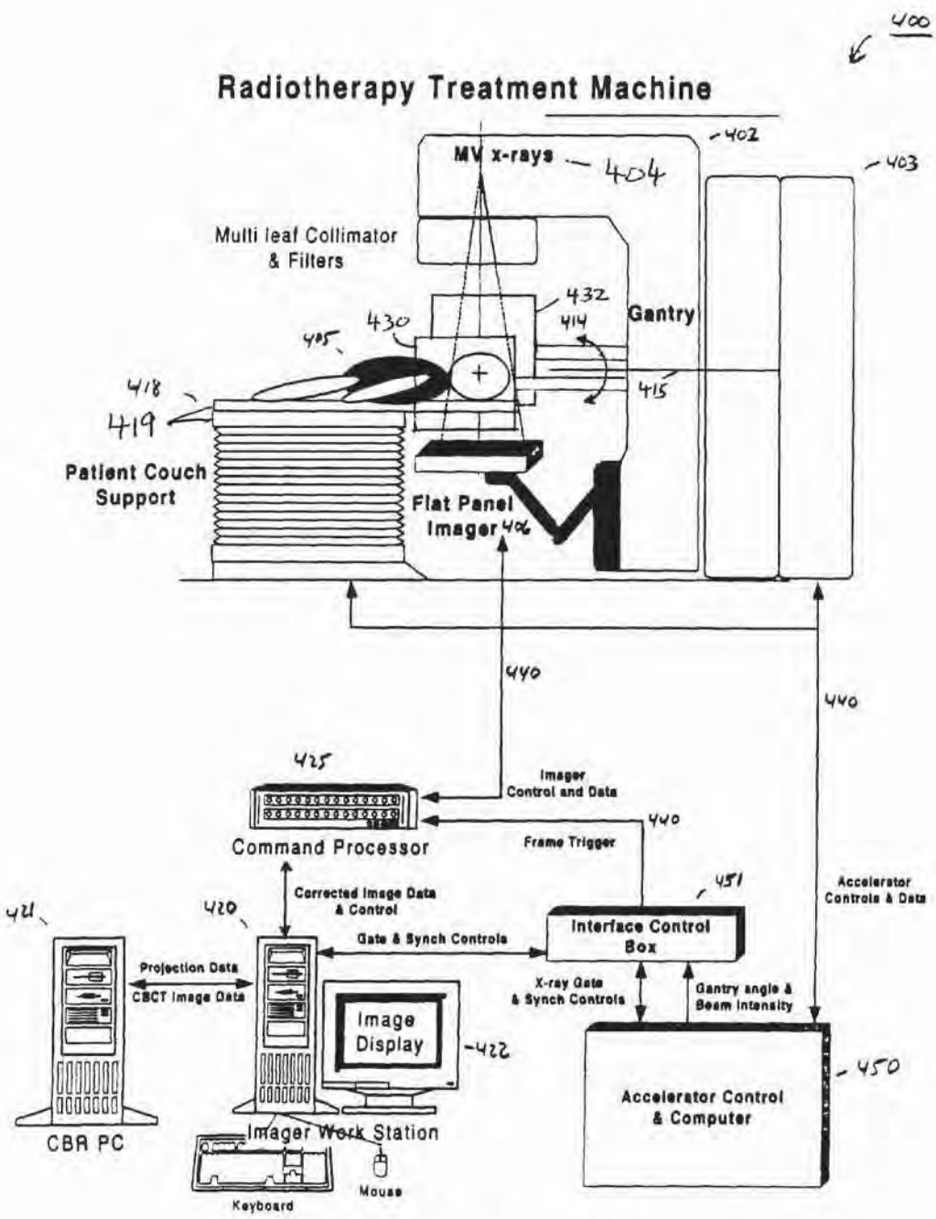
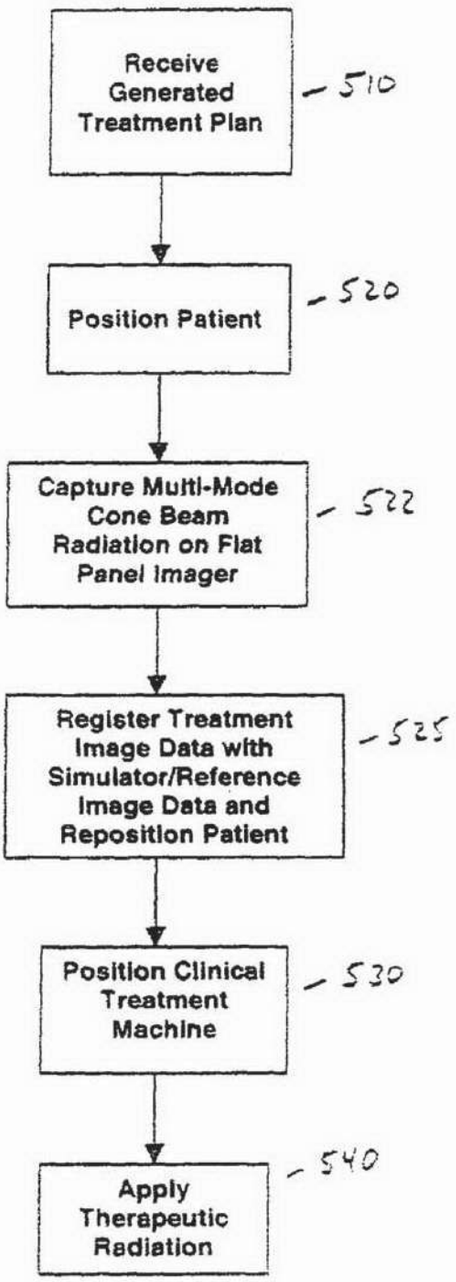


Figure 3- MV Cone Beam CT Diagram

Figure 4


Receive Generated Treatment Plan
510
Position Patient
520
Capture Multi-Mode Cone Beam Radiation on Flat Panel Imager
522
Register Treatment Image Data with Simulator/Reference Image Data and Reposition Patient
525
Position Clinical Treatment Machine
530
Apply Therapeutic Radiation
540

MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

TECHNICAL FIELD

The present invention pertains in general to therapeutic radiology. In particular, the invention involves imaging devices.

BACKGROUND

An objective of radiation therapy is to maximize the amount of radiation to a target volume (e.g., a cancerous tumor) and minimize the amount of radiation to healthy tissues and critical structures. The process of identifying the precise location of the target volume immediately prior to a dose of therapeutic radiation is key to the objective. Since each patient is treated over 30 to 40 fractionated sessions, then the time allowed for each session is relatively short, e.g. 10 to 15 minutes, so the process must be fast as well as accurate.

In the case of electronic portal imaging, megavolt therapeutic X-rays emerging from the patient can be used to generate images. However, this method of target location generates images of low contrast and quality, in addition to incidentally damaging healthy tissue. As a result, imaging with megavoltage (MV) radiation is used primarily for portal verification, that is, to confirm that the treatment volume is being radiated.

Radiotherapy simulator machines have been used to perform the pretreatment analysis of the target volume before a radiotherapy treatment machine applies the therapeutic radiation. However, traditional radiotherapy simulator machines use bulky image intensifier tube detectors to capture images of the treatment volume. These image intensifier tube detectors have the disadvantage of being very large relative to their imaging area. They also have image spatial distortions from their spherical shaped input surface and the orientation of the intensifier tube with the Earth's magnetic field.

SUMMARY OF AN EMBODIMENT OF THE INVENTION

A multi-mode cone beam computed tomography radiotherapy simulator and treatment machine is disclosed. The radiotherapy simulator and treatment machine both include a rotatable gantry on which is positioned a cone-beam radiation source and a flat panel imager. The flat panel imager captures x-ray image data to generate cone-beam CT volumetric images used to generate a therapy patient position setup and a treatment plan.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

FIG. **1** is an illustration of a side view of one embodiment of a simulation treatment machine;

FIG. **2** is an illustration of a process flow of one embodiment of a method for generating a treatment plan;

FIG. **3** is a side view of one embodiment of a clinical treatment machine; and

FIG. **4** illustrates a process flow of one embodiment of a method for implementing a treatment plan.

DETAILED DESCRIPTION

In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details. In some instances, well-known structures and devices are shown in gross form rather than in detail in order to avoid obscuring the present invention. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical, and other changes may be made without departing from the scope of the present invention.

A clinical therapy simulation machine having a cone-beam computed tomograpy (CT) radiation source and a flat-panel imager is described. The clinical therapy simulation machine is capable of manipulating the flat-panel imager and the cone beam CT radiation source to generate x-ray images for determining patient setup/alignment and a clinical treatment plan to be implemented by a clinical treatment machine.

FIG. **1** is a side view of one embodiment of a simulation treatment machine **100**. The simulation treatment machine **100** includes a rotatable gantry **202** pivotably attached to a drive stand **203**. A cone-beam CT radiation source **204** and a flat panel imager **206** oppose each other and are coupled to the rotatable gantry **202**. In one embodiment, the cone-beam CT radiation source is a kilovoltage radiation source generally in the 50 to 150 kilovolt (kV) energy range, and for example at 125 kilovolts peak (kVp).

A treatment couch **218** is positioned adjacent to the gantry **202** to place the patient and the target volume within the range of operation for the radiation source **204** and the imager **206**. The couch **218** may be connected to the therapy simulator rotatable gantry via a communications network and is capable of translating in multiple planes plus angulation **219** for positioning and re-positioning the patient **205** and therefore the target volume.

The gantry **202** can rotate **214** about an isocenterline **215** to place the radiation source **204** and imager **206** at any position 360 degrees around the target volume, for example, to generate CT scan image data. As will be described, cone-beam CT image data can be used to generate a three-dimensional representation of the patient anatomy and the target volume. The image data may further be used to generate a treatment plan to tailor a dose of therapeutic radiation to the target volume.

FIG. **2** is a process diagram of one embodiment of a method for generating a treatment plan. At block **310**, a patient is placed on the treatment couch **218** and the couch **218** positioned relative to the simulation machine **100**. At block **320**, the gantry **202** rotates around the patient **205** while the radiation from the cone-beam CT radiation source **204** impinges the flat-panel imager **206**. The gantry **202** rotates and collects image data until a computer can calculate a representation of the patient and the target volume. For example, software in a computer may take the image data to generate cone-beam CT volumetric image data for generation of a treatment plan. At block **330**, a treatment plan may be generated from the collected image data. The treatment plan may then be transferred, at block **340**, to a clinical treatment machine to provide instructions to the clinical treatment machine, for example, to position a therapeutic radiation source to apply a radiation dose to a target volume, and to minimize dose to health tissue and critical structures.

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In one embodiment the flat panel imager **206** is a real-time digital x-ray imager incorporating a large-area amorphous silicon sensor array with a high-sensitivity cesium iodide (CsI) scintillator. The flat panel imager may include a receptor module that incorporates the amorphous silicon sensor array, which accepts incoming X-ray photons and converts them to a digital video signal. The X-ray to light conversion may be provided by a thin or thick columnar CsI:Tl (cesium iodide: thalium doped) scintillator The scintillator may be vacuum deposited in a thin (e.g. 0.6 mm) layer or include individual CsI crystals (e.g., being approximately 9 mm thick with an approximate 0.38 mm×0.38 mm pixel pitch) supported in a housing with an aluminum window (e.g., approximately 1 mm thick). The top of the thin CsI scintillator may be coated with a reflective powder/epoxy mixture. Five sides of each thick crystal may be coated with a reflecting powder/epoxy mixture. The sixth side may be in contact with and face the flat-panel sensor. Alternatively, the scintillator components may have other dimensions.

The receptor module may also include a power supply module (e.g., 24 VDC power), interconnecting cables (e.g., fiber optic control and data cables), and drive and readout circuits followed by digital data conversion and transmission capabilities well known to those of ordinary skill in the art.

It should be appreciated that the flat panel imager may be a two-dimensional large flat panel imager that can operate, for example, at 15 to 30 frames per second (fps) over a wide range of dose. In this way, fluoroscopic, radiographic and cone-beam CT imaging can all be achieved with the same flat panel system. Typically, 300-900 projections may be collected during a single rotation of the gantry depending on the image resolution and dose requirements. Fewer projections allow for a faster collection of cone-beam CT image data (e.g., in 20 to 40 seconds depending on gantry speed limits), thereby, allowing for lower dose cone-beam CT images with less patient motion artifacts. Alternatively, the images may operate at other frame rates.

In one embodiment, the flat panel imager has a landscape orientation, an active area of 39.7×29.8 cm^2 with 194 micron pixel pitch, and a pixel count of 2048×1536 pixels. It can operate at a frame rate of 7.5 fps in full resolution mode and at a frame rate of 30 fps in 2×2 binned mode—where the pixel count is reduced to 1024×768 $pixels^2$. For example, the flat panel imager may be an amorphous silicon (a-Si) imager available from Varian Medical Systems of Palo Alto, Calif., under the tradename PaxScan™ 4030A. The PaxScan™ 4030A detectors are each 40 cm×30 cm. The detectors may be coupled to signal processing circuitry comprising a preamplifier stage with dynamically controllable signal gain, as described in U.S. Pat. No. 6,486,808, filed on Oct. 16, 2001, assigned to the assignee of the present invention and incorporated by reference, herein, to improve contrast resolution and dynamic range.

The readout electronics may also be located out of the path of the primary cone-beam CT radiation source **204**. The flat panel imager **206** may also employ a split data-line where the top half of the array and the bottom half of the array are read out simultaneously. This allows the imager **206** to read out more rapidly and reduces the parasitic capacitance of the data-lines, which in turn reduces the noise gain of the readout charge amplifiers. It should be appreciated that only half of the frame time is used to read out the pixels. During the rest of the frame time, the sensor can be irradiated without generating any interference patterns due to the pulsing of the cone-beam CT radiation source **204**. In addition, it should also be appreciated the control system of the flat panel imager **206** allows an external synchronization signal (from the computer **220**) to initiate the readout of a frame. This allows the user to externally control when the imager will acquire an image.

In one embodiment, a command processor module **225** manages the receptor module, processes the digital video, and provides interfaces to other components of the simulator **100**. The command processor module **225** may include a microcontroller-based, single board computer running a real-time operating system with acquisition, control, and interface software. Also, included in the command processor may be a high-speed digital video interface card, a dedicated image processor card to perform real-time image corrections, a system interface card, and a parallel output to transmit image data to an external image processor and display. Scan-converted digital and analog video may also be provided.

The captured cone-beam CT image projection data may be delivered and stored to a computer **220**. As shown in FIG. **1**, the computer **220** connects to the simulator **100** and the command processor **225** via communications network **240**. The computer **220** may control the synchronized movement of the simulator **100** including the rotatable gantry **202**, the cone-beam CT radiation source **204**, imager **206**, and the treatment couch **218**. Specifically, the computer **220** may be used by an oncologist to display image projection data on a monitor **222**, control the intensity of the cone-beam CT radiation source **204**, and control the gantry angle.

The cone-beam CT image projection data may also be transferred to a cone-beam CT reconstruction computer **221** that includes software designed to achieve rapid cone-beam CT image generation. The computer **221** can merge or reconstruct the image data into a three-dimensional representation of the patient and target volume. In one embodiment, cone-beam CT reconstruction software may allow for full-cone and partial-cone input data that can produce cone-beam CT images (e.g., approximately 26 to 48 cm diameter) at a specific source-to-imager distance (e.g., 140-150 cm). In addition, in this way, the clinical simulator machine **100** and cone-beam reconstruction software may also allow for large diameter (e.g., approximately 48 cm) axial image volumes.

In one embodiment, the cone-beam CT reconstruction software may transform the image projection data into volumetric CT image data. The volumetric CT image data may include full-fan and/or partial cone image data to reconstruct head size (e.g. 26 cm diameter×17 cm length) and body size (e.g. 48 cm diameter×15 cm length) volumes. For example, the partial-cone method may be used to obtain body size scans when the flat panel imager is not long enough to image the full body in each projection. If the 15 or 17 cm axial section is not wide enough and therefore does not cover sufficient anatomical volume, then multiple scans can be performed. For example, in the two scan case, the patient may be moved axially by 15 or 17 cm couch movements between scans and the reconstructed image volumes may then be merged to provide a 30 to 34 cm axial view.

In one embodiment, prior to reconstruction, the image projection data is preprocessed to account for x-ray beam and detector properties and the system electronic and geometric properties. The algorithm and its implementation is similar to that used in single slice computer tomography in reconstruction of fan beam data obtained with a one-dimensional detector. For partial cone beam reconstruction, the partial cone image projection data is extended to full cone beam image data and then reconstructed using a full cone beam reconstruction algorithm well known to those of ordinarily skill in the art, such as, for example, the Feldkamp cone beam reconstruction technique. It should be understood that the extension of the partial cone beam image data is performed using

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techniques similar to those used for the extension of partial fan data in well known single slice fan beam computer tomography.

In one embodiment, using the shape and distance data determined from the generated dimensional representation, the target volume may be automatically identified by the computer system **221** and/or by the inspection of an oncologist. The identified target volume may be applied to a radiotherapy planning computer system **220**, which creates a treatment plan to be implemented by a clinical treatment machine. The visualization of the data along arbitrary planes, e.g. sagital, coronal, axial, beams eye view, etc., can be displayed to assist the oncologist. To further enhance the visualization, averaging of volume image data perpendicular to the plane of view, i.e. rectangular voxels may be used.

FIG. **3** is a side view of one embodiment of a clinical treatment machine **400** that may implement the treatment plan generated by the simulator **100** and treatment planning computer **220**. The clinical treatment machine **400** includes a rotatable gantry **402** pivotably attached to a drive stand **403**. A cone-beam CT radiation source **404** and a flat panel imager **406** oppose each other and are coupled to the rotatable gantry **402**. In one embodiment, the cone-beam CT radiation source **404** is a megavoltage (MV) radiation source generally in the 4 to 25 MV energy range, for example, at 6 MV.

A treatment couch **418** is positioned adjacent to the gantry **402** to place the patient and the target volume within the range of operation for the radiation source **404** and the imager **406**. The couch **418** can be capable of translating in multiple planes plus angulation **419** for positioning and re-positioning the patient **405** and therefore the target volume.

The gantry **402** can rotate **414** about an isocenterline **415** to place the cone-beam CT radiation source **404** and imager **406** at any position 360 degrees around the target volume. The resulting megavoltage cone-beam CT image data can then be used to tailor a dose of therapeutic radiation based on at least the generated pre-defined treatment plan.

FIG. **4** is a process diagram of one embodiment of a method for implementing a treatment plan. At block **510**, an accelerator control computer **450** is provided with the treatment plan generated from the clinical simulator machine **100** for a specific patient. For example, the treatment plan may provide initial targeting information about the target volume. At block **520**, a patient is placed on the treatment couch **418** and the couch **418** is positioned relative to the clinical treatment machine **400**. At block **522**, multi-mode cone beam radiation from the radiation source **404** is captured by the imager **406** to generate images of the target volume. At block **525**, the captured image data can be compared/registered with the simulator or other reference images to determine the patient repositioning required, if any, before treatment. Image data can also be taken without repositioning to determine the random and systematic errors in treatment position, if any. At block **530**, the gantry **402** is rotated around the patient **405** to a treatment position based on the generated treatment plan. At block **540**, a therapeutic radiation dose is applied to the target volume from the cone-beam CT radiation source **404** based on the generated treatment plan. The cone-beam CT radiation source **404** also impinges the flat-panel imager **406** with radiation. In this way, the flat panel imager **406** may provide verification that the target volume is properly targeted. The process **500** may be repeated until the treatment session is complete.

The flat panel imager **406** is similar to the flat panel imager **206** including the corresponding interconnects with a command processor module **425**, a computer **420**, a monitor **422**, and a cone-beam reconstruction computer **421**, corresponding with the command processor module **225**, the computer **220**, monitor **222**, and the cone-beam reconstruction computer **221**, as described above. However, in one embodiment, the flat panel imager **406** may have its electronics unfolded from beneath the imager **406** and the input screen coating may be thicker (e.g., 9 mm vs. 0.6 mm). An example of a flat panel imager that may be used in the present invention is described in U.S. patent Ser. No. 10/013,199, filed on Nov. 2, 2001, now U.S. Pat. 6,800,898 B1 assigned to the assignee of the present invention and incorporated herein by reference.

The imager **406** may also interface with an accelerator interface control box **451**. The accelerator interface control box **451** interfaces with an accelerator control computer **450** to provide synchronization and gated control between the imager **406** and the cone-beam CT radiation source **404** during treatment based on the generated treatment plan. As shown in FIG. **3**, box **451**, processor **425**, and computer **450** connect to simulator **400** via communications network **440**. This allows single or multiple beam pulse images that are not affected by accelerator noise during readout.

In one embodiment, the accelerator interface control box **451** includes a timing interface. The timing interface coordinates acquisition by the flat panel imager **406** and pulsing of the cone-beam CT radiation source **404**. With this interface, as little as one radiation pulse (0.028 cGy at the isocenter) can be used to form projection images.

In one embodiment, the timing interface includes a National Instruments PCI 6602 data acquisition card from National Instruments Corporation of Austin, Tex. USA, that contains hardware and firmware for counting and timing pulses; computer software that provides control logic; and a user interface for the interface system. Alternatively, other cards may also be used.

A master clock signal is derived from a sync signal of the cone-beam CT radiation source **404**, which may operate at 360 pulses/s (6 MV) or 180 pulses/s (15-18 MV), according to one embodiment. Using a counter on the National Instruments PCI **6602** card, the sync signal is divided down to produce a master clock, and hence are timed relative to the production of cone-beam CT radiation pulses from the cone-beam CT radiation source **404**.

The master clock may be used to generate two control pulses, one that gates the cone-beam CT radiation source **404** on and off and the other that triggers the flat panel imager **406**. In one embodiment, the frequency of these pulses is user selectable, and may be any value below 30 pulses/sec. The relative timing of the two pulses may also be user selectable. When the flat panel imager **406** is triggered there is a period, while the image is being read out (half a frame time) during which no beam from the cone-beam CT radiation source **404** is desired. A user can enter the appropriate delay that will prevent irradiation during the frame readout period of the imager. The length of the gate pulse of the cone-beam CT radiation source **404** is also user selectable. By adjusting the width of the gate pulse, the user can control the number of beam pulses emitted by the cone-beam CT radiation source **404** during each gate pulse.

It should be appreciated that the MV cone-beam CT flat panel imager **406** has a high quantum efficient 9 mm thick CsI:Tl screen (e.g., approximately 10% efficient at 6 MV), which preserves spatial resolution and minimizes dose to the patient by at least a factor of 5 over a standard 1 mm thin copper plate and less than 1 mm GOS (gadolinium oxysulfide) screens used in standard flat panel and screen-camera portal imaging. Therefore, images with as low as one 6 MV accelerator beam pulse (e.g., 0.028 cGy) per frame may be collected. In addition, a low patient dose of 8 to 16 cGy per

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cone-beam CT data set may be yielded for 300 to 600 CT image frames or projections per data set. The lower dose of the MV cone-beam CT radiation allows for more frequent use on each patient during the typical 30 to 37 fractionated treatment sessions. Moreover, reduced spatial resolution on the MV cone-beam CT scans can be afforded for faster processing time using the cone-beam reconstruction software on the CBR computer **421** to achieve rapid image generation.

It should be appreciated that a separate kV cone-beam CT radiation source (optional and shown as source **430**) and another opposing flat panel imager (as described above on the simulator, optional and shown as imager **432**) may also be coupled to the gantry **404** to perform a diagnostic cone-beam CT scan. For example, the kV cone-beam CT radiation source and opposing flat panel imager may be coupled to the treatment machine gantry **404** at an off axis of e.g. forty-five or ninety degrees from the MV cone-beam radiation source **404** and opposing imager **406**. As before, software in the computers **420** and/or **421** may generate the three-dimensional representation of the patient anatomy and target volume from the cone-beam CT image data provided by the kV radiation source. The clinical treatment machine **400** may use the kV cone-beam CT image data to make any necessary adjustments to the treatment plan based on identified movement of the target volume or to determine the amount of patient repositioning required by the treatment couch **418** or collimator movements. In this way, the kV cone-beam CT radiation source and flat panel imager share a common axis of rotation with the MV cone-beam CT radiation source **404** and provide additional information for aligning the patient to the generated simulation treatment plan.

It should also be appreciated that in this way, either the clinical simulator machine **100** and/or the clinical treatment machine **400** diagnostic cone-beam CT image data can be used as a reference for applying the MV radiation beams.

It should also be understood that it is not necessary for the therapeutic radiation to be applied from the exact position(s) where any of the previously generated CT images were taken since the computer software can provide virtual two-dimensional representations for any desired radial location in-between the images.

It should be understood that although the clinical treatment machine **400** has been described as having a cone-beam radiation source, in alternative embodiments beam shaping, along with intensity modulation, may also be implemented based on the generated treatment plan by directing a therapeutic beam through a dynamic multileaf collimator. The multileaf collimator may include a series of stacked metal shims having a center of shim pairs where each shim of the pairs may be individually moved to create a shaped opening capable of shaping the therapeutic beam. To be effective, the radiation field should be large enough to radiate the entire tumor while at the same time minimize radiating healthy tissue. The collimator may be dynamic in that the shims can rapidly move to reshape the beam, which results in blocking the therapeutic beam from striking certain areas of the target volume based on the treatment plan. Such dynamic shaping may result in different areas of the tumor receiving different amounts of radiation over the time that a radiation dose is applied.

It should be appreciated that more or fewer processes may be incorporated into the methods illustrated in FIGS. **2** and **4** without departing from the scope of the invention and that no particular order is implied by the arrangement of blocks shown and described herein. It further will be appreciated that the method described in conjunction with FIGS. **2** and **4** may be embodied in machine-executable instructions (e.g. software). The instructions can be used to cause a general-purpose or special-purpose processor that is programmed with the instructions to perform the operations described. Alternatively, the operations might be performed by specific hardware components that contain hardwired logic for performing the operations, or by any combination of programmed computer components and custom hardware components. The methods may be provided as a computer program product that may include a machine-readable medium having stored thereon instructions that may be used to program a computer (or other electronic devices) to perform the methods. For the purposes of this specification, the terms "machine-readable medium" shall be taken to include any medium that is capable of storing or encoding a sequence of instructions for execution by the machine and that cause the machine to perform any one of the methodologies of the present invention. The term "machine-readable medium" shall accordingly be taken to included, but not be limited to, solid-state memories, optical and magnetic disks, and carrier wave signals. Furthermore, it is common in the art to speak of software, in one form or another (e.g., program, procedure, process, application, module, logic . . .), as taking an action or causing a result. Such expressions are merely a shorthand way of saying that execution of the software by a computer causes the processor of the computer to perform an action or produce a result.

It should be appreciated that a clinical simulation machine having a cone-beam radiation source and flat-panel imagers, as described, allows for identification of a target volume via fluoroscopic, radiographic, and cone-beam CT imaging. In this way, the generation of the treatment plan via the clinical simulation machine prior to the application of therapeutic radiation, increases the accuracy of treating the tumor target. Furthermore, embodiments of the invention as described above may capture images while the gantry is continuously rotating versus traditional systems that stop and shoot every, approximately, four degrees around the patient, thereby further lessening the time for completion.

It should also be appreciated that the cone-beam volumetric reconstruction software can utilize image projection data at non-uniformly spaced gantry angles. Thus the data collection does not require a precise gantry speed of rotation. There is a normalizing detector at the radiation source, which is used to correct for system output variations. In one embodiment, the support arms for the images **206** and **406** are sufficiently precise in mechanical stability during gantry rotation that no compensating spatial corrections are required.

Although the present invention has been described with reference to specific exemplary embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader scope of the invention as set forth in the claims. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

What is claimed is:

1. An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high-energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient;

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-

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beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

2. The apparatus of claim **1**, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

3. The apparatus of claim **1**, wherein the computing unit generates a treatment plan based on the image projection data.

4. The apparatus of claim **1**, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

5. The apparatus of claim **1**, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high-energy radiation source is a megavoltage radiation source.

6. The apparatus of claim **1**, wherein the rotatable gantry is capable of 360 degree rotation.

7. The apparatus of claim **1**, wherein the high-energy source comprises a megavoltage radiation source to radiate a target volume with radiation.

8. The apparatus of claim **1**, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry at a pivotable attachment at which the gantry pivots about an isocenter.

9. The apparatus of claim **1**, wherein the cone-beam source and high-energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high-energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

10. The apparatus of claim **1**, wherein the rotatable gantry is coupled to the frame at a rotational axis of the gantry; wherein the cone-beam radiation source is a cone-beam imaging source coupled to a first end of a first arm, the first arm having a second end coupled to the gantry; wherein the flat-panel imager is coupled to a first end of a second arm, the second arm having a second end coupled to the gantry; and wherein the high-energy radiation source comprises a high-energy cone-beam source.

11. An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high-energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient, wherein the flat-panel imager includes an amorphous silicon sensor array, and wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

12. The apparatus of claim **11**, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

13. An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high-energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

14. An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high-energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient;

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient; and

a translatable treatment couch coupled to the rotatable gantry via a communications network.

15. The apparatus of claim **14**, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

16. An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high-energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient;

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient, wherein the a flat-panel imager is a flat-panel KV imager; and

a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high-energy MV radiation source.

17. A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical radiation treatment machine capable of implementing a treatment plan;

irradiating a patient with a radiation source;

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

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18. The method of claim 17, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

19. The method of claim 17, wherein the radiation source is a cone-beam computed tomography radiation source, and wherein the image projection data is generated from a flat-panel imager capturing radiation from the cone-beam computed tomography radiation source passing through a target volume.

20. The method of claim 19, wherein the radiation source is a kilovoltage radiation source.

21. The method of claim 17, wherein the image projection data is fluoroscopic image projection data.

22. The method of claim 17, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align a treatment volume with the therapeutic radiation.

23. The method of claim 17, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

24. The method of claim 17, further comprising:

positioning a patient based on the cone-beam volumetric image data.

25. The method of claim 17, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry at a pivotable attachment at which the gantry pivots about an isocenter.

26. A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical radiation treatment machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

capturing image projection data from a flat-panel imager using the clinical radiation treatment machine, the image projection data for generating cone-beam computed tomography (CT) volumetric image data, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

27. A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical radiation treatment machine capable of implementing a treatment plan;

irradiating a patient with a radiation source;

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data, wherein the radiation source is a cone-beam computed tomography radiation source, wherein the image projection data is generated from a flat-panel imager capturing radiation from the cone-beam computed tomography radiation source passing through a target volume;

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager; and

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

28. A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical radiation treatment machine capable of implementing a treatment plan;

irradiating a patient with a radiation source;

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data, wherein the radiation source is a cone-beam computed tomography radiation source, wherein the image projection data is generated from a tlat-panel imager capturing radiation from the cone-beam computed tomography radiation source passing through a target volume;

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing image projection data at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

29. A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical radiation treatment machine capable of implementing a treatment plan;

irradiating a patient with a radiation source;

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data, wherein the radiation source is a cone-beam computed tomography radiation source, wherein the image projection data is generated from a flat-panel imager capturing radiation from the cone-beam computed tomography radiation source passing through a target volume; and

continuously rotating the radiation source about the target volume while capturing image projection data.

30. An apparatus, comprising:

one of a radiation simulation system comprising logic configured to determine a patient position relative to a high-energy radiation treatment beam and a radiation treatment system comprising logic configured to implement a treatment plan for a high-energy radiation treatment, the logic comprising at least one of hardwired logic and a programmable computer component, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame at a pivot point;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

31. The apparatus of claim 30, wherein the means for capturing includes an amorphous silicon sensor array.

32. The apparatus of claim 31, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

33. The apparatus of claim 32, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

34. The apparatus of claim 30, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

35. The apparatus of claim 30, wherein the means for capturing captures the image data at 15 to 30 frames per second.

36. The apparatus of claim 30, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

37. The apparatus of claim 30, further comprising:

means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

38. The apparatus of claim 37, wherein the means for generating generates a three-dimensional age of a target volume based on the captured image projection data.

39. The apparatus of claim 30, wherein the means for applying includes a kilovoltage radiation source.

40. The apparatus of claim 30, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

41. The apparatus of claim 40, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

42. The apparatus of claim 30, wherein the rotatable gantry is capable of 360-degree rotation.

43. The apparatus of claim 30, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

44. The apparatus of claim 43, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

45. The apparatus of claim 30. wherein the radiation simulation system comprises logic configured to determine a patient position relative to a high-energy radiation treatment beam of a treatment machine to be simulated by the simulation system, the logic comprising at least one of hardwired logic and a programmable computer component; and wherein the radiation treatment system includes a high-energy radiation treatment beam source.

46. A machine-readable medium selected from the group consisting of solid-state memories, optical disks, and magnetic disks; the machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical radiation treatment machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

47. The machine-readable medium of claim 46, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

48. The machine-readable medium of claim 46, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

49. The machine-readable medium of claim 46, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

50. The machine-readable medium of claim 46, wherein instructing further comprises instructing the clinical radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

51. The machine-readable medium of claim 46, further comprising instructing a megavoltage radiation source to radiate a target volume with radiation.

52. The machine-readable medium of claim 46, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry at a pivotable attachment at which the gantry pivots about an isocenter.

53. An apparatus, comprising:

a clinical radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high-energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

54. The apparatus of claim 53, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

55. The apparatus of claim 54, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

56. The apparatus of claim 55, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

57. The apparatus of claim 53, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

58. The apparatus of claim 57, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

59. The apparatus of claim 58, wherein the high-energy radiation source comprises:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

60. The apparatus of claim 53, further comprising a translatable treatment couch coupled to the rotatable gantry via a

communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

61. The apparatus of claim **53**, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

62. The apparatus of claim **53**, wherein the cone-beam source and high-energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high-energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

63. An apparatus, comprising:

a radiation treatment simulation system comprising logic configured to determine a patient position relative to a high-energy radiation treatment beam, the logic comprising at least one of hardwired logic and a programmable computer component, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame at a pivot point;

a cone-beam imaging radiation source coupled to the rotatable gantry to radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

64. The apparatus of claim **63**, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

65. The apparatus of claim **64**, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data

66. The apparatus of claim **63**, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

67. The apparatus of claim **63**, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

68. A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical treatment simulator machine comprising logic configured to implement a treatment plan for a high-energy radiation treatment beam, the logic comprising at least one of hardwired logic and a programmable computer component;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

69. The method of claim **68**, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align a treatment volume with the therapeutic radiation.

70. The method of claim **68**, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

71. The method of claim **70**, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data.

72. The method of claim **68**, wherein rotating further comprises pivoting the gantry about an isocenter using a drive stand pivotably coupled to the rotatable gantry by a pivotable attachment.

73. The method of claim **68**, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

74. A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled at a pivot point to a frame of a clinical simulator machine comprising logic configured to determine a patient position relative to a high-energy radiation treatment beam, the logic comprising at least one of hardwired logic and a programmable computer component;

irradiating a patient with a radiation source; and

using the clinical simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

75. The method of claim **74**, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align a treatment volume with the therapeutic radiation.

76. The method of claim **74**, wherein rotating further comprises pivoting the gantry about an isocenter using a drive stand pivotably coupled to the rotatable gantry by a pivotable attachment.

77. The method of claim **74**, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

* * * * *

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BIBDATASHEET

CONFIRMATION NO. 4627

Bib Data Sheet

SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/324,227	12/18/2002 RULE	378	2882	5513P009

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Richard E. Colbeth, Los Altos, CA;

** CONTINUING DATA **********

NONE

** FOREIGN APPLICATIONS **********

NONE

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 03/28/2003

Foreign Priority claimed ☐ yes ☒ no 35 USC 119 (a-d) conditions met ☐ yes ☐ no ☐ Met after Allowance Verified and Acknowledged ACH (Examiner's Signature) (Initials)	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
	CA	4	37	4

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TITLE
Multi-mode cone beam CT radiotherapy simulator and treatment machine with a flat panel imager

FILING FEE RECEIVED 2510	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

12/23/2002 SZEWDIE1 00000080 10324227

01 FC:1001	740.00	OP
02 FC:1201	84.00	OP
03 FC:1202	306.00	OP

PTO-1556
(5/87)

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12-23-02 A

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	5513P009
First Inventor	Edward G. Shapiro, et al.
Title	A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager
Express Mail Label No.	EL627533999US

JC978 U.S. PTO 10/324227 12/18/02

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. ☐ Applicant claims small entity status. See 37 CFR 1.27.
3. ☒ Specification *[Total Pages 28]* *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☒ Drawing(s) *(35 U.S.C. 113)* *[Total Sheets 4]*
5. Oath or Declaration (unsigned) *[Total Pages 4]*
   a. ☐ Newly executed (original or copy)
   b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 18 completed)*
      i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b)
6. ☐ Application Data Sheet. See 37 CFR 1.76
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*
8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all of the following are necessary)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ paper
   c. ☐ Statements verifying identity of above copies
9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 C.F.R. § 3.73(b) Statement *(when there is an assignee)* ☐ Power of Attorney
11. ☐ English Translation Document *(if applicable)*
12. ☒ Information Disclosure Statement (IDS)/PTO-1449 ☒ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. ☒ Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. ☐ Other: _____

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

Prior application Information: *Examiner* _____ *Group/Art Unit:* _____

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

18. CORRESPONDENCE ADDRESS

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Name (Print/Type)	Andre M. Gibbs	Registration No. (Attorney/Agent)	47,593
Signature		Date	December 18 2002

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FEE TRANSMITTAL for FY 2003

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 1,130.00

Complete If Known	
Application Number	Unassigned
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	
Group/Art Unit	
Attorney Docket No.	5513P009

METHOD OF PAYMENT (check one)

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	740	2001	370	Utility filing fee	740.00
1002	330	2002	165	Design filing fee	
1003	510	2003	255	Plant filing fee	
1004	740	2004	370	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 740.00

2. EXTRA CLAIM FEES

		Extra Claims		Fee from below		Fee Paid
Total Claims	37 - 20* =	17	x	18.00	=	$306.00
Independent Claims	4 - 3* =	1	x	84.00	=	$84.00
Multiple Dependent					=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple Dependent claim, if not paid
1204	84	2204	42	**Reissue independent claims over original patent
1205	18	2205	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 390.00

**or number previously paid, if greater. For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	400	2252	200	Extension for reply within second month	
1253	920	2253	460	Extension for reply within third month	
1254	1,440	2254	720	Extension for reply within fourth month	
1255	1,960	2255	980	Extension for reply within fifth month	
1404	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,280	2453	640	Petition to revive - unintentional	
1501	1,280	2501	640	Utility issue fee (or reissue)	
1502	460	2502	230	Design issue fee	
1503	620	2503	310	Plant issue fee	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	740	1809	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	740	2810	370	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	740	2801	370	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

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SUBTOTAL (3) ($)

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Andre M. Gibbs	Registration No. (Attorney/Agent)	47,593	Telephone	(408) 720-8300
Signature				Date	December 18 2002

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First Named Inventor	Edward G. Shapiro
Examiner Name	
Group/Art Unit	
Attorney Docket No.	5513P009

Jc979 U.S. PTO 10/324221 12/18/02

METHOD OF PAYMENT (check one)

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

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2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
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Independent Claims	4	- 3* =	1	x	84.00	=	$84.00
Multiple Dependent						=	

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***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	400	2252	200	Extension for reply within second month	
1253	920	2253	460	Extension for reply within third month	
1254	1,440	2254	720	Extension for reply within fourth month	
1255	1,960	2255	980	Extension for reply within fifth month	
1404	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,280	2453	640	Petition to revive - unintentional	
1501	1,280	2501	640	Utility issue fee (or reissue)	
1502	460	2502	230	Design issue fee	
1503	620	2503	310	Plant issue fee	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	740	1809	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	740	2810	370	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	740	2801	370	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY

Complete (if applicable)

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Signature				Date	December 18 2002

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UNITED STATES PATENT APPLICATION

FOR

A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

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A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

TECHNICAL FIELD

[0001] The present invention pertains in general to therapeutic radiology. In particular, the invention involves imaging devices.

BACKGROUND

[0002] An objective of radiation therapy is to maximize the amount of radiation to a target volume (e.g., a cancerous tumor) and minimize the amount of radiation to healthy tissues and critical structures. The process of identifying the precise location of the target volume immediately prior to a dose of therapeutic radiation is key to the objective. Since each patient is treated over 30 to 40 fractionated sessions, then the time allowed for each session is relatively short, e.g. 10 to 15 minutes, so the process must be fast as well as accurate.

[0003] In the case of electronic portal imaging, megavolt therapeutic X-rays emerging from the patient can be used to generate images. However, this method of target location generates images of low contrast and quality, in addition to incidentally damaging healthy tissue. As a result, imaging with megavoltage (MV) radiation is used primarily for portal verification, that is, to confirm that the treatment volume is being radiated.

[0004] Radiotherapy simulator machines have been used to perform the pre-treatment analysis of the target volume before a radiotherapy treatment machine

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applies the therapeutic radiation. However, traditional radiotherapy simulator machines use bulky image intensifier tube detectors to capture images of the treatment volume. These image intensifier tube detectors have the disadvantage of being very large relative to their imaging area. They also have image spatial distortions from their spherical shaped input surface and the orientation of the intensifier tube with the Earth's magnetic field.

[redacted]

SUMMARY OF AN EMBODIMENT OF THE INVENTION

[0005] A multi-mode cone beam computed tomography radiotherapy simulator and treatment machine is disclosed. The radiotherapy simulator and treatment machine both include a rotatable gantry on which is positioned a cone-beam radiation source and a flat panel imager. The flat panel imager captures x-ray image data to generate cone-beam CT volumetric images used to generate a therapy patient position setup and a treatment plan.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

[0007] Figure 1 is an illustration of a side view of one embodiment of a simulation treatment machine;

[0008] Figure 2 is an illustration of a process flow of one embodiment of a method for generating a treatment plan;

[0009] Figure 3 is a side view of one embodiment of a clinical treatment machine; and

[0010] Figure 4 illustrates a process flow of one embodiment of a method for implementing a treatment plan.

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DETAILED DESCRIPTION

[0011] In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention may be practiced without these specific details. In some instances, well-known structures and devices are shown in gross form rather than in detail in order to avoid obscuring the present invention. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that logical, mechanical, electrical, and other changes may be made without departing from the scope of the present invention.

[0012] A clinical therapy simulation machine having a cone-beam computed tomograpy (CT) radiation source and a flat-panel imager is described. The clinical therapy simulation machine is capable of manipulating the flat-panel imager and the cone beam CT radiation source to generate x-ray images for determining patient setup/ alignment and a clinical treatment plan to be implemented by a clinical treatment machine.

[0013] Figure 1 is a side view of one embodiment of a simulation treatment machine 100. The simulation treatment machine 100 includes a rotatable gantry 202 pivotably attached to a drive stand 203. A cone-beam CT radiation source 204 and a flat panel imager 206 oppose each other and are coupled to the rotatable gantry 202. In one embodiment, the cone-beam CT radiation source is a kilovoltage radiation source generally in the 50 to 150 kilovolt (kV) energy range, and for example at 125 kilovolts peak (kVp).

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[0014] A treatment couch 218 is positioned adjacent to the gantry 202 to place the patient and the target volume within the range of operation for the radiation source 204 and the imager 206. The couch 218 may be connected to the therapy simulator rotatable gantry via a communications network and is capable of translating in multiple planes plus angulation for positioning and re-positioning the patient 205 and therefore the target volume.

[0015] The gantry 202 can rotate 214 about an isocenterline 215 to place the radiation source 204 and imager 206 at any position 360 degrees around the target volume, for example, to generate CT scan image data. As will be described, cone-beam CT image data can be used to generate a three-dimensional representation of the patient anatomy and the target volume. The image data may further be used to generate a treatment plan to tailor a dose of therapeutic radiation to the target volume.

[0016] Figure 2 is a process diagram of one embodiment of a method for generating a treatment plan. At block 310, a patient is placed on the treatment couch 218 and the couch 218 positioned relative to the simulation machine 100. At block 320, the gantry 202 rotates around the patient 205 while the radiation from the cone-beam CT radiation source 204 impinges the flat-panel imager 206. The gantry 202 rotates and collects image data until a computer can calculate a representation of the patient and the target volume. For example, software in a computer may take the image data to generate cone-beam CT volumetric image data for generation of a treatment plan. At block 330, a treatment plan may be generated from the collected image data. The treatment plan may then be transferred, at block 340, to a clinical treatment machine to provide instructions to the clinical treatment machine, for example, to position a therapeutic

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radiation source to apply a radiation dose to a target volume, and to minimize dose to health tissue and critical structures.

[0017] In one embodiment the flat panel imager 206 is a real-time digital x-ray imager incorporating a large-area amorphous silicon sensor array with a high-sensitivity cesium iodide (CsI) scintillator. The flat panel imager may include a receptor module that incorporates the amorphous silicon sensor array, which accepts incoming X-ray photons and converts them to a digital video signal. The X-ray to light conversion may be provided by a thin or thick columnar CsI:Tl (cesium iodide: thalium doped) scintillator The scintillator may be vacuum deposited in a thin (e.g. 0.6 mm) layer or include individual CsI crystals (e.g., being approximately 9 mm thick with an approximate 0.38 mm x 0.38 mm pixel pitch) supported in a housing with an aluminum window (e.g., approximately 1 mm thick). The top of the thin CsI scintillator may be coated with a reflective powder/epoxy mixture. Five sides of each thick crystal may be coated with a reflecting powder/epoxy mixture. The sixth side may be in contact with and face the flat-panel sensor. Alternatively, the scintillator components may have other dimensions.

[0018] The receptor module may also include a power supply module (e.g., 24 VDC power), interconnecting cables (e.g., fiber optic control and data cables), and drive and readout circuits followed by digital data conversion and transmission capabilities well known to those of ordinary skill in the art.

[0019] It should be appreciated that the flat panel imager may be a two-dimensional large flat panel imager that can operate, for example, at 15 to 30 frames per second (fps) over a wide range of dose. In this way, fluoroscopic, radiographic and cone-beam CT imaging can all be achieved with the same flat panel system. Typically, 300-900

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projections may be collected during a single rotation of the gantry depending on the image resolution and dose requirements. Fewer projections allow for a faster collection of cone-beam CT image data (e.g., in 20 to 40 seconds depending on gantry speed limits), thereby, allowing for lower dose cone-beam CT images with less patient motion artifacts. Alternatively, the images may operate at other frame rates.

[0020] In one embodiment, the flat panel imager has a landscape orientation, an active area of 39.7x29.8cm^2 with 194 micron pixel pitch, and a pixel count of 2048x1536 pixels. It can operate at a frame rate of 7.5 fps in full resolution mode and at a frame rate of 30 fps in 2x2 binned mode – where the pixel count is reduced to 1024x768 pixels^2. For example, the flat panel imager may be an amorphous silicon (a-Si) imager available from Varian Medical Systems of Palo Alto, California, under the tradename PaxScan™ 4030A. The PaxScan™ 4030A detectors are each 40 cm x 30 cm. The detectors may be coupled to signal processing circuitry comprising a preamplifier stage with dynamically controllable signal gain, as described in US patent number 6,486,808, filed on October 16, 2001, assigned to the assignee of the present invention and incorporated by reference, herein, to improve contrast resolution and dynamic range.

[0021] The readout electronics may also be located out of the path of the primary cone-beam CT radiation source 404. The flat panel imager 206 may also employ a split data-line where the top half of the array and the bottom half of the array are read out simultaneously. This allows the imager 206 to read out more rapidly and reduces the parasitic capacitance of the data-lines, which in turn reduces the noise gain of the readout charge amplifiers. It should be appreciated that only half of the frame time is used to read out the pixels. During the rest of the frame time, the sensor can be

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irradiated without generating any interference patterns due to the pulsing of the cone-beam CT radiation source 204. In addition, it should also be appreciated the control system of the flat panel imager 206 allows an external synchronization signal (from the computer 220) to initiate the readout of a frame. This allows the user to externally control when the imager will acquire an image.

[0022] In one embodiment, a command processor module 225 manages the receptor module, processes the digital video, and provides interfaces to other components of the simulator 100. The command processor module 225 may include a microcontroller-based, single board computer running a real-time operating system with acquisition, control, and interface software. Also, included in the command processor may be a high-speed digital video interface card, a dedicated image processor card to perform real-time image corrections, a system interface card, and a parallel output to transmit image data to an external image processor and display. Scan-converted digital and analog video may also be provided.

[0023] The captured cone-beam CT image projection data may be delivered and stored to a computer 220. As shown in Figure 1, the computer 220 connects to the simulator 100 and the command processor 225 via communications network 240. The computer 220 may control the synchronized movement of the simulator 100 including the rotatable gantry 202, the cone-beam CT radiation source 204, imager 206, and the treatment couch 218. Specifically, the computer 220 may be used by an oncologist to display image projection data on a monitor 222, control the intensity of the cone-beam CT radiation source 204, and control the gantry angle.

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[0024] The cone-beam CT image projection data may also be transferred to a cone-beam CT reconstruction computer 221 that includes software designed to achieve rapid cone-beam CT image generation. The computer 221 can merge or reconstruct the image data into a three-dimensional representation of the patient and target volume. In one embodiment, cone-beam CT reconstruction software may allow for full-cone and partial-cone input data that can produce cone-beam CT images (e.g., approximately 26 to 48 cm diameter) at a specific source-to-imager distance (e.g., 140 -150 cm). In addition, in this way, the clinical simulator machine 100 and cone-beam reconstruction software may also allow for large diameter (e.g., approximately 48 cm) axial image volumes.

[0025] In one embodiment, the cone-beam CT reconstruction software may transform the image projection data into volumetric CT image data. The volumetric CT image data may include full-fan and/or partial cone image data to reconstruct head size (e.g. 26 cm diameter x 17 cm length) and body size (e.g. 48 cm diameter x 15 cm length) volumes. For example, the partial-cone method may be used to obtain body size scans when the flat panel imager is not long enough to image the full body in each projection. If the 15 or 17 cm axial section is not wide enough and therefore does not cover sufficient anatomical volume, then multiple scans can be performed. For example, in the two scan case, the patient may be moved axially by 15 or 17 cm couch movements between scans and the reconstructed image volumes may then be merged to provide a 30 to 34 cm axial view.

[0026] In one embodiment, prior to reconstruction, the image projection data is preprocessed to account for x-ray beam and detector properties and the system electronic and geometric properties. The algorithm and its implementation is similar to

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that used in single slice computer tomography in reconstruction of fan beam data obtained with a one-dimensional detector. For partial cone beam reconstruction, the partial cone image projection data is extended to full cone beam image data and then reconstructed using a full cone beam reconstruction algorithm well known to those of ordinarily skill in the art, such as, for example, the Feldkamp cone beam reconstruction technique. It should be understood that the extension of the partial cone beam image data is performed using techniques similar to those used for the extension of partial fan data in well known single slice fan beam computer tomography.

[0027] In one embodiment, using the shape and distance data determined from the generated dimensional representation, the target volume may be automatically identified by the computer system 221 and/or by the inspection of an oncologist. The identified target volume may be applied to a radiotherapy planning computer system 220, which creates a treatment plan to be implemented by a clinical treatment machine. The visualization of the data along arbitrary planes, e.g. sagital, coronal, axial, beams eye view, etc., can be displayed to assist the oncologist. To further enhance the visualization, averaging of volume image data perpendicular to the plane of view, i.e. rectangular voxels may be used.

[0028] Figure 3 is a side view of one embodiment of a clinical treatment machine 400 that may implement the treatment plan generated by the simulator 100 and treatment planning computer 220. The clinical treatment machine 400 includes a rotatable gantry 402 pivotably attached to a drive stand 403. A cone-beam CT radiation source 404 and a flat panel imager oppose each other and are coupled to the rotatable gantry 402. In

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one embodiment, the cone-beam CT radiation source 404 is a megavoltage (MV) radiation source generally in the 4 to 25 MV energy range, for example, at 6MV.

[0029] A treatment couch 418 is positioned adjacent to the gantry 402 to place the patient and the target volume within the range of operation for the radiation source 404 and the imager 406. The couch 418 can be capable of translating in multiple planes plus angulation for positioning and re-positioning the patient 405 and therefore the target volume.

[0030] The gantry 402 can rotate 414 about an isocenterline 415 to place the cone-beam CT radiation source 404 and imager 406 at any position 360 degrees around the target volume. The resulting megavoltage cone-beam CT image data can then be used to tailor a dose of therapeutic radiation based on at least the generated pre-defined treatment plan.

[0031] Figure 4 is a process diagram of one embodiment of a method for implementing a treatment plan. At block 510, an accelerator control computer 450 is provided with the treatment plan generated from the clinical simulator machine 100 for a specific patient. For example, the treatment plan may provide initial targeting information about the target volume. At block 520, a patient is placed on the treatment couch 418 and the couch 418 is positioned relative to the clinical treatment machine 400. At block 522, multi-mode cone beam radiation from the radiation source 404 is captured by the imager 406 to generate images of the target volume. The captured image data can be compared/registered with the simulator or other reference images to determine the patient repositioning required, if any, before treatment. Image data can also be taken without repositioning to determine the random and systematic errors in

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treatment position, if any. At block 530, the gantry 402 is rotated around the patient 405 to a treatment position based on the generated treatment plan. At block 540, a therapeutic radiation dose is applied to the target volume from the cone-beam CT radiation source 404 based on the generated treatment plan. The cone-beam CT radiation source 404 also impinges the flat-panel imager 406 with radiation. In this way, the flat panel imager 406 may provide verification that the target volume is properly targeted. The process 500 may be repeated until the treatment session is complete.

[0032] The flat panel imager 406 is similar to the flat panel imager 206 including the corresponding interconnects with a command processor module 425, a computer 420, and a cone-beam reconstruction computer 421, corresponding with the command processor module 225, the computer 220, and the cone-beam reconstruction computer 221, as described above. However, in one embodiment, the flat panel imager 406 may have its electronics unfolded from beneath the imager 406 and the input screen coating may be thicker (e.g., 9 mm vs. 0.6 mm). An example of a flat panel imager that may be used in the present invention is described in US patent serial number 10/013,199, filed on November 2, 2001, assigned to the assignee of the present invention and incorporated herein by reference.

[0033] The imager 406 may also interface with an accelerator interface control box 451. The accelerator interface control box 451 interfaces with an accelerator control computer 450 to provide synchronization and gated control between the imager 406 and the cone-beam CT radiation source 404 during treatment based on the generated treatment plan. This allows single or multiple beam pulse images that are not affected by accelerator noise during readout.

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[0034] In one embodiment, the accelerator interface control box 451 includes a timing interface. The timing interface coordinates acquisition by the flat panel imager 406 and pulsing of the cone-beam CT radiation source 404. With this interface, as little as one radiation pulse (0.028 cGy at the isocenter) can be used to form projection images.

[0035] In one embodiment, the timing interface includes a National Instruments PCI 6602 data acquisition card from National Instruments Corporation of Austin, Texas USA, that contains hardware and firmware for counting and timing pulses; computer software that provides control logic; and a user interface for the interface system. Alternatively, other cards may also be used.

[0036] A master clock signal is derived from a sync signal of the cone-beam CT radiation source 404, which may operate at 360 pulses/s (6 MV) or 180 pulses/s (15-18 MV), according to one embodiment. Using a counter on the National Instruments PCI 6602 card, the sync signal is divided down to produce a master clock, and hence are timed relative to the production of cone-beam CT radiation pulses from the cone-beam CT radiation source 404.

[0037] The master clock may be used to generate two control pulses, one that gates the cone-beam CT radiation source 404 on and off and the other that triggers the flat panel imager 406. In one embodiment, the frequency of these pulses is user selectable, and may be any value below 30 pulses/sec. The relative timing of the two pulses may also be user selectable. When the flat panel imager 406 is triggered there is a period, while the image is being read out (half a frame time) during which no beam from the cone-beam CT radiation source 404 is desired. A user can enter the

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appropriate delay that will prevent irradiation during the frame readout period of the imager. The length of the gate pulse of the cone-beam CT radiation source 404 is also user selectable. By adjusting the width of the gate pulse, the user can control the number of beam pulses emitted by the cone-beam CT radiation source 404 during each gate pulse.

[0038] It should be appreciated that the MV cone-beam CT flat panel imager 406 has a high quantum efficient 9 mm thick CsI:Tl screen (e.g., approximately 10% efficient at 6 MV), which preserves spatial resolution and minimizes dose to the patient by at least a factor of 5 over a standard 1 mm copper plate and thin less than 1 mm GOS (gadolinium oxysulfide) screens used in standard flat panel and screen-camera portal imaging Therefore, images with as low as one 6 MV accelerator beam pulse (e.g., 0.028 cGy) per frame may be collected. In addition, a low patient dose of 8 to 16 cGy per cone-beam CT data set may be yielded for 300 to 600 CT image frames or projections per data set. The lower dose of the MV cone-beam CT radiation allows for more frequent use on each patient during the typical 30 to 37 fractionated treatment sessions. Moreover, reduced spatial resolution on the MV cone-beam CT scans can be afforded for faster processing time using the cone-beam reconstruction software on the CBR computer 421 to achieve rapid image generation.

[0039] It should be appreciated that a separate kV cone-beam CT radiation source (not shown) and another opposing flat panel imager (as described above on the simulator but not shown here) may also be coupled to the gantry 404 to perform a diagnostic cone-beam CT scan. For example, the kV cone-beam CT radiation source and opposing flat panel imager may be coupled to the treatment machine gantry 404 at

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an off axis of e.g. forty-five or ninety degrees from the MV cone-beam radiation source 404 and opposing imager 406. As before, software in the computers 420 and/or 421 may generate the three-dimensional representation of the patient anatomy and target volume from the cone-beam CT image data provided by the kV radiation source. The clinical treatment machine 400 may use the kV cone-beam CT image data to make any necessary adjustments to the treatment plan based on identified movement of the target volume or to determine the amount of patient repositioning required by the treatment couch 418 or collimator movements. In this way, the kV cone-beam CT radiation source and flat panel imager share a common axis of rotation with the MV cone-beam CT radiation source 404 and provide additional information for aligning the patient to the generated simulation treatment plan.

[0040] It should also be appreciated that in this way, either the clinical simulator machine 100 and/or the clinical treatment machine 400 diagnostic cone-beam CT image data can be used as a reference for applying the MV radiation beams.

[0041] It should also be understood that it is not necessary for the therapeutic radiation to be applied from the exact position(s) where any of the previously generated CT images were taken since the computer software can provide virtual two-dimensional representations for any desired radial location in-between the images.

[0042] It should be understood that although the clinical treatment machine 400 has been described as having a cone-beam radiation source, in alternative embodiments beam shaping, along with intensity modulation, may also be implemented based on the generated treatment plan by directing a therapeutic beam through a dynamic multileaf collimator. The multileaf collimator may include a series of stacked metal shims having

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a center of shim pairs where each shim of the pairs may be individually moved to create a shaped opening capable of shaping the therapeutic beam. To be effective, the radiation field should be large enough to radiate the entire tumor while at the same time minimize radiating healthy tissue. The collimator may be dynamic in that the shims can rapidly move to reshape the beam, which results in blocking the therapeutic beam from striking certain areas of the target volume based on the treatment plan. Such dynamic shaping may result in different areas of the tumor receiving different amounts of radiation over the time that a radiation dose is applied.

[0043] It should be appreciated that more or fewer processes may be incorporated into the methods illustrated in Figures 2 and 4 without departing from the scope of the invention and that no particular order is implied by the arrangement of blocks shown and described herein. It further will be appreciated that the method described in conjunction with Figures 2 and 4 may be embodied in machine-executable instructions (e.g. software). The instructions can be used to cause a general-purpose or special-purpose processor that is programmed with the instructions to perform the operations described. Alternatively, the operations might be performed by specific hardware components that contain hardwired logic for performing the operations, or by any combination of programmed computer components and custom hardware components. The methods may be provided as a computer program product that may include a machine-readable medium having stored thereon instructions that may be used to program a computer (or other electronic devices) to perform the methods. For the purposes of this specification, the terms "machine-readable medium" shall be taken to include any medium that is capable of storing or encoding a sequence of instructions for

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execution by the machine and that cause the machine to perform any one of the methodologies of the present invention. The term "machine-readable medium" shall accordingly be taken to included, but not be limited to, solid-state memories, optical and magnetic disks, and carrier wave signals. Furthermore, it is common in the art to speak of software, in one form or another (e.g., program, procedure, process, application, module, logic...), as taking an action or causing a result. Such expressions are merely a shorthand way of saying that execution of the software by a computer causes the processor of the computer to perform an action or produce a result.

[0044] It should be appreciated that a clinical simulation machine having a cone-beam radiation source and flat-panel imagers, as described, allows for identification of a target volume via fluoroscopic, radiographic, and cone-beam CT imaging. In this way, the generation of the treatment plan via the clinical simulation machine prior to the application of therapeutic radiation, increases the accuracy of treating the tumor target. Furthermore, embodiments of the invention as described above may capture images while the gantry is continuously rotating versus traditional systems that stop and shoot every, approximately, four degrees around the patient, thereby further lessening the time for completion.

[0045] It should also be appreciated that the cone-beam volumetric reconstruction software can utilize image projection data at non-uniformly spaced gantry angles. Thus the data collection does not require a precise gantry speed of rotation. There is a normalizing detector at the radiation source, which is used to correct for system output variations. In one embodiment, the support arms for the images 206 and 406 are

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sufficiently precise in mechanical stability during gantry rotation that no compensating spatial corrections are required.

[0046] Although the present invention has been described with reference to specific exemplary embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader scope of the invention as set forth in the claims. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

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CLAIMS

What is claimed is:

1. An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume.

2. The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. The apparatus of claim 2, wherein the flat-panel imager includes a high-sensitivity thin cesium iodide scintillator for kilovoltage imaging.

4. The apparatus of claim 3, wherein the scintillator includes thick cesium iodide crystals coated with a reflective power and epoxy mixture in a large matrix for megavoltage imaging.

5. The apparatus of claim 1, wherein the flat-panel imager is capable of high frame rate fluoroscopic imaging.

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6. The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per seconds.

7. The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

9. The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

[redacted]

13. The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

17. The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

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19. The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume.

22. The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. The apparatus of claim 22, wherein the means for capturing includes a high-sensitivity cesium iodide scintillator.

24. The apparatus of claim 23, wherein the scintillator includes thick cesium iodide

[redacted]

crystals coated with a reflective power and epoxy mixture in a large matrix.

25. The apparatus of claim 21, wherein the means for capturing is capable of high frame rate fluoroscopic imaging.

26. The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per seconds.

27. The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. The apparatus of claim 21, wherein the means for capturing includes a kilovoltage radiation source.

[redacted]

31. The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. The apparatus of claim 21, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. The machine-readable medium of claim 34, wherein capturing comprises

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capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

[redacted]

ABSTRACT

[0047] A multi-mode cone beam computed tomography radiotherapy simulator and treatment machine is disclosed. The radiotherapy simulator and treatment machine both include a rotatable gantry on which is positioned a cone-beam radiation source and a flat panel imager. The flat panel imager captures x-ray image data to generate cone-beam CT volumetric images used to generate a therapy patient position setup and a treatment plan.

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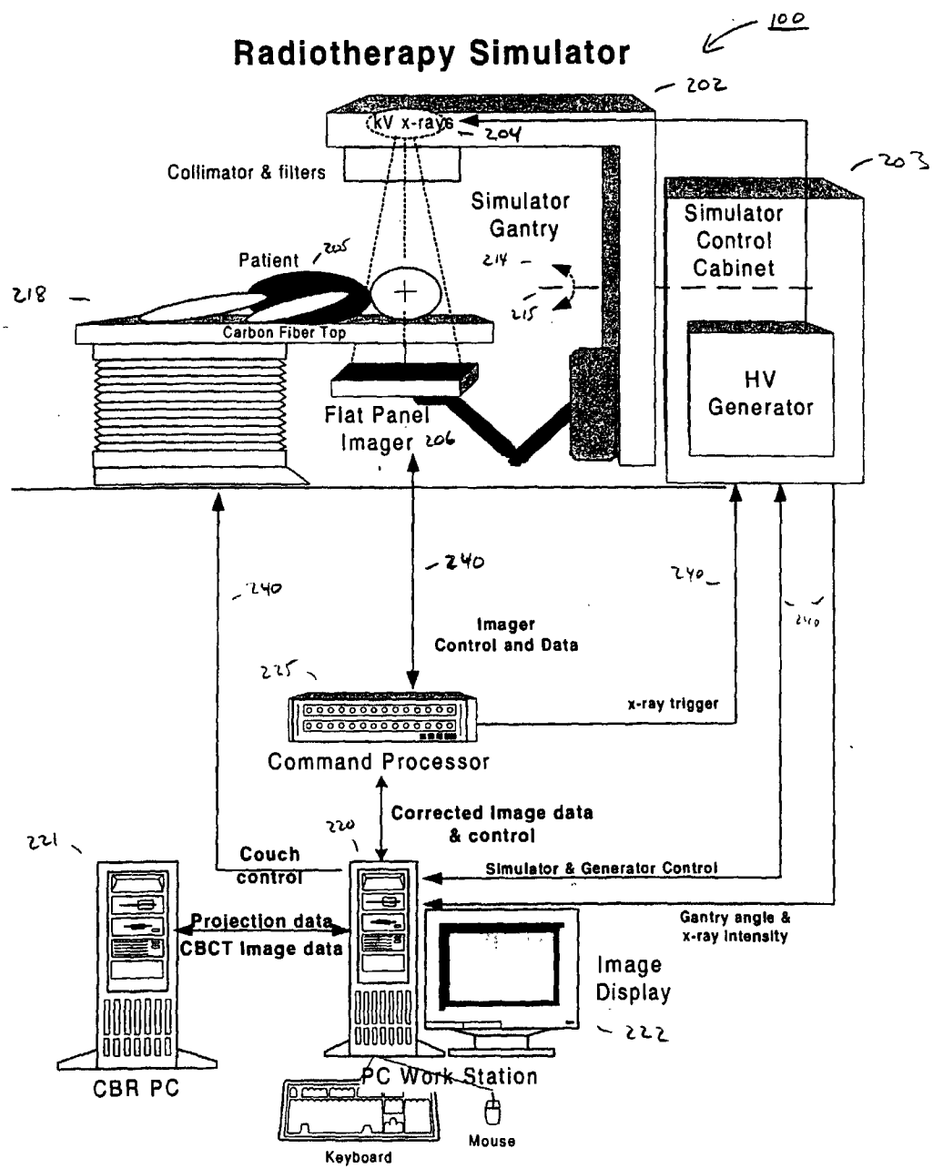


Figure 1- Simulator kV Cone Beam CT Diagram

[redacted]

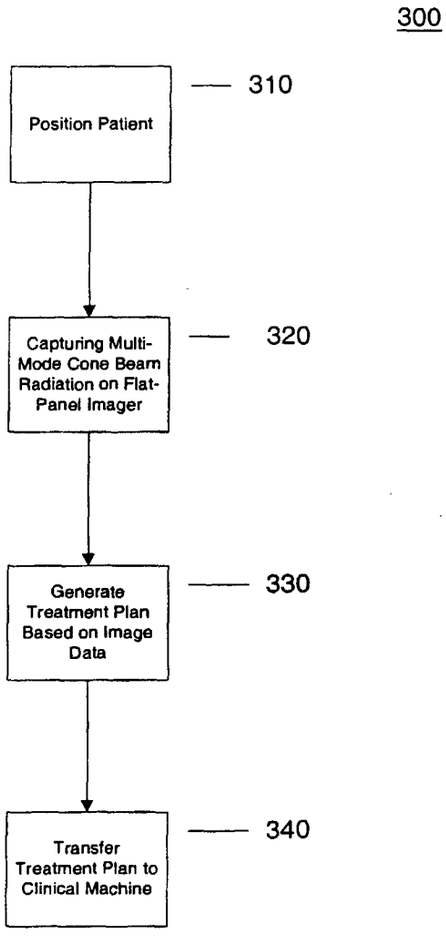

300
Position Patient
310
Capturing Multi-Mode Cone Beam Radiation on Flat-Panel Imager
320
Generate Treatment Plan Based on Image Data
330
Transfer Treatment Plan to Clinical Machine
340

Figure 2

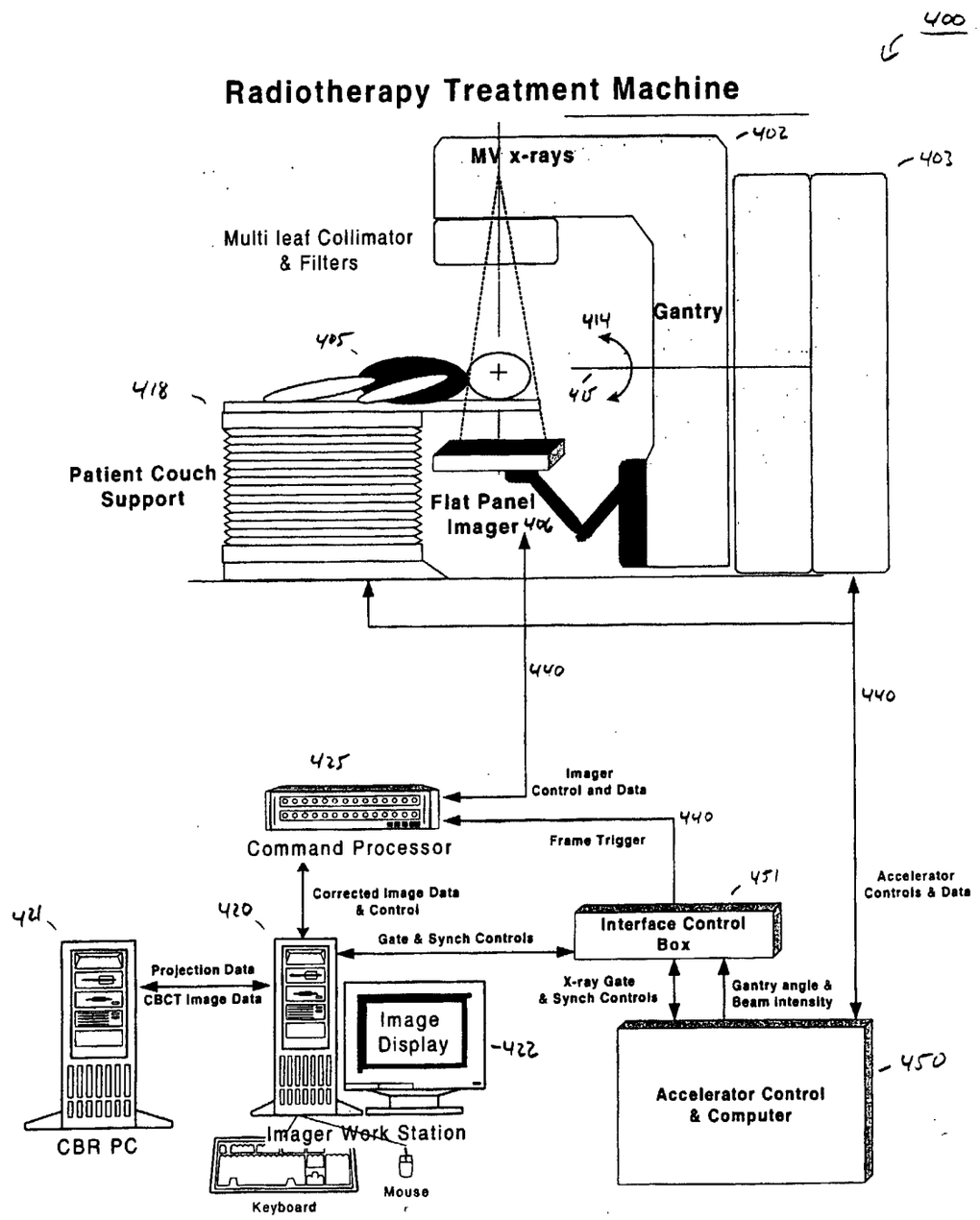
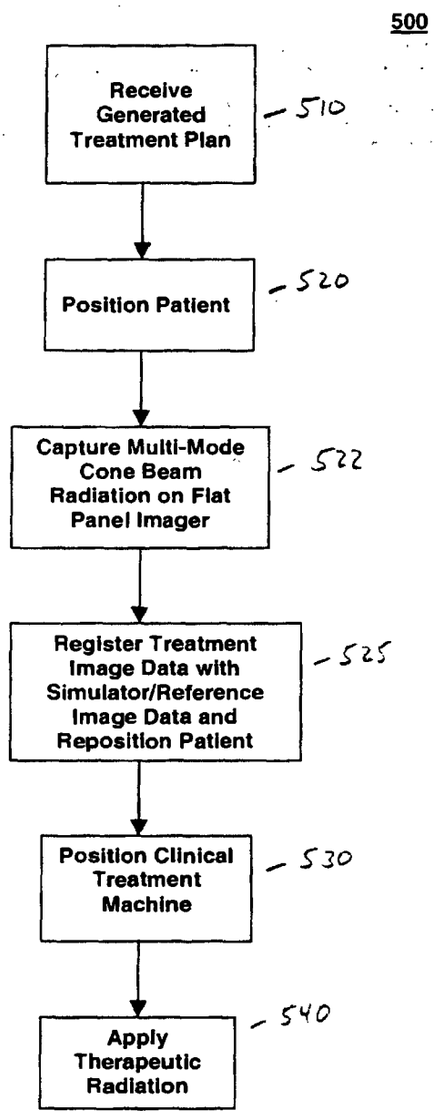


Figure 3- MV Cone Beam CT Diagram

[redacted]

Figure 4


500
Receive Generated Treatment Plan
510
Position Patient
520
Capture Multi-Mode Cone Beam Radiation on Flat Panel Imager
522
Register Treatment Image Data with Simulator/Reference Image Data and Reposition Patient
525
Position Clinical Treatment Machine
530
Apply Therapeutic Radiation
540

Attorney's Docket No.: 5513P009 Patent

First Named Inventor: Edward G. Shapiro

Check One:		Complete If Known:
X	Declaration Submitted with Initial Filing OR	Application No.:
		Filing Date:
	Declaration Submitted After Initial Filing (Surcharge under 37 C.F.R. § 1.16(e) Required).	Art Unit:
		Examiner Name:

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

the specification of which

X is attached hereto.
___ was filed on (MM/DD/YYYY) _____ as
United States Application Number _____
or PCT International Application Number _____
and was amended on (MM/DD/YYYY) _____. (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed?		Certified Copy Attached?	
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
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I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected herewith. I also hereby appoint Keith Askoff, Reg. No. 33,828, my patent attorney; of Varian Medical Systems, Inc. located at 3100 Hansen Way, Palo Alto, CA 94304, telephone (650) 493-4000, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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APPENDIX A

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[redacted]

Jc978 U.S. PTO
10/324227
12/18/02

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:	
EDWARD G. SHAPIRO, ET AL.	Art Group: Unassigned
Application No.: Unassigned	Examiner: Unassigned
Filed: December 18, 2002	
For: A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager	

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In accordance with the duty of disclosure, enclosed is a copy of Information Disclosure Statement by Applicant (form PTO/SB/08), which is being submitted concurrently with the Utility Application. It is respectfully requested that the cited references be considered and that the enclosed copy of PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s). Copies of the references cited on PTO/SB/08 are enclosed herewith.

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The submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made in the subject application and is not to be construed as an admission that the information cited in this statement is material to patentability.

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Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: December 18 2002

Andre M. Gibbs, Reg. No. 47,593

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 **of** 2

Complete if Known	
Application Number	Unassigned
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	5513P009

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10/324227
12/18/02

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number - Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-4,149,247	04-10-1979	Pavkovich et al.	
		US-4,149,248	04-10-1979	Pavkovich	
		US-5,099,505	03-24-1992	Seppi et al.	
		US-5,117,445	05-26-1992	Seppi et al.	
		US-5,168,532	12-01-1992	Seppi et al.	
		US-5,335,255	08-02-1994	Seppi et al.	
		US-5,692,507	12-02-1997	Seppi et al.	
		US-6,222,901 B1	04-24-2001	Meulenbrugge et al.	
		US-2001/0008271 A1	07-19-2001	Ikeda et al.	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	2	of	2

Complete if Known	
Application Number	Unassigned
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	5513P009

OTHER ART - NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		JAFFRAY, David A., et al., "Cone-Beam CT: Applications in Image-Guided External Beam Radiotherapy and Brachytherapy," IEEE, 2000, 2 pgs.	
		MIDGLEY, S., et al., "A Feasibility Study for Megavoltage Cone Beam CT Using a Commercial EPID," Phys. Med. Biol. 43, United Kingdom, 1998, pgs. 155-169	
		NING, Ruola, et al., "An Image Intensifier-Based Volume Tomographic Angiography Imaging System: System Evaluation," SPIE, Vol. 2432, 0-8194-1780-7/95, pgs. 280-290.	

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NONPUBLICATION REQUEST UNDER 35 U.S.C. 122(b)(2)(B)(i)	First Named Inventor	Edward G. Shapiro
	Title	A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager
	Attorney Docket Number	5513P009

I hereby certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing.

I hereby request that the attached application not be published under 35 U.S.C. 122(b).

December 18 2002
Date

Signature

Andre M. Gibbs, Reg. No. 47,593
Typed or printed name

This request must be signed in compliance with 37 CFR 1.33(b) and submitted with the application **upon filing**.

Applicant may rescind this nonpublication request at any time. If applicant rescinds a request that an application not be published under 35 U.S.C. 122(b), the application will be scheduled for publication at eighteen months from the earliest claimed filing date for which a benefit is claimed.

If applicant subsequently files an application directed to the invention disclosed in the attached application in another country, or under a multilateral international agreement, that requires publication of applications eighteen months after filing, the applicant **must** notify the United States Patent and Trademark Office of such filing within forty-five (45) days after the date of the filing of such foreign or international application. **Failure to do so will result in abandonment of this application (35 U.S.C. 112(b)(2)(B)(iii)).**

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TRANSMITTAL FORM

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Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Group Art Unit	Unassigned
Examiner Name	Unassigned
Total Number of Pages in This Submission: 8	Attorney Docket Number: 5513P009

ENCLOSURES ***(check all that apply)***

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  - [ ] Fee Attached
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  - [ ] After Final
  - [ ] Affidavits/declaration(s)
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Firm or Individual name	Andre M. Gibbs, Reg. No. 47,593 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
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Date	March 14, 2003

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TOTAL AMOUNT OF PAYMENT ($)

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Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Unassigned
Group/Art Unit	Unassigned
Attorney Docket No.	5513P009

METHOD OF PAYMENT (check one)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None
☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☒ Credit any overpayments
☒ Charge any additional fee(s) required under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20.
☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

		Extra Claims		Fee from below		Fee Paid
Total Claims		- 20** =		X	=	
Independent Claims		- 3 =		X	=	
Multiple Dependent					=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple Dependent claim, if not paid
1204	84	2204	42	**Reissue independent claims over original patent
1205	18	2205	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
2053	130	2053	130	Non-English specification	
1812	2,520	1612	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	410	2252	205	Extension for reply within second month	
1253	930	2253	465	Extension for reply within third month	
1254	1,450	2254	725	Extension for reply within fourth month	
1255	1,970	2255	985	Extension for reply within fifth month	
1404	320	2401	160	Notice of Appeal	
1402	320	2402	160	Filing a brief in support of an appeal	
1403	280	2403	140	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,300	2453	650	Petition to revive - unintentional	
1501	1,300	2501	650	Utility issue fee (or reissue)	
1502	470	2502	235	Design issue fee	
1503	630	2503	315	Plant issue fee	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	750	1809	375	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	750	2810	375	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	750	2801	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
Other fee (specify)					

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY

					Complete (if applicable)
Name (Print/Type)	Andre M. Gibbs	Registration No. (Attorney/Agent)	47,593	Telephone	(408) 720-8300
Signature				Date	March 14 2003

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application to the USPTO. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

OIPE
MAR 20 2003
PATENT & TRADEMARK OFFICE

PTO/SB/17 (01-03)
Approved for use through 04/30/2003. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($)

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Unassigned
Group/Art Unit	Unassigned
Attorney Docket No.	5513P009

METHOD OF PAYMENT (check one)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None
☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☒ Credit any overpayments
☒ Charge any additional fee(s) required under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20.
☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account

FEE CALCULATION

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1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below		Fee Paid
Total Claims		- 20** =		X	=
Independent Claims		- 3 =		X	=
Multiple Dependent					=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
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1205	18	2205	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
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1801	750	2601	375	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	
Other fee (specify)					

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Andre M. Gibbs	Registration No. (Attorney/Agent)	47,593	Telephone	(408) 720-8300
Signature				Date	March 14, 2003

This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application to the USPTO. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

JPE JC14
MAR 2 0 2003
PAT & TRADEMARK OFFICE

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Art Group: Unassigned

Examiner: Unassigned

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents
Washington, D.C. 20231

Sir:

In accordance with the duty of disclosure, enclosed is a copy of Information Disclosure Statement by Applicant (form PTO/SB/08), which is being submitted within three (3) months of filing of the application. It is respectfully requested that the cited references be considered and that the enclosed copy of PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s). Copies of the references cited on PTO/SB/08 are enclosed herewith.

Elekta_000000150

The submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made in the subject application and is not to be construed as an admission that the information cited in this statement is material to patentability.

Please charge any fees due to Deposit Account 02-2666. A duplicate copy of the Fee Transmittal (PTO/SB/17) is enclosed for this purpose.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: March 14 2003

Andre M. Gibbs, Reg. No. 47,593

12400 Wilshire Blvd., 7th Floor
Los Angeles, California 90025
(408) 720-8300

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class mail with sufficient postage in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on:

March 14, 2003

Debra L. Riggio — *Date* 3/14/2003 — 03-14-03

Elekta_000000151

MAR 2 0 2003
PATENT & TRADEMARK OFFICE

PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet	1	of	1

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	5513P009

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number - Kind Code[2] *(if known)*	Publication Date or Issue Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-6,041,097	03-21-2000	Roos et al.	
		US-			
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] - Number[4] - Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
Washington, DC 20231
www.uspto.gov

APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
10/324,227	12/18/2002	Edward G. Shapiro	5513P009

CONFIRMATION NO. 4627

08791
BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD, SEVENTH FLOOR
LOS ANGELES, CA 90025

FORMALITIES LETTER

OC000000009731876

Date Mailed: 03/28/2003

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is unsigned.
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of $130 for a non-small entity, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **$130** for a Large Entity

- **$130** Late oath or declaration Surcharge.

---

*A copy of this notice **MUST** be returned with the reply.*

AG

Customer Service Center
Initial Patent Examination Division (703) 308-1202
PART 3 - OFFICE COPY

PTO/SB/01 (08-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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PTO JC109 MAY 30 2003 PATENT & TRADEMARK OFFICE

Attorney's Docket No.: 005513.P009 Patent

First Named Inventor: Edward G. Shapiro

Check One:

___ Declaration Submitted with Initial Filing OR

_X_ Declaration Submitted After Initial Filing (Surcharge under 37 C.F.R. § 1.16(e) Required).

Complete If Known:

Application No.: 10/324,227
Filing Date: December 18, 2002
Art Unit: Unknown
Examiner Name: Unknown

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

the specification of which

___ is attached hereto.

_X_ was filed on (MM/DD/YYYY) 12/18/2002 as
United States Application Number 10/324,227
or PCT International Application Number _____
and was amended on (MM/DD/YYYY) _____.
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed?		Certified Copy Attached?	
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No
(Number)	(Country)	(Foreign Filing Date - MM/DD/YYYY)	Yes	No	Yes	No

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected herewith. I also hereby appoint Keith G. Askoff, Reg. No. 33,828, my patent attorney; of Varian Medical Systems, Inc. located at 3100 Hansen Way, Palo Alto, CA 94304, telephone (650) 493-4000, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Direct all correspondence to (check one):

___ **Customer Number or Bar Code Label** _____ **OR**

_X_ **Correspondence Address Below:**

Daniel E. Ovanezian
(Name of Attorney or Agent)
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
Telephone: (408) 720-8300
Fax: (408) 720-8383

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor: Edward G. Shapiro

Inventor's Signature: Edward G. Shapiro Date: May 2, 2003

Residence: Menlo Park, California U.S.A. (City, State, Country) Citizenship: U.S.A. (Country)

Mailing Address: 2107 Manzanita Avenue
Menlo Park, California 94025 U.S.A.

Full Name of Second/Joint Inventor: Edward J. Seppi

Inventor's Signature: Edward J. Seppi Date: 5/6/03

Residence: Portola Valley, California U.S.A. (City, State, Country) Citizenship: U.S.A. (Country)

Mailing Address: 320 Dedalera Drive
Portola Valley, California 94028 U.S.A.

Full Name of Third/Joint Inventor: John M. Pavkovich

Inventor's Signature: John M Pavkovich Date: 5/6/03

Residence: Palo Alto, California U.S.A. (City, State, Country) Citizenship: U.S.A. (Country)

Mailing Address: 2945 Alexia Drive
Palo Alto, California 94304 U.S.A.

Full Name of Fourth/Joint Inventor: Peter Munro

Inventor's Signature: Peter Munro Date: 6 May 03

Residence: Mountain View, California (City, State, Country) Citizenship: Canada (Country)

Mailing Address: 465 Calderon Avenue #27
Mountain View, California 94041

Full Name of Fifth/Joint Inventor: Stanley W. Johnsen

Inventor's Signature: Stanley W Johnsen Date: May 7, 2003

Residence: Palo Alto, California U.S.A. (City, State, Country) Citizenship: U.S.A. (Country)

Mailing Address: 3842 La Donna Avenue
Palo Alto, California 94306 U.S.A.

Full Name of Sixth/Joint Inventor: Richard E. Colbeth

Inventor's Signature: Richard E Colbeth Date: 5/6/03

Residence: Los Altos, California U.S.A. (City, State, Country) Citizenship: U.S.A. (Country)

Mailing Address: 1243 Richardson Avenue
Palo Alto, California 94024 U.S.A.

APPENDIX A

Ramin Aghevli, Reg. No. 43,462; William E. Alford, Reg. No. 37,764; Farzad E. Amini, Reg. No. 42,261; W. Thomas Babbitt, Reg. No. 39,591; Jordan M. Becker, Reg. No. 39,602; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; R. Alan Burnett, Reg. No. 46,149; Gregory D. Caldwell, Reg. No. 39,926; Thomas M. Coester, Reg. No. 39,637; Florin A. Corie, Reg. No. 46,244; Mimi D. Dao, Reg. No. 45,628; Stephen M. De Klerk, Reg. No. 46,503; Daniel M. De Vos, Reg. No. 37,813; Sanjeet Dutta, Reg. No. 46,145; Tarek N. Fahmi, Reg. No. 41,402; Thomas S. Ferrill, Reg. No. 42,532; George L. Fountain, Reg. No. 36,374; Adam Furst, Reg. No. 51,710; Angelo J. Gaz, Reg. No. 45,907; Andre M. Gibbs, Reg. No. 47,593; James Y. Go, Reg. No. 40,621; Melissa A. Haapala, Reg. No. 47,622; Alan E. Heimlich, Reg. No. 48,808; James A. Henry, Reg. No. 41,064; William E. Hickman, Reg. No. 46,771; Willmore F. Holbrow III, Reg. No. 41,845; Sheryl Sue Holloway, Reg. No. 37,850; George W Hoover II, Reg. No. 32,992; Libby H. Hope, Reg. No. 46,774; Eric S. Hyman, Reg. No. 30,139; Aslam A. Jaffery, Reg. No. 51,841; William W. Kidd, Reg. No. 31,772; Walter T. Kim, Reg. No. 42,731; Eric T. King, Reg. No. 44,188; Steve Laut, Reg. No. 47,736; Suk S. Lee, Reg. No. 47,745; Gordon R. Lindeen III, Reg. No. 33,192; Jan C. Little, Reg. No. 41,181; Julio Loza, Reg. No. 47,758; Joseph Lutz, Reg. No. 43,765; Lawrence E. Lycke, Reg. No. 38,540; Michael J. Mallie, Reg. No. 36,591; Andre L. Marais, Reg. No. 48,095; Raul D. Martinez, Reg. No. 46,904; Paul A. Mendonsa, Reg. No. 42,879; Jonathan S. Miller, Reg. No. 48,534; Richard A. Nakashima, Reg. No. 42,023; Thien T. Nguyen, Reg. No. 43,835; Thinh V. Nguyen, Reg. No. 42,034; Robert B. O'Rourke, Reg. No. 46,972; Daniel E. Ovanezian, Reg. No. 41,236; Gregg A. Peacock, Reg. No. 45,001; Philip A. Pedigo, Reg. No. 52,107; Marina Portnova, Reg. No. 45,750; Joseph A. Pugh, Reg. No. 52,137; James H. Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No. 31,195; Saina S. Shamilov, Reg. No. 48,266; Kevin G. Shao, Reg. No. 45,095; Stanley W. Sokoloff, Reg. No. 25,128; Judith A. Szepesi, Reg. No. 39,393; Edwin H. Taylor, Reg. No. 25,129; Lisa Tom, Reg. No. 52,291; John F. Travis, Reg. No. 43,203; Kerry D. Tweet, Reg. No. 45,959; Mark C. Van Ness, Reg. No. 39,865; Thomas A. Van Zandt, Reg. No. 43,219; Lester J. Vincent, Reg. No. 31,460; Glenn E. Von Tersch, Reg. No. 41,364; John P. Ward, Reg. No. 40,216; Mark L. Watson, Reg. No. 46,322; Thomas C. Webster, Reg. No. 46,154; and Norman Zafman, Reg. No. 26,250; my patent attorneys, and William J. Daley, Reg. No. P-52,471; Brent E. Vecchia, Reg. No. 48,011, and Lehua Wang, Reg. No. 48,023; my patent agents, of BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (408) 720-8300, and James R. Thein, Reg. No. 31,710, my patent attorney.

OIPE JC13
NOV 20 2003
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1 11-24-03 Receipt 0120

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20 November 2003

MS PG Pub
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Via Express Mail
EV 335 419 723 US

Re: USSN: 10/324,227 Filed 18 December 2002
Applicant: Varian Medical Systems Technologies, Inc.
Title: A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER
Transmittal of Request to Rescind Previous Nonpublication Request Under 35 USC 122(b)(2)(B)(ii) and Notification of Foreign Filing Under 35 USC 122(b)(2)(B)(iii)
Our File No.: 5513.P009

Dear Sirs:

We have filed the above-identified application under the Patent Cooperation Treaty. A Request and Certification under 35 USC 122(b)(2)(B)(i) has been submitted for this invention. We herewith submit a Request to Rescind Previous Nonpublication Request under 35 USC 122(b)(2)(B)(ii) and a Notification of Foreign Filing under 35 USC 122(b)(2)(B)(iii).

Respectfully submitted,

Blakely, Sokoloff, Taylor & Zafman LLP

Michael J. Mallie
Reg. No. 36,591

MJM/SKW/sgt
Enclosure

OIPE
NOV 20 2003
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RESCISSION OF PREVIOUS NONPUBLICATION REQUEST
(35 U.S.C. 122(b)(2)(B)(ii))
AND, IF APPLICABLE,
NOTICE OF FOREIGN FILING
(35 U.S.C. 122(b)(2)(B)(iii))

Send completed form to:
Mail Stop PG Pub
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
FAX: (703) 305-8568

Application Number 10/324,227
Filing Date 18 December 2002
First Named Inventor Edward G. Shapiro
Title A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER
Attorney Docket No. 5513.P009
Group Art Unit 2882
Examiner

A request that the above-identified application not be published under 35 U.S.C. 122(b) (nonpublication request) was included with the above-identified application on filing pursuant to 35 U.S.C. 122(b)(2)(B)(i). I hereby **rescind** the previous nonpublication request.

If a notice of foreign or international filing is or will be required by 35 U.S.C. 122(b)(2)(B) (iii) and 37 CFR 1.213(c), I hereby provide such notice. This notice is being provided no later than forty-five (**45**) days after the date of such foreign or international filing.

If a notice of subsequent foreign or international filing required by 35 U.S.C. 122(b)(2)(B)(iii) and 37 CFR 1.213(c) was not filed within forty-five (45) days after the date of filing of the foreign or international application, the application is ABANDONED, and a petition to revive under 37 CFR 1.137(b) is required. See 37 CFR 1.137(f).

20 November 2003
Date

Signature

(408) 720 8300
Telephone

Michael J. Mallie
Typed or Printed Name

36,591
Registration No.

This request must be signed in compliance with 37 CFR 1.33(b).

If information or assistance is needed in completing this form, please contact the Pre-Grant Publication Division at (703) 605-4283 or by e-mail at PGPub@USPTO.gov.

EXPRESS MAIL STATEMENT

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Date of Deposit: 20 November 2003

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Name (Print/Type) Sara Gomez Tavarez

Signature

Date Signed 11/20/03

Based on Form PTO/SB/36 (05-03) as modified by BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP on 05/09/03

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APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO
10/324,227	12/18/2002	Edward G. Shapiro	5513P009

CONFIRMATION NO. 4627

08791
BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD, SEVENTH FLOOR
LOS ANGELES, CA 90025

OC000000011386058

Date Mailed: 12/01/2003

Communication Regarding Rescission Of Nonpublication Request and/or Notice of Foreign Filing

Applicant's rescission of the previously-filed nonpublication request and/or notice of foreign filing is acknowledged. The paper has been reflected in the Patent and Trademark Office's (USPTO's) computer records so that the earliest possible projected publication date can be assigned.

The projected publication date is 06/24/2004.

If applicant rescinded the nonpublication request before or on the date of "foreign filing,"[1] then no notice of foreign filing is required.

If applicant foreign filed the application after filing the above application and before filing the rescission, and the rescission did not also include a notice of foreign filing, then a notice of foreign filing (not merely a rescission) is required to be filed within 45 days of the date of foreign filing. See 35 U.S.C. § 122(b)(2)(B)(iii), and Clarification of the United States Patent and Trademark Office's Interpretation of the Provisions of 35 U.S.C. § 122(b)(2)(B)(ii)-(iv), 1272 Off. Gaz. Pat. Office 22 (July 1, 2003).

If a notice of foreign filing is required and is not filed within 45 days of the date of foreign filing, then the application becomes abandoned pursuant to 35 U.S.C. § 122(b)(2)(B)(iii). In this situation, applicant should either file a petition to revive or notify the Office that the application is abandoned. See 37 CFR 1.137(f). Any such petition to revive will be forwarded to the Office of Petitions for a decision. Note that the filing of the petition will not operate to stay any period of reply that may be running against the application.

Questions regarding petitions to revive should be directed to the Office of Petitions at (703) 305-9282. Questions regarding publications of patent applications should be directed to the patent application publication hotline at (703) 605-4283 or by e-mail pgpub@uspto.gov.

[1] Note, for purpose of this notice, that "foreign filing" means "filing an application directed to the same invention in another country, or under a multilateral international agreement, that requires publication of applications 18 months after filing".

OIPE JC116 APR 19 2004 PATENT & TRADEMARK OFFICE

2882

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	TBA
Total Number of Pages in This Submission: 96	Attorney Docket Number: 5513P009

ENCLOSURES ***(check all that apply)***

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Response
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☒ Information Disclosure Statement
  - ☒ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
- ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
- ☐ After Allowance Communication to Group
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below):*
  - 83 cited references and
  - Return Postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Andre M. Gibbs, Reg. No. 47,593 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	April 14, 2004

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Signature		Date	April 14, 2004

Based on PTO/SB/21 (02-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 02/10/2004
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

OIPE JC116
APR 19 2004
PATENT & TRADEMARK OFFICE

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Art Group: 2882

Examiner: TBA

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure, enclosed is a copy of IDS Citation Form PTO/SB/08 or PTO-1449, together with copies of the documents cited on that form, except for copies not required to be submitted (e.g., copies of U.S. patents and U.S. published patent applications need not be enclosed for applications filed after June 30, 2003). This IDS and IDS Citation Form are being submitted before the mailing of a first Office Action. It is respectfully requested that the cited references be considered and that the enclosed copy of PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

Elekta_000000162

The submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made in the subject application and is not to be construed as an admission that the information cited in this statement is material to patentability.

Please charge any fees due to Deposit Account 02-2666. A duplicate copy of the Fee Transmittal (PTO/SB/17) is enclosed for this purpose.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: April 14, 2004

Andre M. Gibbs, Reg. No. 47,593

12400 Wilshire Boulevard, 7th Floor
Los Angeles, CA 90025
Telephone: (408) 720-8300

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Esther L. Campbell — *Date* 04-14-04

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Substitute for Form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

OIPE JC116 APR 19 2004 PATENT & TRADEMARK OFFICE

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor:	Edward G. Shapiro
Art Unit	2882
Examiner Name	TBA
Attorney Docket Number	5513P009

Sheet 1 of 9

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (If known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 3,133,227	5/12/1964	Brown et al.	
		US- 3,193,717	7/6/1965	Nunan	
		US- 4,209,706	6/24/1980	Nunan	
		US- 4,726,046	2/16/1988	Nunan	
		US- 5,471,546	11/28/1995	Nunan	
		US- 6,508,586	1/1/2003	Oota	
		US- 6,429,578	8/1/2002	Danielson et al.	
		US- 6,325,537	12/1/2001	Watanabe	
		US- 6,307,914	10/1/2001	Kunieda et al.	
		US- 6,104,780	8/1/2000	Hanover et al.	
		US- 6,031,888	2/1/2000	Ivan et al.	
		US- 5,751,781	5/1/1998	Brown et al.	
		US- 5,537,452	7/1/1996	Sheopard et al.	
		US- 5,394,452	2/1/1995	Swerdloff et al.	
		US- 6,144,875	11/7/2000	Schweikard et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENT FEES OR COMPLETED FORMS TO THIS ADDRESS.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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OIPE APR 19 2004 PATENT & TRADEMARK OFFICE

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor:	Edward G. Shapiro
Art Unit	2882
Examiner Name	TBA
Attorney Docket Number	5513P009

Sheet 2 | 5513P009 | 9

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (If known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 6,381,302	4/30/2002	Berestov	
		US- 6,385,286	5/7/2002	Fitchard et al.	
		US- 5,438,991	8/8/1995	Yu et al.	
		US- 6,104,778	8/15/2000	Murad	
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FOREIGN PATENT DOCUMENTS

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Examiner Signature		Date Considered	

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Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet	3	of	9	Attorney Docket Number	5513.P009

APR 1 9 2004 JC116 PATENT & TRADEMARK OFFICE

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
		RAGAN, "Correction for Distrotion in a Beam Outline Transfer Device in Radiotherapy CT-Based Simulation", Med. Phys. 20 (1), Jan/Feb 1993, pgs. 179-185.	
		KUHN, "AIM Project A2003: COmputer VIsion in RAdiology (COVIRA)", Computer Methods and Programs in Biomedicine, 1994, Citation from Dissertation Abstracts, 1 page.	
		KEYS, "A CCTV-Microcomputer Biostereometric System for Use in Radiation Therapy (Topography, Medical Physics, Tissue Compensators), 1984, Citation from Energy Science and Technology, 1 page.	
		KUTCHER et al., "Three dimensional radiation treatment planning", Citation from Engineering Index, 1988, 2 pages.	
		REDPATH, et al., "Use of a Simulator and Treatment Planning Computer as a CT Scanner for Radiotherapy Planning", 1984, Citation from INSPEC., 1 page.	
		ELLIOTT, "Interactive Image Segmentation for Radiation Treatment Planning", IBM Systems Journal, 1992, Citation from Medline (R) Database, 1 page.	
		KUSHIMA et al., "New Development of Integrated CT Simulation System for Radiation Therapy Planning", Kobs J Med Sci., 1993, Citation from Medline (R) Database, 1 page.	
		GADEMANN et al., "Three-Dimensional Radiation Planning. Studies on Clinical Integration", Strahlenther Onkol, 1993, 1 page.	
		RAGAN, "Correction for Distortion in a Beam Outline Transfer Device in Radkotherapy CT-based Simulation", Med Phys., 1993, 1 page.	
		ANDREW et al., "A Video-Based Patient Contour Acquisition System for the Design of Radiotherapy Compensators", Med Phys., 1989, 1 page.	
		REYNOLDS, "An Algorithm for Three-Dimensional Visualization of Radiation Therapy Beams", Med Phys., 1988, 1 page.	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet	4	of	9	Attorney Docket Number	5513.P009

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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
		MOHAN, "Intersection of Shaped Radiation Beams with Arbitrary Image Sections", Comput Methods Programs Biomed, 1987, 1 page.	
		BREWSTERFUAUF, "Automatic Generation of Beam Apertures", Medical Physics, 1993, 1 page.	
		HARA et al., "Radiotherapeutic System", 00480035/EP-B1, Citation from World Patent, 1994, 1 page.	
		MOORE, "Radiation Image Generating System and Method", 1992020202/WO-A1, 1992, 1 page.	
		SEPPI, "Computed Tomography Apparatus Using Image Intensifier Detector", 1992000567/WO-A1, 1 page.	
		BOVA, "Dosimetric Technique for Stereotactic Radiosurgery", 1990014129/WO-A1, 1990, 1 page.	
		KAZUFUMI, "Radiation Treatment Device", 05057028 JP, 1993, 1 page.	
		INAMURA, "CT Simulator For Radiotherapy", 63294839 JP, 1988, 1 page.	
		MOORE, "Radiation Image Generating System and Method", Citation from US Patent, Issued 1993, 2 pages.	
		NISHIHARA, "Therapeutic Apparatus", Issued 1991, 2 pages.	
		Jaffray, "Cone-Beam CT: Application in Image Guided External Beam Radiotherapy and Brachytherapy", IEEE, 2000, 2 pages.	
		NING et al., "An Image Intensifier-Based Volume Tomographic Angiography Imaging System: System Evaluation," SPIE, Vol,.2432, pages. 280-290	
		"Advanced Workstation for Irregular Field Simulation and Image Matching", Copyright 1999, MDS Nordion, 7 pages.	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Based on Form PTO/SB/08B (08-03) as modified by BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP on 09/10/03.

Substitute for Form 1449A/PTO (Modified)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Group Art Unit	2882
				Examiner Name	TBA
Sheet	5	of	9	Attorney Docket Number	5513.P009

USPTO APR 19 2004 PATENT & TRADEMARK OFFICE

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
		BALTER, James M. et al., "Daily Targeting of Intrahepatic Tumors for Radiotherapy," Int. J. Radiation Oncology Biol. Phys., vol. 52, no. 1 (2002), pp. 266-271	
		SWINDELL, William et al., "Computed Tomography With a Linear Accelerator With Radiotherapy Applications," Med. Phys., vol. 10, no. 4, July/August 1983; pp. 416-420	
		MOSLEH-SHIRAZI, Mohammad Amin et al., "A Cone-Beam Megavoltage CT Scanner for Treatment Verification in Conformal Radiotherapy," Radiotherapy and Oncology, vol. 48 (1998), pp. 319-328	
		MIDGLEY, S. et al., "A Feasibility Study for Megavoltage Cone Beam CT Using A Commercial EPID," Phys. Med. Biol., vol. 43 (1998), pp. 155-169	
		RUCHALA, K.J. et al., "Megavoltage CT on a Tomotherapy System," Phys. Med. Biol., vol. 44 (1999), pp. 2597-2621	
		NAKAGAWA, Keiichi, M.D. et al., "Megavoltage CT-Assisted Stereotactic Radiosurgery for Thoracic Tumors: Original Research in the Treatment of Thoracic Neoplasms," Int. J. Radiation Oncology Biol. Phys., vol. 48, no. 2, (2000), pp. 449-457	
		GROH, B.A. et al., "A Performance Comparison of Flat-Panel Imager-Based MV and kV Conebeam CT," Med. Phys., vol. 29, no. 6, June 2002, pp. 967-975	
		UEMATSU, Minoru et al., "Daily Positioning Accuracy of Frameless Stereotactic Radiation Therapy With a Fusion of Computed Tomography and Linear Accelerator (FOCAL) Unit: Evaluation of Z-Axis With a Z-Marker," Radiotherapy and Oncology, vol. 50, no. 3, March 1999, pp. 337-339	
		UEMATSU, Minoru, M.D. et al., "A Dual Computed Tomography Linear Accelerator Unit for Stereotactic Radiation Therapy: A New Approach Without Cranially Fixated Stereotactic Frames," Int. J. Radiation Oncology Biol. Phys., vol. 35, no. 3 (1996), pp. 587-592	
		UEMATSU, Minoru, M.D. et al, "Intrafractional Tumor Position Stability During Computed Tomography (CT)-Guided Frameless Stereotactic Radiation Therapy for Lung or Liver Cancers With a Fusion of CT and Linear Accelerator (FOCAL) Unit," Int. J. Radiation Oncology Biol. Phys., vol. 48, no. 2 (2000), pp. 443-448	
		JAFFRAY, David A., Ph.D. et al., "A Radiographic and Tomographic Imaging System Integrated Into a Medical Linear Accelerator for Localization of Bone and Soft-Tissue Targets," Int. J. Radiation Oncology Biol. Phys., vol. 45, no. 3 (1999), pp. 773-789	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Unique citation designation number. [2]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Substitute for Form 1449A/PTO (Modified)				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Group Art Unit	2882
				Examiner Name	TBA
Sheet	6	of	9	Attorney Docket Number	5513P009

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OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
		PISANI, Laura, M.S. et al., "Setup Error in Radiotherapy: On-line Correction Using Electronic Kilovoltage and Megavoltage Radiographs," Int. J. Radiation Oncology Biol. Phys., vol. 47, no. 3 (2000), pp. 825-839	
		DRAKE, D.G. et al, "Characterization of a Fluoroscopic Imaging System for kV and MV Radiography," Med. Phys., vol. 27, no. 5, May 2000, pp. 898-905	
		JAFFRAY, D.A. and SIEWERDSEN, J.H., "Cone-Beam Computed Tomography with a Flat-Panel Imager: Initial Performance Characterization," Med. Phys., vol. 27, no. 6, June 2000, 1311-1323	
		FAHRIG, R. and HOLDSWORTH, D. W., "Three-Dimensional Computed Tomographic Reconstruction Using a C-Arm Mounted XRII: Image Based Correction of Gantry Motion Nonidéalities," Med. Phys., vol. 27, no. 1, January 2000, pp. 30-38	
		FELDKAMP, L.A. et al. "Practical Cone-Beam Algorithm," J. Opt. Soc. Am. A., vol. 1, no. 6, June 1984; pp. 612-619	
		SIEWERDSEN, Jeffery H. and JAFFRAY, David A., "Optimization of X-Ray Imaging Geometry (With Specific Application to Flat-Panel Cone-Beam Computed Tomography)," Med. Phys., vol. 27, no. 8, August 2000, pp. 1903-1914	
		SIEWERDSEN, Jeffery H. and JAFFRAY, David A., "Cone-Beam Computed Tomography With a Flat-Panel Imager: Magnitude and Effects of X-Ray Scatter," Med. Phys., vol. 28, no. 2, February 2001, pp. 220-231	
		CHO, Paul S. et al., "Cone-Beam CT for Radiotherapy Applications," Phys. Med. Biol., vol. 40 (1995), pp. 1863-1883	

Examiner Signature		Date Considered	

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Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet	7	of	9	Attorney Docket Number	5513P009

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		us-	4,208,675	6/17/1980	Bajon et al.	
		us-	4,521,808	6/4/1985	Ong et al.	
		us-	4,593,967	6/10/1986	Haugen	
		us-	4,675,731	6/23/1987	Takasu et al.	
		us-	4,679,076	7/7/1987	Vikterlof et al.	
		us-	4,741,621	5/3/1988	Taft et al.	
		us-	4,825,393	4/25/1989	Nishiya	
		us-	4,853,777	8/1/1989	Hupp	
		us-	4,868,844	9/19/1989	Nunan	
		us-	3,144,552	8/11/1964	Schonberg	
		us-	5,080,100	1/14/1992	Trotel	
		us-				
		us-				
		us-				
		us-				

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		PCT WO 85/03212 A1	8/1/1985	Michaels		
		EP 0062941 B1	9/26/1984	De Vogel		
		EP 0205720 A1	12/30/1986	Brahme		
		FR 2 269 745				
		FR 2 551 664				

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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENT FEES OR COMPLETED FORMS TO THIS ADDRESS.

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If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

Based on Form PTO/SB/08A (08-03) as modified by BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP on 09/10/03.

Substitute for Form 1449/PTO				Complete if Known	
	INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)			Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet	8	of	9	Attorney Docket Number	5513P009

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (If known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-			
		US-			
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		DE 42 23 488 A1				
		DE 196 14 643 A1				
		JP HEI 5[1993]-57028	3/9/1993	Translated JP patent application		
		GB 1328033	8/22/1973			

Examiner Signature		Date Considered	

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Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(use as many sheets as necessary)*				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet	9	of	9	Attorney Docket Number	5513P009

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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
		MASAHIRO et al., "Patient Beam Positioning System Using CT Images", Phys. Med. Biol., 1982, Vol. 27, No. 2, pgs. 301-305, printed in Great Britain.	

Examiner Signature		Date Considered	

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JUL 26 2004
PATENT & TRADEMARK OFFICE

2882

Attorney's Docket No. 005513.P009 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Patent Application of:	
Edward G. Shapiro et al.	Examiner: Not yet assigned
Application No.: 10/324,227	Art Unit: 2882
Filed: 12/18/02	
For: A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER	

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 together with copies of the documents cited on that form, except for copies not required to be submitted (e.g., copies of U.S. patents and U.S. published patent applications need not be enclosed for applications filed after June 30, 2003). It is respectfully requested that the cited documents be considered and that the enclosed copy of Information Disclosure Citation Form PTO-1449 or PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on 7/22/04
(Date of Deposit)

JUANITA BRISCOE
(Typed or printed name of person mailing correspondence)

(Signature of person mailing correspondence)

LJV/cak (02/24/04)

Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of the appropriate paragraph):

__X__ 37 C.F.R. §1.97(b).

_____ 37 C.F.R. §1.97(c). If so, then enclosed with this Information Disclosure Statement is one of the following:

____ A statement pursuant to 37 C.F.R. §1.97(e) or

____ A check for $180.00 for the fee under 37 C.F.R. § 1.17(p).

_____ 37 C.F.R. §1.97(d). If so, then enclosed with this Information Disclosure Statement are the following:

(1) A statement pursuant to 37 C.F.R. §1.97(e); and

(2) A check for $180.00 for the fee under 37 C.F.R. §1.17(p) for submission of the Information Disclosure Statement.

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 7/22, 2004

Daniel E. Ovanezian
Reg. No. 41,236

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Seventh Floor
Los Angeles, CA 90025
(408) 720-8300

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 005513.P009	Application Number: 10/324,227
	First Named Inventor: Edward G. Shapiro	
	Filing Date: 12/18/02	

OIPE JC185 JUL 26 2004 PATENT & TRADEMARK OFFICE

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,027,818		Bova et al.	7/2/91	
		6,325,758		Carol et al.	12/4/01	
		6,370,421		Williams et al.	4/9/02	
		US2001/0001807A1		Green	5/24/01	

FOREIGN PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	Foreign Patent Document Office Code[3]	Number[4]	Kind (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		EP	0480035		Hara	11/9/94		

Examiner Signature		Date Considered	

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

8791 7590 08/17/2004

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
HO, ALLEN C	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 08/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 December 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 December 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: **404**. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: **300** (Fig. 2), **440**, **422** (Fig. 3), **500**, **525** (Fig. 4). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes

are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:

(1) Page 8, paragraph [0021], line 2, "404" should be replaced by --204--.

(2) Page 11, paragraph [0028], line 5, --406-- should be inserted after "imager".

Appropriate correction is required.

Claim Objections

4. Claims 4 and 24 are objected to because of the following informalities: "power" should be replaced by --powder--. Appropriate correction is required.

5. Claims 6 and 26 are objected to because of the following informalities: "seconds" should be replaced by --second--. Appropriate correction is required.

6. Claim 30 is objected to because of the following informalities: "capturing" should be replaced by --applying--. Appropriate correction is required.

7. Claim 32 is objected to because of the following informalities: "21" should be replaced by --31--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 3-5 and 23-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. The term "high-sensitivity thin cesium iodide scintillator" in claims 3 and 23 is a relative term which renders the claim indefinite. The term "high-sensitivity thin cesium iodide scintillator" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The specification fails to set forth a definition of a "high-sensitivity thin cesium iodide scintillator".

11. The term "thick cesium iodide crystals" in claims 4 and 24 is a relative term which renders the claim indefinite. The term " thick cesium iodide crystals" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The specification fails to set forth a definition of a " thick cesium iodide crystal".

12. The term "high frame rate" in claims 5 and 25 is a relative term which renders the claim indefinite. The term "high frame rate" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The specification fails to set forth a definition of "high frame rate".

Claim Rejections - 35 USC § 102

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

14. Claims 1-3, 5-23, and 25-33 are rejected under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Pub. No. 2003/0007601 A1).

With regard to claims 1 and 21, Jaffray *et al.* disclosed an apparatus, comprising: a rotatable gantry (**406**); a cone-beam radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**), wherein the flat-panel imager captures image projection data to generate cone-beam tomography (CT) volumetric image data to generate a treatment plan for a target volume (paragraph [0117], lines 10-13).

With regard to claims 2 and 22, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes an amorphous silicon sensor array (paragraph [0101], lines 15-16).

With regard to claims 3 and 23, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes a high-sensitivity thin cesium iodide scintillator for kilovoltage imaging (paragraph [0096], lines 11-16).

With regard to claims 5 and 25, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of high frame rate fluoroscopic imaging (paragraph [0016], lines 12-15).

With regard to claims 6 and 26, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of generating image projection data at 15-30 frames per second (paragraph [0098], lines 10-13).

With regard to claims 7 and 27, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, further comprising a computing unit (paragraph [0121], lines 26-27).

With regard to claims 8 and 28, Jaffray *et al.* disclosed the apparatus of claims 7 and 27, wherein the computing unit generates the treatment plan based on the image projection data (paragraphs [0129] - [0133]).

With regard to claims 9 and 29, Jaffray *et al.* disclosed the apparatus of claims 7 and 28, wherein the computing unit generates a three-dimensional image (paragraph [0122]).

With regard to claims 10 and 30, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the cone-beam CT radiation source is a kilovoltage radiation source (paragraph [0101], lines 12-15).

With regard to claims 11, 12, 31, and 32, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, further comprising a translatable treatment couch (paragraph [0124]).

With regard to claims 13 and 33, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the rotatable gantry is capable of 360-degree rotation.

With regard to claims 14 and 16, Jaffray *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine (cone beam CT) to capture image

projection data from a flat-panel imager (**404**) for generating cone-beam computed tomography (CT) volumetric image data; and generating a treatment plan for a clinical treatment machine (radiation therapy system) based on the cone-beam volumetric image data (paragraphs [0129] - [0133]).

With regard to claim 15, Jaffray *et al.* disclosed the method of claim 14, further comprising transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan (paragraph [0131]).

With regard to claim 17, Jaffray *et al.* disclosed the method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frame per second (paragraph [0098], lines 10-13).

With regard to claim 18, Jaffray *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (paragraph [0016], lines 12-15).

With regard to claim 19, Jaffray *et al.* disclosed the method of claim 14, wherein the radiation source (**402**) is a kilovoltage radiation source.

With regard to claim 20, Jaffray *et al.* disclosed the method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source (**409**) into position to align the treatment volume with the therapeutic radiation.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claims 4 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Pub. No. 2003/0007601 A1) as applied to claims 3 and 23 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4 and 24, Jaffray *et al.* disclosed the apparatus of claims 3 and 23. However, Jaffray *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

17. Claims 34-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Pub. No. 2003/0007601 A1) as applied to claims 14, 15, 17, and 20 above.

With regard to claims 34-37, Jaffray *et al.* disclosed the method of claims 14, 15, 17, and 20. However, Jaffray *et al.* failed to teach that the method is in the form of computer instructions stored on a computer-readable medium.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the method in the form of computer instructions stored on a

computer-readable medium, since a person would be motivated to control the clinical simulator machine and the clinical treatment machine using a computer.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Allen C. Ho

Allen C. Ho
Patent Examiner
Art Unit 2882

Notice of References Cited	Application/Control No. 10/324,227	Applicant(s)/Patent Under Reexamination SHAPIRO ET AL.	
	Examiner Allen C. Ho	Art Unit 2882	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-2003/0007601 A1	01-2003	Jaffray et al.	378/65
	B	US-5,956,382	09-1999	Wiener-Avnear et al.	378/98.8
	C	US-			
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 2

Complete if Known	
Application Number	Unassigned
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	5513P009

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U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
ACH		US-4,149,247	04-10-1979	Pavkovich et al.	
ACH		US-4,149,248	04-10-1979	Pavkovich	
ACH		US-5,099,505	03-24-1992	Seppi et al.	
ACH		US-5,117,445	05-26-1992	Seppi et al.	
ACH		US-5,168,532	12-01-1992	Seppi et al.	
ACH		US-5,335,255	08-02-1994	Seppi et al.	
ACH		US-5,692,507	12-02-1997	Seppi et al.	
ACH		US-6,222,901 B1	04-24-2001	Meulenbrugge et al.	
ACH		US-2001/0008271 A1	07-19-2001	Ikeda et al.	
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Examiner Signature	Allen C. Ho	Date Considered	13 Aug. 2004

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Sheet 2 of 2

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First Named Inventor	Edward G. Shapiro
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	5513P009

OTHER ART - NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]	
		JAFFRAY, David A., et al., "Cone-Beam CT: Applications in Image-Guided External Beam Radiotherapy and Brachytherapy," IEEE, 2000, 2 pgs.		NO DATE
ACH		MIDGLEY, S., et al., "A Feasibility Study for Megavoltage Cone Beam CT Using a Commercial EPID," Phys. Med. Biol. 43, United Kingdom, 1998, pgs. 155-169		
		NING, Ruola, et al., "An Image Intensifier-Based Volume Tomographic Angiography Imaging System: System Evaluation," SPIE, Vol. 2432, 0-8194-1780-7/95, pgs. 280-290.		NO DATE

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Sheet 1 **of** 1

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Examiner Name	Unassigned
Attorney Docket Number	5513P009

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ACH		US-6,041,097	03-21-2000	Roos et al.	
		US-			
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				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet 1	of	9		Attorney Docket Number	5513P009

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ACH		US-	3,133,227	5/12/1964	Brown et al.	
ACH		US-	3,193,717	7/6/1965	Nunan	
ACH		US-	4,209,706	6/24/1980	Nunan	
ACH		US-	4,726,046	2/16/1988	Nunan	
ACH		US-	5,471,546	11/28/1995	Nunan	
ACH		US-	6,508,586	1/1/2003	Oota	
ACH		US-	6,429,578	8/1/2002	Danielson et al.	
ACH		US-	6,325,537	12/1/2001	Watanabe	
ACH		US-	6,307,914	10/1/2001	Kunieda et al.	
ACH		US-	6,104,780	8/1/2000	Hanover et al.	
ACH		US-	6,031,888	2/1/2000	Ivan et al.	
ACH		US-	5,751,781	5/1/1998	Brown et al.	
ACH		US-	5,537,452	7/1/1996	Sheopard et al.	
ACH		US-	5,394,452	2/1/1995	Swerdloff et al.	
ACH		US-	6,144,875	11/7/2000	Schweikard et al.	

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Art Unit	2882
Examiner Name	TBA
Attorney Docket Number	5513P009

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ACH		US- 4,726,046	2/16/1988	Nunan	
ACH		US- ~~6,471,646~~ 5,471,516	11/28/1995	Nunan	
ACH		US- 6,508,586	1/1/2003	Oota	
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Change(s) applied to document
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ACH		US- 6,381,302	4/30/2002	Berestov	
ACH		US- 6,385,286	5/7/2002	Fitchard et al.	
ACH		US- 5,438,991	8/8/1995	Yu et al.	
ACH		US- 6,104,778	8/15/2000	Murad	
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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	Allen C. Ho	Date Considered	13 Aug 2004

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Substitute for Form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)				Application Number	10/324,227
				Filing Date	December 18, 2002
				First Named Inventor:	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	TBA
Sheet	3	of	9	Attorney Docket Number	5513.P009

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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
ACH		RAGAN, "Correction for Distrotion in a Beam Outline Transfer Device in Radiotherapy CT-Based Simulation", Med. Phys. 20 (1), Jan/Feb 1993, pgs. 179-185.	
		KUHN, "AIM Project A2003: COmputer VIsion in RAdiology (COVIRA)", Computer Methods and Programs in Biomedicine, 1994, Citation from Dissertation Abstracts, 1 page.	
		KEYS, "A CCTV-Microcomputer Biostereometric System for Use in Radiation Therapy (Topography, Medical Physics, Tissue Compensators), 1984, Citation from Energy Science and Technology, 1 page.	
		KUTCHER et al., "Three dimensional radiation treatment planning", Citation from Engineering Index, 1988, 2 pages.	
		REDPATH, et al., "Use of a Simulator and Treatment Planning Computer as a CT Scanner for Radiotherapy Planning", 1984, Citation from INSPEC., 1 page.	
		ELLIOTT, "Interactive Image Segmentation for Radiation Treatment Planning", IBM Systems Journal, 1992, Citation from Medline (R) Database, 1 page.	
		KUSHIMA et al., "New Development of Integrated CT Simulation System for Radiation Therapy Planning", Kobs J Med Sci., 1993, Citation from Medline (R) Database, 1 page.	
		GADEMANN et al., "Three-Dimensional Radiation Planning. Studies on Clinical Integration", Strahlenther Onkol, 1993, 1 page.	
		RAGAN, "Correction for Distortion in a Beam Outline Transfer Device in Radkotherapy CT-based Simulation", Med Phys., 1993, 1 page.	
		ANDREW et al., "A Video-Based Patient Contour Acquisition System for the Design of Radiotherapy Compensators", Med Phys., 1989, 1 page.	
		REYNOLDS, "An Algorithm for Three-Dimensional Visualization of Radiation Therapy Beams", Med Phys., 1988, 1 page.	

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		MOHAN, "Intersection of Shaped Radiation Beams with Arbitrary Image Sections", Comput Methods Programs Biomed, 1987, 1 page.	
		BREWSTERFUAUF, "Automatic Generation of Beam Apertures", Medical Physics, 1993, 1 page.	
ACH		HARA et al., "Radiotherapeutic System", 00480035/EP-B1, Citation from World Patent, 1994, 1 page.	
		MOORE, "Radiation Image Generating System and Method", 1992020202/WO-A1, 1992, 1 page.	
		SEPPI, "Computed Tomography Apparatus Using Image Intensifier Detector", 1992000567/WO-A1, 1 page.	
		BOVA, "Dosimetric Technique for Stereotactic Radiosurgery", 1990014129/WO-A1, 1990, 1 page.	
		KAZUFUMI, "Radiation Treatment Device", 05067028 JP, 1993, 1 page.	
		INAMURA, "CT Simulator For Radiotherapy", 63294839 JP, 1988, 1 page	
		MOORE, "Radiation Image Generating System and Method", Citation from US Patent, Issued 1993, 2 pages.	
		NISHIHARA, "Therapeutic Apparatus", Issued 1991, 2 pages.	
		Jaffray, "Cone-Beam CT: Application in Image Guided External Beam Radiotherapy and Brachytherapy", IEEE, 2000, 2 pages.	
		NING et al., "An Image Intensifier-Based Volume Tomographic Angiography Imaging System: System Evaluation," SPIE, Vol. 2432, pages. 280-290	
ACH		"Advanced Workstation for Irregular Field Simulation and Image Matching", Copyright 1999, MDS Nordion, 7 pages.	

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OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	T[2]
ACH		BALTER, James M. et al., "Daily Targeting of Intrahepatic Tumors for Radiotherapy," Int. J. Radiation Oncology Biol. Phys., vol. 52, no. 1 (2002), pp. 266-271	
ACH		SWINDELL, William et al., "Computed Tomography With a Linear Accelerator With Radiotherapy Applications," Med. Phys., vol. 10, no. 4, July/August 1983; pp. 416-420	
ACH		MOSLEH-SHIRAZI, Mohammad Amin et al., "A Cone-Beam Megavoltage CT Scanner for Treatment Verification in Conformal Radiotherapy," Radiotherapy and Oncology, vol. 48 (1998), pp. 319-328	
ACH		MIDGLEY, S. et al., "A Feasibility Study for Megavoltage Cone Beam CT Using A Commercial EPID," Phys. Med. Biol., vol. 43 (1998), pp. 155-169	
ACH		RUCHALA, K.J. et al., "Megavoltage CT on a Tomotherapy System," Phys. Med. Biol., vol. 44 (1999), pp. 2597-2621	
ACH		NAKAGAWA, Keiichi, M.D. et al., "Megavoltage CT-Assisted Stereotactic Radiosurgery for Thoracic Tumors: Original Research in the Treatment of Thoracic Neoplasms," Int. J. Radiation Oncology Biol. Phys., vol. 48, no. 2, (2000), pp. 449-457	
ACH		GROH, B.A. et al., "A Performance Comparison of Flat-Panel Imager-Based MV and kV Conebeam CT," Med. Phys., vol. 29, no. 6, June 2002, pp. 967-975	
ACH		UEMATSU, Minoru et al., "Daily Positioning Accuracy of Frameless Stereotactic Radiation Therapy With a Fusion of Computed Tomography and Linear Accelerator (FOCAL) Unit: Evaluation of Z-Axis With a Z-Marker," Radiotherapy and Oncology, vol. 50, no. 3, March 1999, pp. 337-339	
ACH		UEMATSU, Minoru, M.D. et al., "A Dual Computed Tomography Linear Accelerator Unit for Stereotactic Radiation Therapy: A New Approach Without Cranially Fixated Stereotactic Frames," Int. J. Radiation Oncology Biol. Phys., vol. 35, no. 3 (1996), pp. 587-592	
ACH		UEMATSU, Minoru, M.D. et al, "Intrafractional Tumor Position Stability During Computed Tomography (CT)-Guided Frameless Stereotactic Radiation Therapy for Lung or Liver Cancers With a Fusion of CT and Linear Accelerator (FOCAL) Unit," Int. J. Radiation Oncology Biol. Phys., vol. 48, no. 2 (2000), pp. 443-448	
ACH		JAFFRAY, David A., Ph.D. et al., "A Radiographic and Tomographic Imaging System Integrated Into a Medical Linear Accelerator for Localization of Bone and Soft-Tissue Targets," Int. J. Radiation Oncology Biol. Phys., vol. 45, no. 3 (1999), pp. 773-789	

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ACH		PISANI, Laura, M.S. et al., "Setup Error in Radiotherapy: On-line Correction Using Electronic Kilovoltage and Megavoltage Radiographs," Int. J. Radiation Oncology Biol. Phys., vol. 47, no. 3 (2000), pp. 825-839	
ACH		DRAKE, D.G. et al, "Characterization of a Fluoroscopic Imaging System for kV and MV Radiography," Med. Phys., vol. 27, no. 5, May 2000, pp. 898-905	
ACH		JAFFRAY, D.A. and SIEWERDSEN, J.H., "Cone-Beam Computed Tomography with a Flat-Panel Imager: Initial Performance Characterization," Med. Phys., vol. 27, no. 6, June 2000, 1311-1323	
ACH		FAHRIG, R. and HOLDSWORTH, D. W., "Three-Dimensional Computed Tomographic Reconstruction Using a C-Arm Mounted XRII: Image Based Correction of Gantry Motion Nonidealities," Med. Phys., vol. 27, no. 1, January 2000, pp. 30-38	
ACH		FELDKAMP, L.A. et al. "Practical Cone-Beam Algorithm," J. Opt. Soc. Am. A., vol. 1, no. 6, June 1984; pp. 612-619	
ACH		SIEWERDSEN, Jeffery H. and JAFFRAY, David A., "Optimization of X-Ray Imaging Geometry (With Specific Application to Flat-Panel Cone-Beam Computed Tomography)," Med. Phys., vol. 27, no. 8, August 2000, pp. 1903-1914	
ACH		SIEWERDSEN, Jeffery H. and JAFFRAY, David A., "Cone-Beam Computed Tomography With a Flat-Panel Imager: Magnitude and Effects of X-Ray Scatter," Med. Phys., vol. 28, no. 2, February 2001, pp. 220-231	
ACH		CHO, Paul S. et al., "Cone-Beam CT for Radiotherapy Applications," Phys. Med. Biol., vol. 40 (1995), pp. 1863-1883	

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Sheet	7	of	9	Attorney Docket Number	5513P009

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U.S. PATENT DOCUMENTS

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ACH		US-	4,208,675	6/17/1980	Bajon et al.	
ACH		US-	4,521,808	6/4/1985	Ong et al.	
ACH		US-	4,593,967	6/10/1986	Haugen	
ACH		US-	4,675,731	6/23/1987	Takasu et al.	
ACH		US-	4,679,076	7/7/1987	Vikterlof et al.	
ACH		US-	4,741,621	5/3/1988	Taft et al.	
ACH		US-	4,825,393	4/25/1989	Nishiya	
ACH		US-	4,853,777	8/1/1989	Hupp	
ACH		US-	4,868,844	9/19/1989	Nunan	
ACH		US-	3,144,552	8/11/1964	Schonberg	
ACH		US-	5,080,100	1/14/1992	Trotel	
		US-				
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		US-				
		US-				

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ACH		PCT WO 85/03212 A1	8/1/1985	Michaels		
ACH		EP 0062941 B1	9/26/1984	De Vogel		
ACH		EP 0205720 A1	12/30/1986	Brahme		
ACH		FR 2 269 745	11/28/1975			
ACH		FR 2 551 664	3/15/1985			

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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OIPE JC1116 APR 19 2004 PATENT & TRADEMARK OFFICE

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Sheet 8 of 9

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ACH		DE 42 23 488 A1	1/20/1994			
ACH		DE 196 14 643 A1	10/16/1997			
		~~JP HEI 5[1993] 67028~~	~~3/9/1993~~	~~Translated JP patent application~~		
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	Filing Date: 12/18/02	

OIPE JC16 JUL 26 2004 PATENT & TRADEMARK OFFICE

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ACH		5,027,818		Bova et al.	7/2/91	
ACH		6,325,758		Carol et al.	12/4/01	
ACH		6,370,421		Williams et al.	4/9/02	
ACH		US2001/0001807A1		Green	5/24/01	

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[1]Unique citation designation number. [2]See attached Kinds of U.S. Patent Documents. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard S.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

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OIPE JC1/06 FEB 22 2005 PATENT & TRADEMARK OFFICE

IPW 2882

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission	25
Attorney Docket Number	5513P009

ENCLOSURES *(check all that apply)*

- [X] Fee Transmittal Form
  - [X] Fee Attached
- [X] Amendment / Response
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [X] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
  - [ ] PTO/SB/08
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Basic Filing Fee
  - [ ] Declaration/POA
- [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s)
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [X] Other Enclosure(s) *(please identify below):*

3 Replacement Sheets
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	February 15, 2005

CERTIFICATE OF MAILING/TRANSMISSION

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Based on PTO/SB/21 (04-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 06/04/2004.
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OIPE JC106 FEB 22 2005 PATENT & TRADEMARK OFFICE

FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 1,020.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

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FEE CALCULATION

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	1,020.00
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
				Other fee (specify) _____	
				SUBTOTAL (2)	($) 1,020.00

SUBMITTED BY Complete (if applicable)

Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	02/15/05

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
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OIPE JC106 FEB 22 2005 PATENT & TRADEMARK OFFICE

Docket No. 005513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Edward G. Shapiro, et al.	Examiner: Ho, Allen C.
Application No.: **10/324,227**	Art Unit: 2882
Filed: **December 18, 2002**	Confirmation No.: 4627
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

AMENDMENT AND RESPONSE TO OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P. O. 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action mailed August 17, 2004, please amend the above-identified patent application as follows and consider the following remarks.

02/24/2005 EAREGAY1 00000033 022666 10324227
01 FC:1201 400.00 DA
02 FC:1202 850.00 DA

AMENDMENTS TO THE SPECIFICATION

[0021] The readout electronics may also be located out of the path of the primary cone-beam CT radiation source ~~404~~204. The flat panel imager 206 may also employ a split data-line where the top half of the array and the bottom half of the array are read out simultaneously. This allows the imager 206 to read out more rapidly and reduces the parasitic capacitance of the data-lines, which in turn reduces the noise gain of the readout charge amplifiers. It should be appreciated that only half of the frame time is used to read out the pixels. During the rest of the frame time, the sensor can be irradiated without generating any interference patterns due to the pulsing of the cone-beam CT radiation source 204. In addition, it should also be appreciated the control system of the flat panel imager 206 allows an external synchronization signal (from the computer 220) to initiate the readout of a frame. This allows the user to externally control when the imager will acquire an image.

[0028] Figure 3 is a side view of one embodiment of a clinical treatment machine 400 that may implement the treatment plan generated by the simulator 100 and treatment planning computer 220. The clinical treatment machine 400 includes a rotatable gantry 402 pivotably attached to a drive stand 403. A cone-beam CT radiation source 404 and a flat panel imager 406 oppose each other and are coupled to the rotatable gantry 402. In one embodiment, the cone-beam CT radiation source 404 is a megavoltage (MV) radiation source generally in the 4 to 25 MV energy range, for example, at 6MV.

[0031] Figure 4 is a process diagram of one embodiment of a method for implementing a treatment plan. At block 510, an accelerator control computer 450 is provided with the treatment plan generated from the clinical simulator machine 100 for a specific patient. For example, the treatment plan may provide initial targeting information about the target volume. At block 520, a patient is placed on the treatment couch 418 and the couch 418 is positioned relative to the clinical treatment machine 400. At block 522, multi-mode cone beam radiation from the radiation source 404 is captured by the imager 406 to generate images of the target volume. At block 525, ~~The~~ the

captured image data can be compared/registered with the simulator or other reference images to determine the patient repositioning required, if any, before treatment. Image data can also be taken without repositioning to determine the random and systematic errors in treatment position, if any. At block 530, the gantry 402 is rotated around the patient 405 to a treatment position based on the generated treatment plan. At block 540, a therapeutic radiation dose is applied to the target volume from the cone-beam CT radiation source 404 based on the generated treatment plan. The cone-beam CT radiation source 404 also impinges the flat-panel imager 406 with radiation. In this way, the flat panel imager 406 may provide verification that the target volume is properly targeted. The process 500 may be repeated until the treatment session is complete.

[0032] The flat panel imager 406 is similar to the flat panel imager 206 including the corresponding interconnects with a command processor module 425, a computer 420, a monitor 422, and a cone-beam reconstruction computer 421, corresponding with the command processor module 225, the computer 220, monitor 222, and the cone-beam reconstruction computer 221, as described above. However, in one embodiment, the flat panel imager 406 may have its electronics unfolded from beneath the imager 406 and the input screen coating may be thicker (e.g., 9 mm vs. 0.6 mm). An example of a flat panel imager that may be used in the present invention is described in US patent serial number 10/013,199, filed on November 2, 2001, assigned to the assignee of the present invention and incorporated herein by reference.

[0033] The imager 406 may also interface with an accelerator interface control box 451. The accelerator interface control box 451 interfaces with an accelerator control computer 450 to provide synchronization and gated control between the imager 406 and the cone-beam CT radiation source 404 during treatment based on the generated treatment plan. As shown in Figure 3, box 451, processor 425, and computer 450 connect to simulator 400 via communications network 440. This allows single or multiple beam pulse images that are not affected by accelerator noise during readout.

[0038] It should be appreciated that the MV cone-beam CT flat panel imager 406 has a high quantum efficient 9 mm thick CsI:Tl screen (e.g., approximately 10% efficient

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at 6 MV), which preserves spatial resolution and minimizes dose to the patient by at least a factor of 5 over a standard 1 mm thin copper plate and ~~thin~~ less than 1 mm GOS (gadolinium oxysulfide) screens used in standard flat panel and screen-camera portal imaging. Therefore, images with as low as one 6 MV accelerator beam pulse (e.g., 0.028 cGy) per frame may be collected. In addition, a low patient dose of 8 to 16 cGy per cone-beam CT data set may be yielded for 300 to 600 CT image frames or projections per data set. The lower dose of the MV cone-beam CT radiation allows for more frequent use on each patient during the typical 30 to 37 fractionated treatment sessions. Moreover, reduced spatial resolution on the MV cone-beam CT scans can be afforded for faster processing time using the cone-beam reconstruction software on the CBR computer 421 to achieve rapid image generation.

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AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture ~~captures~~ image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume while continuously rotating about a target volume.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Currently Amended) The apparatus of claim 2, wherein the flat-panel imager includes a ~~high-sensitivity thin~~ cesium iodide scintillator for kilovoltage imaging.

4. (Currently Amended) The apparatus of claim 3, wherein the scintillator includes ~~thick~~ cesium iodide crystals coated with a reflective ~~power~~ powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Currently Amended) The apparatus of claim 1, wherein the flat-panel imager is capable of ~~high frame rate~~ fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Currently Amended) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per ~~seconds~~second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection

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data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data;

continuously rotating the imager about a target volume while capturing; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~a~~ the target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

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19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Currently Amended) The apparatus of claim 22, wherein the means for capturing includes a ~~high-sensitivity~~ cesium iodide scintillator for kilovoltage imaging.

24. (Currently Amended) The apparatus of claim 23, wherein the scintillator includes ~~thick~~ cesium iodide crystals coated with a reflective ~~power~~ powder and epoxy mixture in a large matrix.

25. (Currently Amended) The apparatus of claim 21, wherein the means for capturing is capable of ~~high-frame-rate~~ fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Currently Amended) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per ~~seconds~~second.

27. (Original) The apparatus of claim 21, further comprising:

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means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Currently Amended) The apparatus of claim 21, wherein the means for ~~capturing~~ applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Currently Amended) The apparatus of claim ~~21~~31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data while the imager continuously rotates about a target volume; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

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36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (New) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (New) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (New) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (New) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (New) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly space angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (New) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (New) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (New) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (New) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (New) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (New) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (New) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (New) The apparatus of claim 49, wherein the computing unit generates a three-

dimensional image of the target volume based on the captured image projection data.

51. (New) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (New) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation, and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (New) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (New) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

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REMARKS

Claims 1-37 were examined and rejected. Furthermore, the drawings, specification, and certain claims were objected to. Applicants amend the specification, submit drawing replacement sheets, and amend claims 1, 3-6, 14, 21, 23-26, 30, 32, and 34. Applicants submit additional claims 38-54, and assert that no new matter is added herein as the additional claims are supported by paragraphs 17, 19, 20, 24, 25, 28, 32-38, and 44-45 of the specification as originally filed. Applicants respectfully request reconsideration of claims 1-37, and consideration of additional claims 38-54 in view of at least the following remarks.

Furthermore, Applicants reserve the right to "swear behind" cited U.S. Publication No. 2003/0007601 A1 issued to Jaffray et al (Jaffray) according to 37 C.F.R. section 1.131.

I. Drawings

The Patent Office objects to the drawings because they do not include reference sign 404. Applicants have provided a replacement sheet for Figure 3 including feature 404, and respectfully requests that the Patent Office withdraw the above objection.

The Patent Office objects to Figures 2-4 because they include reference characters 300, 440, 422, 500, and 525 which are not mentioned in the description. Applicants provide replacement sheets for Figures 2 and 4 excluding features 300 and 500. Applicants amend paragraphs 12, 13, and 32 of the specification to incorporate reference to features 440, 422, and 525. Thus, Applicants assert that the drawings comply with 37 C.F.R. 1.84(p)(5), and respectfully request that the Patent Office withdraw the above objections.

II. Specification

The Patent Office objects to the specification because in paragraph 21, "404" should be replaced by "204"; and in paragraph 28, "406" should be inserted after "imager". Applicants amend the specification as suggested by the Patent Office, and therefore, respectfully request that the Patent Office withdraw the above objection.

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III. Claim Objection

The Patent Office objects to claims 4 and 24 because "power" should be replaced by "powder"; claims 6 and 26 because "seconds" should be replaced by "second"; claim 30 because "capturing" should be replaced by "applying"; and claim 32 because "21" should be replaced by "31". Applicants amend the claims as suggested by the Patent Office, and therefore respectfully request that the Patent Office withdraw the objections above.

IV. Claims Rejected Under 35 U.S.C. § 112

The Patent Office rejects claims 3-5 and 23-25 under 35 U.S.C. § 112 as being indefinite. Applicants amend claims 3-5 and 23-25, and submit that the amended claims are proper under 35 U.S.C. § 112. Thus, Applicants respectfully request that the Patent Office withdraw the rejection above.

V. Claims Rejected Under 35 U.S.C. § 102

The Patent Office rejects claims 1-3, 5-23, and 25-33 under 35 U.S.C. § 102(e) as being anticipated by U.S. Publication No. 2003/0007601 A1 issued to Jaffray et al (Jaffray). Applicants reserve the right to "swear behind" cited U.S. Publication No. 2003/0007601 A1 issued to Jaffray et al (Jaffray) according to 37 C.F.R. section 1.131. It is axiomatic that to be anticipated, every element of a claim must be disclosed in a single referenced.

Applicants respectfully disagree with the rejection above of independent claim 1, as amended, and assert that amended claim 1 is patentable over Jaffray for at least the reason that the reference does not disclose a flat-panel imager operable to capture image projection data while continuously rotating about a target volume, as required by amended claim 1. According to claim 1, for example, continuously rotating an imager about a patient allows a sufficient amount of image projection data to be collected to generate a treatment plan for a target volume of the patient in a reduced amount of time which allows for lower dose cone-beam CT images with less patent motion artifacts (see Specification paragraphs 19 and 44 as filed).

Jaffray teaches image capturing using a "stop and shoot" method, such as by stopping for a frame time of 6.4 seconds and using a host computer to advance motorized rotation stage 304 between frames (see Table 1 and paragraph 58). In addition, Jaffray teaches gantry rotation in increments of approximately 1 degree through approximately 360 degrees (see paragraph 121, second to last sentence). However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Jaffray of a flat-panel imager operable to capture image projection data while continuously rotating about a target volume, as required by amended claim 1.

In addition, Applicants point out that the other reference cited by the Patent Office in the Office Action (U.S. Patent No. 5,956,382 issued to Wiener-Avnear et al.) (Wiener) teaches a "stop and shoot" or "step and repeat" manner of capturing a series of images such as to move an aligned source and detector together in a "step and repeat" motion (see col. 12, lines 21-27; and col. 12, line 62 through col. 13, line 5). Thus, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Wiener of a flat-panel imager operable to capture image projection data while continuously rotating about a target volume, as required by amended claim 1. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for claim 1.

Applicants submit that dependent claims 2-3 and 5-13 being dependent upon allowable base claim 1, as amended, are patentable over the cited reference for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 2-3 and 5-13.

Moreover, Applicants disagree with the rejection above of independent claim 14, as amended, for at least the reason that the cited references do not disclose or suggest continuously rotating the imager about a target volume while capturing image projection data, as required by amended claim 14. The arguments above with respect to amended independent claim 1 apply here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for claim 14.

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Applicants submit that dependent claims 15-20, being dependent upon allowable base claim 14, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 15-20.

Next, Applicants disagree with the rejection above of independent claim 21, as amended, and assert that amended claim 21 is patentable over the cited reference for at least the reason that the references do not disclose or suggest a flat-panel imager operable to capture the image projection data while continuously rotating about a target volume, as required by amended claim 21. The arguments above with respect to amended independent claim 1 apply here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above of amended claim 21.

Applicants submit that dependent claims 22-23 and 25-33 being dependent upon allowable base claims 21, as amended, are patentable over the cited references for at least the reason cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 22-23 and 25-33.

VI. Claims Rejected Under 35 U.S.C. § 103

The Patent Office rejects claims 4 and 24 under 35 U.S.C. § 103(a) as being unpatentable over Jaffray as applied to claims 3 and 23 above, and further in view of Wiener.

Applicants submit that dependent claims 4 and 24 being dependent upon allowable base claims 1 and 21, respectively, as amended, are patentable over the cited reference for at the reasons for at least the reasons explained above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 4 and 24.

Next, the Patent Office rejects claims 34-37 under 35 U.S.C. § 103 as being unpatentable over Jaffray as applied to claims 14-15, 17, and 20 above.

Applicants respectfully disagree with the rejection above of independent claim 34, as amended, for at the reason that the cited references do not teach or suggest instructing a clinical simulator machine to capture image projection data from a flat-

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panel imager for generating cone-beam computed tomography (CT) volumetric image data while the imager continuously rotates about a target volume, as required by amended claim 34. The arguments above with respect to amended independent claim 1 apply here as well. Thus, Applicants respectfully request that the Patent Office withdraw the rejection above of claim 34.

Applicants submit dependent claims 35-37, being dependent upon allowable base claim 34, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 35-37.

VII. Additional Claims 38-54

Applicants submit that additional claims 38-44, being dependent upon allowable base claims 1, 14, 21, and 34, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants request that the Patent Office consider those additional claims.

In addition, Applicants note that additional claims 45-54 require a megavoltage radiation source to radiate the target volume. However, Jaffray teaches image capturing using a kilovoltage radiation source (see Table 1 and paragraph 55). Consequently, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in the cited references of a megavoltage radiation source coupled to radiate the volume, as required by new claims 45 and 54.

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CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance, and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17. If a telephone interview would expedite the prosecution of this Application, the Examiner is invited to contact the undersigned at (310) 207-3800.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: February 15, 2005

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard
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Los Angeles, California 90025
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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail with sufficient postage in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22313-1450 on February 15, 2005.

Nadya Gordon 2/15/05

Nadya Gordon Date

Elekta_000000219

OIPE JC106
FEB 22 2005
PATENT & TRADEMARK OFFICE

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

Art Group: 2882

Examiner: Ho, Allen C.

PETITION FOR EXTENSION OF TIME PURSUANT TO 37 C.F.R. § 1.136(a)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with 37 C.F. R. § 1.136(a), Applicants for the above-identified application respectfully Petition the Commissioner for a three (3) month extension of time, extending the period for response to February 17, 2005, from the Office Action dated August 17, 2004. The petition filing fee of $1,020.00 and an Amendment and Response to Office Action are attached.

If it should be determined that a longer extension of time is required to prevent this application from being abandoned, please charge any additional fees to Deposit Account No. 02-2666. A copy of the Fee Transmittal is enclosed for deposit account charging purposes.

Respectfully submitted,

Blakely, Sokoloff, Taylor & Zafman LLP

Date: February 15, 2005

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard, 7th Floor
Los Angeles, CA 90025
Telephone: (310) 207-3800

CERTIFICATE OF MAILING/TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Nadya Gordon *02-15-05*

Nadya Gordon *Date*

02/24/2005 EAREGAY1 00000032 10324227
01 FC:1253 1020.00 OP

USPTO JC106 FEB 22 2005 PATENT & TRADEMARK OFFICE

Replacement Sheet

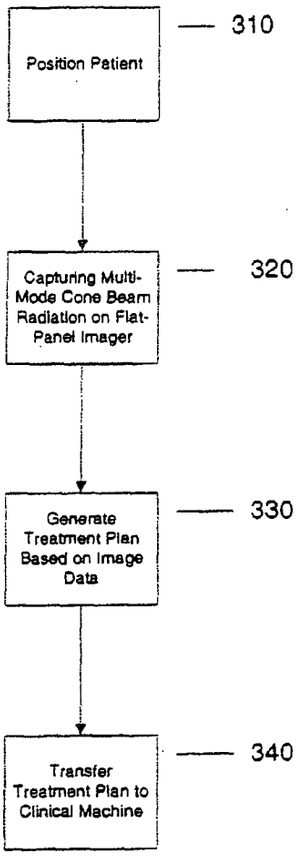


Figure 2

OIPE JC106
FEB 22 2005
PATENT & TRADEMARK OFFICE

Replacement Sheet

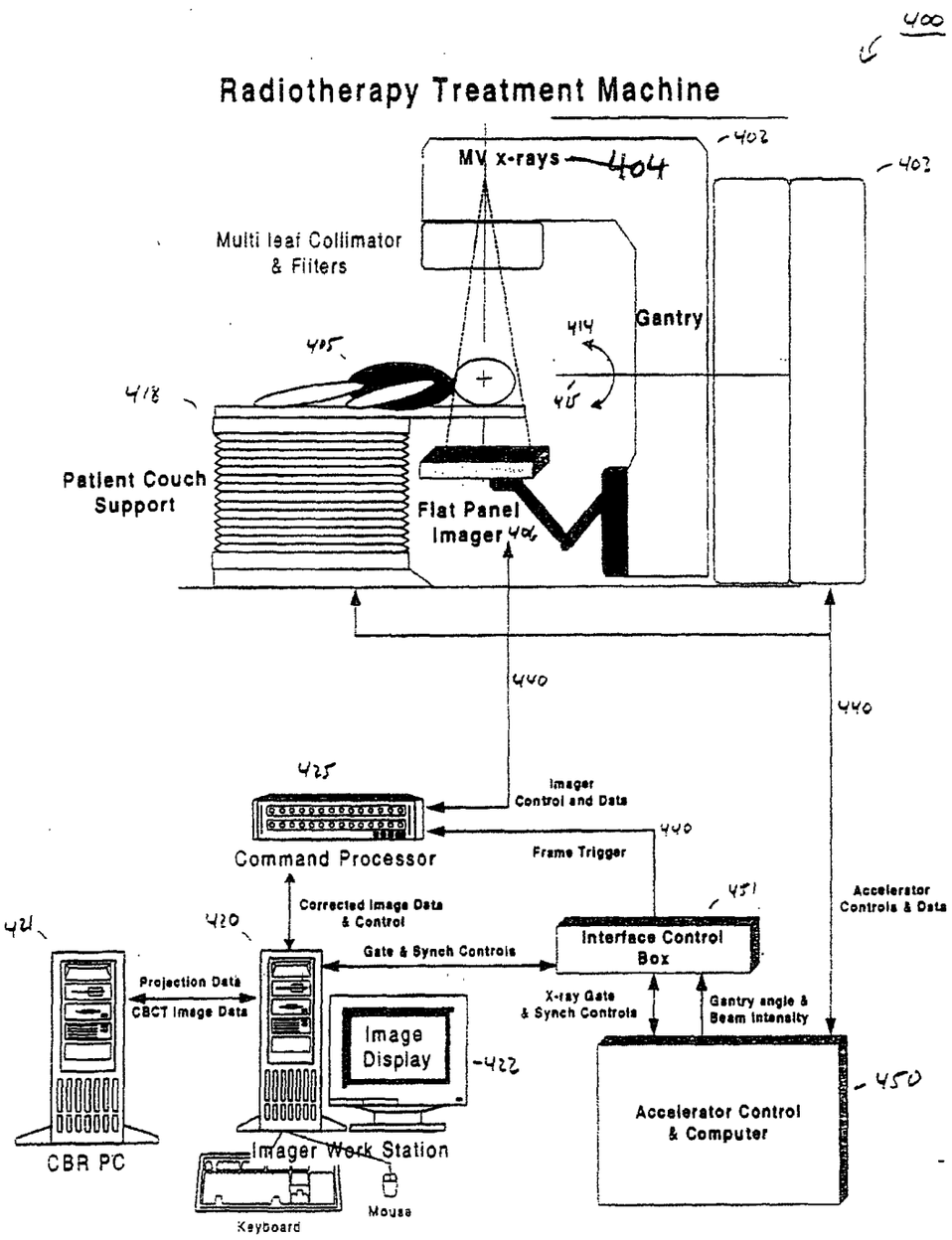
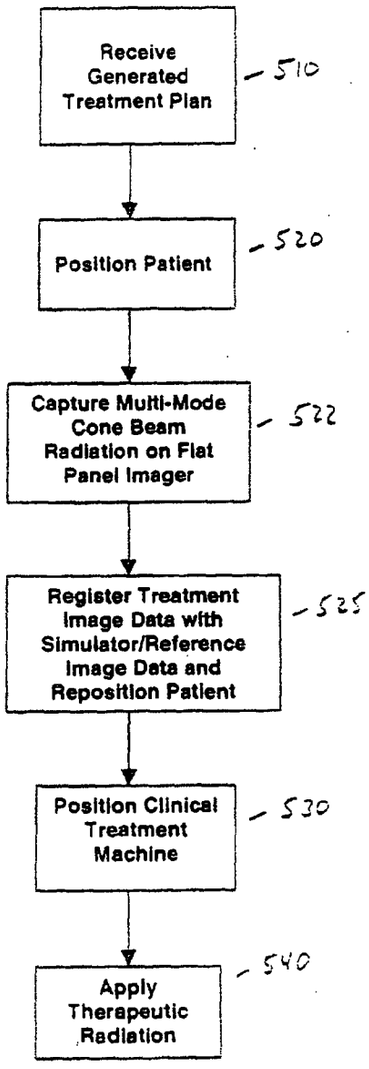


Figure 3- MV Cone Beam CT Diagram

IPE JC106
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Replacement Sheet

Figure 4



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

8791 7590 05/10/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
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LOS ANGELES, CA 90025-1030

EXAMINER	
HO, ALLEN C	
ART UNIT	**PAPER NUMBER**
2882	

DATE MAILED: 05/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

(1) Paragraph [0032], line 9, --now U. S. Patent No. 6,800,858 B1, -- should be inserted before "assigned"

(2) Paragraph [0039], lines 3 and 5, "404" should be replaced by --402--.

Appropriate correction is required.

Claim Objections

2. Claim 42 is objected to because of the following informalities: line 4, "space" should be replaced by --spaced--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 45-51, 53, and 54 are rejected under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Patent No. 6,842,502 B2).

With regard to claim 45, Jaffray *et al.* disclosed an apparatus, comprising: a rotatable gantry (**408**); a cone-beam imager radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**) coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume (column 23, lines 8-11); and a megavoltage radiation source (**409**) coupled to the rotatable gantry to radiate the volume with radiation.

With regard to claim 46, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7).

With regard to claim 47, Jaffray *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6), and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claim 49, Jaffray *et al.* disclosed the apparatus of claim 45, further comprising: a computing unit (column 24, lines 39-40).

With regard to claim 50, Jaffray *et al.* disclosed the apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data (column 24, line 61 - column 25, line 6).

With regard to claim 51, Jaffray *et al.* disclosed the apparatus of claim 45, further comprising a translatable treatment couch (column 25, lines 15-29).

With regard to claim 53, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 megavolts of radiation (column 20, lines 13-15).

With regard to claim 54, Jaffray *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine to capture image projection data from a flat-panel imager (**404**) for generating cone-beam computer tomography (CT) volumetric image data; generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data (column 24, line 61 - column 25, line 6); and radiating the target volume with a megavoltage radiation source (**409**).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-3, 5-23, and 25-33, 39-41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

With regard to claims 1 and 21, Jaffray *et al.* disclosed an apparatus, comprising: a rotatable gantry (**406**); a cone-beam radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**), wherein the flat-panel imager captures image projection data to generate cone-beam tomography (CT) volumetric image data to generate a treatment plan for a target volume (column 23, lines 8-11).

However, Jaffray *et al.* failed to disclose a flat-panel imager that is operable to capture image projection data to generate cone-beam computed tomography volumetric image data while continuously rotating about a target volume.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

With regard to claims 2 and 22, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes an amorphous silicon sensor array (Jaffray *et al.*, column 20, lines 6-7).

With regard to claims 3 and 23, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (Jaffray *et al.*, column 18, lines 17-22).

With regard to claims 5 and 25, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (Jaffray *et al.*, column 4, lines 30-33).

With regard to claims 6 and 26, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of generating image projection data at 15-30 frames per second (Jaffray *et al.*, column 18, lines 61-64).

With regard to claims 7 and 27, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, further comprising a computing unit (Jaffray *et al.*, column 24, lines 39-40).

With regard to claims 8 and 28, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 7 and 27, wherein the computing unit generates the treatment plan based on the image projection data (Jaffray *et al.*, column 26, line 39- column 28, line 10).

With regard to claims 9 and 29, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 7 and 28, wherein the computing unit generates a three-dimensional image (Jaffray *et al.*, column 24, line 61 - column 25, line 6).

With regard to claims 10 and 30, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, wherein the cone-beam CT radiation source is a kilovoltage radiation source (Jaffray *et al.*, column 20, lines 2-6).

With regard to claims 11, 12, 31, and 32, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, further comprising a translatable treatment couch (Jaffray *et al.*, column 25, lines 15-29).

With regard to claims 13 and 33, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claims 1 and 21, wherein the rotatable gantry is capable of 360-degree rotation (Jaffray *et al.*, column 24, lines 52 - 53).

With regard to claims 39 and 40, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claim 21, further comprising means for treating a patient according to the treatment plan (Jaffray *et al.*, **409**) including providing synchronization and gate control between the imager and the radiation beam during treatment (Jaffray *et al.*, column 24, lines 39-60).

With regard to claim 43, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the apparatus of claim 1, further comprising a megavoltage radiation source (Jaffray *et al.*, **409**).

With regard to claims 14 and 16, Jaffray *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine (cone beam CT) to capture image projection data from a flat-panel imager (**404**) for generating cone-beam computed tomography (CT) volumetric image data; and generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data (column 26, line 39- column 28, line 10).

However, Jaffray *et al.* failed to disclose the step of continuously rotating the imager about a target volume while capturing.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

With regard to claim 15, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 14, further comprising transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan (Jaffray *et al.*, column 27, lines 15-23).

With regard to claim 17, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frame per second (Jaffray *et al.*, column 18, lines 61-64).

With regard to claim 18, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (Jaffray *et al.*, column 4, lines 30-33).

With regard to claim 19, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 14, wherein the radiation source (Jaffray *et al.*, **402**) is a kilovoltage radiation source.

With regard to claim 20, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source (Jaffray *et al.*, **409**) into position to align the treatment volume with the therapeutic radiation.

With regard to claim 41, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 14, further comprising: deriving a master clock signal from a synchronization signal of the radiation source; using the master clock to generate a first control pulse to gate the radiation source and a second control pulse to trigger reading of an image from the imager; and

selecting a timing of the first control pulse and the second control pulse to readout the image while the radiation source is off (Jaffray *et al.*, column 24, lines 39-60).

7. Claims 4, 24, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claims 3, 23, and 47 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4, 24, and 48, Jaffray *et al.* disclosed the apparatus of claims 3, 23, and 47. However, Jaffray *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

8. Claims 34-38 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) and Suzuki *et al.* (U. S. Patent No. 6,590,953 B2) as applied to claims 14, 15, 17, and 20 above.

With regard to claims 34-37, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claims 14, 15, 17, and 20. However, Jaffray *et al.* failed to teach that the method is in the form of computer instructions stored on a computer-readable medium.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the method in the form of computer instructions stored on a

computer-readable medium, since a person would be motivated to control the clinical simulator machine and the clinical treatment machine using a computer.

With regard to claim 38, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the machine-readable medium of claim 34. However, Jaffray *et al.* and Suzuki *et al.* failed to teach instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to instruct the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size, since a person would be motivated to image a treatment volume that is located anywhere in a patient.

With regard to claim 44, Jaffray *et al.* and Suzuki *et al.* disclosed the machine-readable medium of claim 34, further comprising a megavoltage radiation source (Jaffray *et al.*, **409**) to radiate the target volume with radiation.

9. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) and Suzuki *et al.* (U. S. Patent No. 6,590,953 B2) as applied to claim 16 above, and further in view of Stanton *et al.* (U. S. Patent No. 6,744,848 B2).

With regard to claim 42, Jaffray *et al.* in combination with Suzuki *et al.* disclosed the method of claim 16. However, Jaffray *et al.* and Suzuki *et al.* failed to teach one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

Stanton *et al.* disclosed a CT system and a method that comprises the step of capturing radiation at non-uniformly spaced angles with respect to the rotation (column 2, line 59 - column

3, line 14). Stanton *et al.* taught that this method uses less radiation dose than a conventional screening methods (column 2, lines 5-16; column 3, lines 15-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to of capture radiation at non-uniformly spaced angles with respect to the rotation, since a person would be motivated to reduce a patient's exposure to radiation.

10. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claim 45 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

With regard to claim 52, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation. However, Jaffray *et al.* failed to disclose that the imager is capable of capturing image projection data while continuously rotating about a target volume.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Response to Arguments

11. Applicant's arguments filed 22 February 2005 with respect to the drawings have been fully considered and are persuasive. The objections of the drawings have been withdrawn.

12. Applicant's arguments filed 22 February 2005 with respect to the specification have been fully considered and are persuasive. The objections of the specification have been withdrawn.

13. Applicant's arguments filed 22 February 2005 with respect to claims 4, 6, 24, 26, 30, and 32 have been fully considered and are persuasive. The objections of claims 4, 6, 24, 26, 30, and 32 have been withdrawn.

14. Applicant's arguments filed 22 February 2005 with respect to claims 3-5 and 23-25 have been fully considered and are persuasive. The rejections of claims 3-5 and 23-25 under 35 U.S.C. 112 second paragraph have been withdrawn.

15. Applicant's arguments filed 22 February 2005 with respect to the rejection(s)of claim(s) 1-3, 5-23, 25-33 under 35 U.S.C. 102 (e) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) and Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

(1) Graf (U. S. Patent No. 6,888,919 B2) disclosed a radiation therapy apparatus comprising a flat-panel detector.

(2) Näfstadius (U. S. Patent No. 6,865,254 B2) disclsoed a radiation system comprising a flat-panel detector.

(3) Moore (U. S. Patent No. 6,463,122 B1) disclosed CT system that rotates the source and the detector continuously around a target region.

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Allen C. Ho

Allen C. Ho
Primary Examiner
Art Unit 2882

05 May 2005

Notice of References Cited	Application/Control No. 10/324,227	Applicant(s)/Patent Under Reexamination SHAPIRO ET AL.	
	Examiner Allen C. Ho	Art Unit 2882	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,888,919 B2	05-2005	Graf, Ulrich Martin	378/65
	B	US-6,865,254 B2	03-2005	Nafstadius, Peder	378/65
	C	US-6,744,848 B2	06-2004	Stanton et al.	378/55
	D	US-6,463,122 B1	10-2002	Moore, John Fitzallen	378/65
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

OIPE JC46
JUN 01 2005
PATENT & TRADEMARK OFFICE

AF 2882
IFW

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission	28
Attorney Docket Number	5513P009

ENCLOSURES ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Response
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☒ Information Disclosure Statement
  - ☒ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
- ☐ After Allowance Communication to Group
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to Group **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below):*

Copies of 20 cited references;
Return receipt postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	5/27/2005

CERTIFICATE OF MAILING/TRANSMISSION

I hereby *certify* that this *correspondence* is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Typed or printed name	Nedy Calderon		
Signature	Nedy Calderon	Date	5/27/2005

Based on PTO/SB/21 (04-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 06/04/2004.
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FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 0.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	50	- 54** =	0	x	50.00	=	$0.00
Independent Claims	5	- 6** =	0	x	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	300	2204	150	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (1) ($) 0.00

***or number previously paid, if greater, For Reissues, see below*

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)					

SUBTOTAL (2) ($)

SUBMITTED BY					Complete (if applicable)
Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	5/27/2005

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
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OIPE JC46 JUN 0 1 2005 PATENT & TRADEMARK OFFICE

Attorney's Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Edward G. Shapiro, et al.

Application No. 10/324,227

Filed: December 18, 2002

For: A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

Examiner: Ho, Allen C.

Art Unit 2882

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

In accordance with the duty of disclosure, Applicants hereby submit Form PTO/SB/08 listing the references with complete information, together with copies of the documents cited on that form. Form SB/08 was previously submitted with the Information Disclosure Statement filed April 14, 2004, but the Examiner found some deficiencies with Form PTO/SB/08 wherein some information are missing (copy enclosed). It is respectfully requested that the cited references be considered and that the enclosed copy of PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicants.

Applicants believe that the submission of the Form PTO/SB/08 may be accomplished without a petition or a fee. If a petition and/or fee is needed for consideration of the Form PTO SB/08, Applicants hereby petition. Please charge any required fee due to Deposit Account 02-2666. A duplicate of the Fee Transmittal sheet is enclosed for charging purposes.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP

Date: 5/27/2005

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
Telephone (310) 207-3800
Facsimile (310) 820-5988

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Nedy Calderon 5/27/2005

Nedy Calderon Date

OIPE JC49 JUN 01 2005 PATENT & TRADEMARK OFFICE

Attorney's Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Edward G. Shapiro, et al.

Application No. 10/324,227

Filed: December 18, 2002

For: A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER

Examiner: Ho, Allen C.

Art Unit 2882

FEE ONLY

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Mail Stop Amendment
Commissioner for Patents
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Alexandria, Virginia 22313-1450

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Date: 5/27/2005

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Nedy Calderon 5/27/2005

Nedy Calderon Date

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JUN 01 2005
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 3

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] *(if known)*	Publication Date Issue Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
.		US-5,039,867	08-13-1991	Nishihara et al.	
		US-5,247,555	09-21-1993	Moore et al.	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] - Number[4] - Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		WO 9220202	11-12-1992	Moore		
		JP 63294839	12-01-1988	Seiya		
		JP 5057028	03-09-1993	Kazufumi, et al.		
		WO 9014129	11-29-1990	Bova, et al.		
		WO 9200567	01-09-1992	Seppi, et al.		

Examiner Signature		Date Considered	

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[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Based on PTO/SB/08A (08-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 08/11/2003.

Send To: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	10/324,227
				Filing Date	December 18, 2002
(use as many sheets as necessary)				First Named Inventor	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	Ho, Allen C.
Sheet	2	**of**	3	Attorney Docket Number	5513P009

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		ANDREW, JW, et al., "A video-based patient contour acquisition system for the design radiotherapy compensators," Abstract, Med Phys, May-June 1989, Vol. 16(3), pp. 425-30.	
		BREWSTERFUAUF, L, et al., "Automatic generation of beam apertures," Abstract, Medical Physics, 1993, Vol. 20, pp. 1337, 1342.	
		ELLIOTT, PJ, et al., "Interactive image segmentation for radiation treatment planning," Abstract, IBM Systems Journal, 1992, Vol. 31, No. 4, pp. 620-34.	
		GADEMANN, G, et al., "Three-dimensional radiation planning. Studies on clinical integration," Abstract, Strahlenther Onkol, 1993, Vol. 169(3), pp. 159-67.	
		JAFFRAY, DA, et al., "Cone-beam CT: applications in image-guided external beam radiotherapy and brachytherapy," Engineering in Medicine & Biology Society, Proceedings of the 22nd Annual International Conference of the IEEE, July 2000, Vol. 3, p. 2044.	
		KEYS, D, "A CCTV-microcomputer biostereometric system for use in radiation therapy (topography, medical physics, tissue compensators)," Abstract, Energy Science and Technology, 1984, Vol. 45-12B, pp. 3857.	
		KUHN, MH, "AIM Project A2003: COmputer VIsion in RAdiology (COVIRA)," Abstract, Computer Methods and Programs in Biomedicine, Oct. 1994, Vol. 45, No. 1-2, pp. 17-31.	

Examiner Signature		Date Considered	

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Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	10/324,227
(use as many sheets as necessary)				Filing Date	December 18, 2002
				First Named Inventor	Edward G. Shapiro
				Art Unit	2882
				Examiner Name	Ho, Allen C.
Sheet	3	**of**	3	Attorney Docket Number	5513P009

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		KUSHIMA, T, et al., "New development of integrated CT simulation system for radiation therapy planning," Abstract, Kobe J Med Sci, Dec. 1993, Vol. 39, No. 5-6, pp. 197-213.	
		KUTCHER, GJ, et al., "Three dimensional radiation treatment planning," Abstract (1988), Dosimetry in radiotherapy. Volume 2. Proceedings of an international symposium held in Vienna, Austria, Aug.-Sept. 1987.	
		MOHAN, R, et al., "Intersection of shaped radiation beams with arbitrary image sections," Abstract, Comput Methods Programs Biomed, June 1987, Vol. 24, pp. 161-8.	
		NING, R, et al., "Image intensifier-based volume tomographic angiography imaging system: system evaluation," SPIE , Medical Imaging 1995, Vol. 2432, pp. 280-290.	
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		REYNOLDS, RA, et al., "An algorithm for three-dimensional visualization of radiation therapy beams," Abstract, Med Phys, Jan-Feb 1988, Vol. 15(1), pp. 24-8.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 3

Complete if Known	
Application Number	10/324,227
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First Named Inventor	Edward G. Shapiro
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Examiner Name	Ho, Allen C.
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U.S. PATENT DOCUMENTS

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ACH		US-5,039,867	08-13-1991	Nishihara et al.	
ACH		US-5,247,555	09-21-1993	Moore et al.	
		US-			
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ACH		WO 9014129	11-29-1990	Bova, et al.		
ACH		WO 9200567	01-09-1992	Seppi, et al.		

Examiner Signature	Allen C. Ho	Date Considered	07 Dec. 2005

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[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

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Substitute for form 1449A/PTO				Complete if Known	
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(use as many sheets as necessary)				Filing Date	December 18, 2002
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				Art Unit	2882
				Examiner Name	Ho, Allen C.
Sheet	2	**of**	3	Attorney Docket Number	5513P009

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Examiner Signature	Allen C. Ho	Date Considered	07 Dec. 2005

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ACH		REYNOLDS, RA, et al., "An algorithm for three-dimensional visualization of radiation therapy beams," Abstract, Med Phys, Jan-Feb 1988, Vol. 15(1), pp. 24-8.	

Examiner Signature	Allen C Ho	Date Considered	07 Dec 2005

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USE OF A SIMULATOR AND TREATMENT PLANNING COMPUTER AS A CT SCANNER FOR RADIOTHERAPY PLANNING.

EIX 85-10 EIX85100150142 NDN- 163-0174-1315-0

Redpath, A. T.; Wright, D. H.

Publ by IEEE, New York, NY, USA. Available from IEEE Service Cent (Cat n 84CH2048-7), Piscataway, NJ, USA p 281-287

1984

DOCUMENT TYPE- CA, Conference Paper

ISBN- 0-8186-0559-6

AUTHOR AFFILIATION- Western General Hospital, Dep of Medical Physics, Edinburgh, Scotl

SPONSOR- IEEE Computer Soc, Los Alamitos, CA, USA; IEEE, New York, NY, USA

CONFERENCE DATE- 19840709-19840712

CONFERENCE TITLE- Proceedings - Eighth International Conference on the Use of Computers in Radiation Therapy.

CONFERENCE LOCATION- Toronto, Ont, Can

LANGUAGE- English

Tomographic sections of patients undergoing radiotherapy have been reconstructed from profiles obtained by irradiating with a narrow half-fan X-ray beam generated at 125 KV and 8 mA. The X-ray beam profile is modified by inserting an aluminium wedge to compensate for the shape of the patient. The measured profiles are converted to tissue path lengths by a calibration technique, digitally filtered and then back projected using a Grinnell GMR 275 image processor. The 256 multiplied by 256 images procuded can be used immediately by radiotherapy planning software. 13 refs.

DESCRIPTOR(S)- IMAGE PROCESSING –Reconstruction; NUCLEAR MEDICINE –Computer Applications

IDENTIFIER(S)- BULK INHOMOGENEITY METHOD; PIXEL BY PIXEL METHOD; RADIOTHERAPY PLANNING; RANDO PHANTOM

SECTIONAL CLASSIFICATION CODE- CAL461; CAL723; CAL462

SECTION HEADING- BIOMEDICAL ENGINEERING –Computerized Tomography

Citations from INSPEC: IN2

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An algorithm for three-dimensional visualization of radiation therapy beams.

MED .03-01 88174519 NDN- 239-0112-6350-0

Reynolds, R. A.; Sontag, M. R.; Chen, L. S.

JOURNAL NAME- Med Phys

VOL. 15

1988 Jan-Feb

PP. 24-8

DOCUMENT TYPE- Journal Article

JOURNAL CODE- 0425746

JOURNAL SUBSET- MEDJSIM

ISSN- 0094-2405

CORPORATE AUTHOR- Dynamic Digital Displays, Inc., Philadelphia, Pennsylvania 19104.

CONTRACT/GRANT NUMBER- R43-CA42615-01.CA.NCI

PUBLICATION COUNTRY- UNITED STATES

LANGUAGE- English

A computer algorithm to display radiation beams superimposed on three-dimensional (3-D) views of patient anatomy has been developed. It may be implemented as a postprocessing step to existing software for 3-D presentation and display. The algorithm takes as input a shaded 3-D view (reconstructed, for example, from computed tomography scans), together with the associated depth map, and generates as output an enhanced 3-D view highlighting in color the visible points which lie within the projected beam outlines The algorithm is independent of the method used to generate the 3-D view (surface or volume rendering techniques may be used) and is independent of beam shape (beams may be modified with shielding blocks). It is not restricted to external surfaces and will correctly show radiation beams projected onto cut-away views of internal organs. The method is illustrated by application to a tangential pair for breast malignancy, using 3-D views generated with volume rendering software.

MEDICAL DESCRIPTOR(S)- Algorithms; Radiotherapy Planning, Computer-Assisted –MT; Radiotherapy , Computer-Assisted – MT
SECONDARY MEDICAL DESCRIPTOR(S)- Breast Neoplasms –RA; Breast Neoplasms –RT; Female; Human; Support, U.S. Gov't, P.H.S.; Tomography, X-Ray Computed
MESH Z TREE NUMBER(S)- H01.548.035; H01.770.035; L01.700.568.110.050; E02.950.825; L01.700.508.100.710.600.608; E02.810.635; L01.700.508.100.710.600 .

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FACSIMILE COVER SHEET

Deliver to: Ho, Allen C., USPTO
Art Group: 2882
Facsimile No.: (703) 872-9306
Date: July 11, 2005
From: Angelo J. Gaz, Reg. No. 45,907
Our Docket No.: 5513P009
Number of pages 22 including this sheet.
Application No.: 10/324,227
Filing Date: 12/18/2002
Docket Due Date(s): 7/10/2005

Enclosed are the following documents:

☒ Amendment: After Final (17 pgs)	☐ Issue Fee Transmittal
☐ Appeal Brief (pgs)	☐ Notice of Appeal
☐ Application:	☐ Petition for:
(pgs) w/cover & abstract)	☐ Request for Continued Examination (RCE)
☐ Assignment & Cover Sheet (pgs)	☐ Reply Brief (pgs)
☒ Certificate of Facsimile	☐ Request & Certification Under 35 USC 122(b)(2)(B)(i)
☐ Continued Prosecution Application (CPA)	☐ Request to Rescind Previous Nonpublication Request
☐ Declaration & POA (pgs)	☐ Response to Notice of Missing Parts & Formalities Letter
☐ Drawings: sheets, figures	☐ Response to Written Opinion (pgs)
☐ Extension of Time:	☐ Terminal Disclaimer
☒ Fee Transmittal (in duplicate)	☐ Transmittal of Publication Fee Due
☐ IDS & PTO/SB/08 (pgs)	☒ Transmittal Letter
☐ Other	

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Lillian E. Rodriguez — *Date* 7/11/2005

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Docket No. 005513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Edward G. Shapiro, et al.	Examiner: Ho, Allen C.
Application No.: 10/324,227	Art Unit: 2882
Filed: December 18, 2002	Confirmation No.: 4627
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

AMENDMENT AND RESPONSE TO OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P. O. 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Final Office Action mailed May 10, 2005, please amend the above-identified patent application as follows and consider the following remarks.

PAGE 4/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

AMENDMENTS TO THE SPECIFICATION

[0032] The flat panel imager 406 is similar to the flat panel imager 206 including the corresponding interconnects with a command processor module 425, a computer 420, a monitor 422, and a cone-beam reconstruction computer 421, corresponding with the command processor module 225, the computer 220, monitor 222, and the cone-beam reconstruction computer 221, as described above. However, in one embodiment, the flat panel imager 406 may have its electronics unfolded from beneath the imager 406 and the input screen coating may be thicker (e.g., 9 mm vs. 0.6 mm). An example of a flat panel imager that may be used in the present invention is described in US patent serial number 10/013,199, filed on November 2, 2001, now U.S. Patent 6,800,898 B1 assigned to the assignee of the present invention and incorporated herein by reference.

[0038] It should be appreciated that a separate kV cone-beam CT radiation source (not shown) and another opposing flat panel imager (as described above on the simulator but not shown here) may also be coupled to the gantry ~~404~~402 to perform a diagnostic cone-beam CT scan. For example, the kV cone-beam CT radiation source and opposing flat panel imager may be coupled to the treatment machine gantry ~~404~~402 at an off axis of e.g. forty-five or ninety degrees from the MV cone-beam radiation source 404 and opposing imager 406. As before, software in the computers 420 and/or 421 may generate the three-dimensional representation of the patient anatomy and target volume from the cone-beam CT image data provided by the kV radiation source. The clinical treatment machine 400 may use the kV cone-beam CT image data to make any necessary adjustments to the treatment plan based on identified movement of the target volume or to determine the amount of patient repositioning required by the treatment couch 418 or collimator movements. In this way, the kV cone-beam CT radiation source and flat panel imager share a common axis of rotation with the MV cone-beam CT radiation source ~~404~~ 402 and provide additional information for aligning the patient to the generated simulation treatment plan.

PAGE 5/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

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AMENDMENTS TO THE CLAIMS

1. (Previously Presented) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume while continuously rotating about a target volume.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

PAGE 6/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Previously Presented) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data;

continuously rotating the imager about a target volume while capturing; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through the target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Previously Presented) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

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25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Previously Presented) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data

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from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data while the imager continuously rotates about a target volume; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation

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source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Currently Amended) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data while continuously rotating about a target volume to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging.

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radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation~~, and the imager is capable of capturing image projection data while continuously rotating about a target volume.~~

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising: using a clinical simulator machine to capture image projection data from a

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flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data while the imager continuously rotates about a target volume;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

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REMARKS

Claims 1-54 were examined and rejected. The specification was objected to. Applicants amend the specification and amend claims 42, 45, 52 and 54. Applicants respectfully request reconsideration of claims 1-54, as amended, in view of at least the following remarks. Furthermore, Applicants reserve the right to "swear behind" cited U.S. Patent No. 6,842,502 to Jaffray et al (Jaffray) according to 37 C.F.R. section 1.131.

I. Specification

The Patent Office objects to the specification because paragraph 32, line 9 should include "now U.S. Patent No. 6,800,858 B1" before "assigned". Applicants amend paragraph 32 in accordance with the Patent Office's suggestion. Thus, Applicants respectfully request the Patent Office withdraw the above objection above.

The Patent Office objects to paragraph 39, lines 3 and 5 where "404" should be replaced by "402". Applicants amend claim 39, as suggested by the Patent Office, and thus, respectfully request the Patent Office withdraw the objection above.

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II. Claim Objections

Claim 42 is objected to because "space" should be replaced by "spaced." Applicants amend claim 42 in accordance with the Patent Office's suggestion, and thus, respectfully request the objection above be withdrawn.

III. Claims Rejected Under 35 U.S.C. § 102

The Patent Office rejects claims 45-51, 53 and 54 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,842,502 B2 to Jaffray et al (Jaffray). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference. Applicants reserve the right to "swear behind" cited U.S. Patent No. 6,842,502 B2 according to 37 C.F.R. § 1.131.

Applicants respectfully disagree with the rejection above of independent claim 45, as amended, and assert that amended claim 45 is patentable over Jaffray for at least the reason that the reference does not disclose a flat-panel imager that captures image projection data while continuously rotating about a target volume, as required by amended claim 45. According to claim 45, for example, continuously rotating an imager about a patient allows a sufficient amount of image projection data to be collected to generate a treatment plan for a target volume of the patient in a reduced amount of time which allows for lower dose cone-beam CT images with less patent motion artifacts (see Specification paragraphs 19 and 44 as filed).

Jaffray teaches image capturing using a "stop and shoot" method, such as by stopping for a frame time of 6.4 seconds and using a host computer to advance motorized rotation stage 304 between frames (see Table 1 and paragraph 58). In addition, Jaffray teaches gantry rotation in increments of approximately 1 degree through approximately 360 degrees (see paragraph 121, second to last sentence). However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Jaffray of a flat-panel imager operable to capture image projection data while continuously rotating about a target volume, as required by amended claim 45. Specifically, in section 6 of the current office action, the Patent

PAGE 15/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

Office notes that Jaffray fails to disclose a flat panel imager operable to capture image projection data while continuously rotating about a target volume. Hence, for at least this reason, Applicants respectfully request the Patent Office withdraw the rejection above of claim 45.

Applicants submit that dependent claims 46-51 and 53 being dependent upon allowable base claim 45, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request the Patent Office withdraw the rejection above of dependent claims 46-51 and 53.

In addition, Applicants respectfully disagree with the rejection above of independent claim 54, as amended, for at least the reason that Jaffray does not disclose a flat panel imager for generating cone-beam computed tomography (CT) volumetric image data while continuously rotating about a target volume. An argument analogous to the one above for amended independent claim 45 applies here as well. Hence, for at least this reason, Applicants respectfully request the Patent Office withdraw the rejection above of independent claim 54.

IV. Claims Rejected Under 35 U.S.C. § 103

The Patent Office rejects claims 1-3, 5-23, 25-33, 39-41 and 43 under 35 U.S.C. 103(a) as being unpatentable over Jaffray in view of U.S. Patent No. 6,590,953 B2 to Suzuki, et al ("Suzuki"). To render a claim obvious, all limitations of that claim must be taught or suggest at least when properly combined reference. Applicants reserve the right to "swear behind" cited U.S. Patent No. 6,590,953 B2, issued to Suzuki, et al. according to 37 C.F.R. 1.131.

Applicants respectfully disagree with the rejection above and assert that independent claim 1 is patentable over the cited references for at least the reasons that the references do not teach or suggest a flat panel imager operable to capture image projection data while continuously rotating about a target volume, as required by claim 1.

As noted above, with respect to claim 45, Jaffray fails to teach or suggest the above-noted limitation of claim 1.

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Instead, the Patent Office relies upon Suzuki to teach the above noted limitation. Suzuki teaches an x-ray CT scanner capable of performing a spiral scan of a subject in a bed pass through opening 148 and aligned with x-axis direction (col. 7, lines 35-54).

However, Applicants assert that the combination of Suzuki with Jaffray is improper. Specifically, as noted above, Jaffray teaches a "stop and shoot" method. Moreover, Jaffray teaches rotating the gantry in increments so that gantry rotation and flat panel imager read-out are synchronized with the motion of anatomical structures in the patient in order to reduce the deleterious effects of organ motion in image reconstructions (col. 24, lines 50-60). Thus, Jaffray also teaches against continuously rotating while capturing image data by teaching gantry rotation and image readout synchronization with anatomical structures, whose movement may not necessary correspond with a continuous gantry rotation. Next, Jaffray also teaches that using the same projection angle to repeat exposures for exposures outside a tolerance selected for reducing an amount of lag in sequential projections (col. 9, lines 44-55). Here, Jaffray teaches against continuous rotation by teaching repeating an exposure at the same projection angle for exposures outside of the lag tolerance, and writing projecting images to a hard disk between frame transfer and motor rotation (col. 9, lines 44-55). Hence, for at least the reasons above, Applicants assert that the combination of Suzuki with Jaffray is improper in accordance with MPEP § 2145.X. Thus, Applicants respectfully request the Patent Office withdraw a rejection above of claim 1.

Applicants submit that dependent claims 2-3, 5-13, and 43 being dependent upon allowable base claim 1, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request the Patent Office withdraw the rejection above of dependent claims 2-3, 5-13, and 43.

Moreover, Applicants disagree with the rejection above of independent claim 14, as amended, for at least the reason that the cited references do not disclose or suggest continuously rotating the imager about a target volume while capturing

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image projection data, as required by amended claim 14. The arguments above with respect to amended independent claim 1 apply here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for claim 14.

Applicants submit that dependent claims 15-20 and 41-42 being dependent upon allowable base claim 14, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 15-20 and 41-42.

Next, Applicants disagree with the rejection above of independent claim 21, as amended, and assert that amended claim 21 is patentable over the cited reference for at least the reason that the references do not disclose or suggest a flat-panel imager operable to capture the image projection data while continuously rotating about a target volume, as required by amended claim 21. The arguments above with respect to amended independent claim 1 apply here as well. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above of amended claim 21.

Applicants submit that dependent claims 22-23, 25-33 and 39-40 being dependent upon allowable base claims 21, as amended, are patentable over the cited references for at least the reason cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 22-23, 25-33 and 39-40.

The Patent Office rejects claims 4, 24 and 48 under 35 U.S.C. § 103(a) as being unpatentable over Jaffray as applied to claims 3, 23 and 47 above, and further in view of Wiener-Avnear, U.S. Patent No. 5,956,382 ("Wiener").

Applicants submit that dependent claims 4 and 24 being dependent upon allowable base claims 1 and 21, respectively, as amended, are patentable over the cited reference for at the reasons for at least the reasons explained above. Thus,

PAGE 18/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

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Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 4 and 24.

In addition, Applicants assert that dependent claim 48 is allowable over the cited references for at least the reason that claim 45 from which claim 48 depends, is patentable over the cited references. Amended claim 45 is patentable over the cited references for at least that the references do not teach or suggest a flat panel imager to capture image projection data while continuously rotating about a target volume. An argument analogous to the ones made above with respect to claim 45 and to claim 1 applies here as well. Hence for at least this reason, Applicants assert that independent claim 45, as amended, and claims depending therefrom are patentable over the cited references. Hence, Applicants respectfully request the Patent Office withdraw the rejection above of claim 48.

Next, the Patent Office rejects claims 42 under 35 U.S.C. § 103 as being unpatentable over Jaffray and Suzuki as applied to claim 16 above, and further, in view of U.S. Patent Nos. 6,744,848 B2 to Stanton, et al ("Stanton").

Applicants submit that dependent claims 42 being dependent upon allowable base claim 14, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 42.

Finally, the Patent Office rejects claim 52 under 35 U.S.C. § 103(a) as being unpatentable over Jaffray, as applied to claim 45 above and further in view of Suzuki.

Applicants submit that dependent claims 52 being dependent upon allowable base claim 45, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 45.

PAGE 19/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

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CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance, and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17. If a telephone interview would expedite the prosecution of this Application, the Examiner is invited to contact the undersigned at (310) 207-3800.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: July 11, 2005

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Blvd.
Seventh Floor
Los Angeles, California 90025
(310) 207-3800

CERTIFICATE OF TRANSMISSION:
I hereby certify that this paper is being facsimile transmitted to the U.S. Patent and Trademark Office on July 11, 2005.

Lillian E. Rodriguez 7-11-05
July 11, 2005

PAGE 20/21 * RCVD AT 7/11/2005 9:08:05 PM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/4 * DNIS:8729306 * CSID:3108205720 * DURATION (mm-ss):06-10

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FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 0.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

	Total Claims		Extra Claims		Fee from below		Fee Paid
Total Claims	50	- 54** =	0	X	50.00	=	$0.00
Independent Claims	5	- 6** =	0	X	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	300	2204	150	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (1) ($) 0.00

****or number previously paid, if greater. For Reissues, see below**

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)					

SUBTOTAL (2) ($)

SUBMITTED BY				Complete (if applicable)	
Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	07/11/05

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wp) 12/15/2004.

FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 0.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	50	- 54* =	0	x	50.00	=	$0.00
Independent Claims	5	- 6** =	0	x	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	200	2204	100	**Reissue independent claims over original patent
1205	200	2205	100	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (1) ($) 0.00

*or number previously paid, if greater; For Reissues, see below

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
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1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)					

SUBTOTAL (2) ($)

SUBMITTED BY				Complete (if applicable)	
Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	07/11/05

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wl) 12/15/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission	21
Attorney Docket Number	5513P009

ENCLOSURES *(check all that apply)*

- [X] Fee Transmittal Form
  - [ ] Fee Attached
- [X] Amendment / Response
  - [X] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
  - [ ] PTO/SB/08
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Basic Filing Fee
  - [ ] Declaration/POA
- [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s)
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [X] Other Enclosure(s) *(please identify below):*

Facsimile Cover Sheet

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	July 11, 2005

CERTIFICATE OF MAILING/TRANSMISSION

I hereby certify that this correspondence is being transmitted via facsimile on the date shown below to the United States Patent and Trademark Office.

Typed or printed name	Lillian E. Rodriguez		
Signature		Date	July 11, 2005

Based on PTO/SB/21 (04-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wh) 06-04-2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

8791 7590 08/02/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
HO, ALLEN C	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 08/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO 90C (Rev 10/03)

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 10/324,227	**Applicant(s)** SHAPIRO ET AL.	
	Examiner Allen C. Ho	**Art Unit** 2882	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 11 July 2005 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☐ The period for reply expires _____months from the mailing date of the final rejection.
   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: _____.
   Claim(s) rejected: 1-54.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08 or PTO-1449) Paper No(s). _____
13. ☐ Other: _____.

Allen C. Ho

Allen C. Ho
Primary Examiner
Art Unit: 2882

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Continuation of 11. does NOT place the application in condition for allowance because: The applicants argue that the combination of Jaffray et al. and Suzuki et al. is improper; specifically, Jaffray et al. disclosed a stop-and-shoot method, and Jaffray et al. teaches against continuous rotation of the gantry. The examiner respectfully disagrees for the reasons as follows. First, the examiner would like to point out that one cannot show nonobviousness by attacking the primary reference where the rejections are based on combinations of references. See In re Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). After all, the issue is whether or not it would be obvious to modify the primary reference. Second, as shown in TABLE I, the cone beam CT system disclosed by Jaffray et al. is capable of rotating the gantry at a maximum angular rotation rate of 0.5° /second; it is clear from this parameter that the gantry is capable of continous rotation. Although Jaffray et al. disclosed a stop-and-shoot mode of operation, Jaffray et al. did not specifically teach against continuous rotation of the gantry. As understood by persons skilled in the art, images could be acquired in either the stop-and-shoot mode or continuous rotation mode. To establish a Prima Facie case of obviousness, there must be a suggestion or motivation for making the modification. In the present case, the motivation for modifying the cone beam CT system disclosed by Jaffray et al. for continuous rotation comes from the teachings of Suzuki et al; specifically, Suzuki et al. taught that a spiral CT scan enables a substantial reduction in the time required to perfomr a three-dimensional CT imaging, which may be crucial for a patient under emergency care. Thus, a person skilled in the art would be motivated to modify the cone beam CT system for continuous rotation such that the scan time could be reduced. In conclusion, the applicants have not shown why it is improper to combine the teachings of Jaffray et al. and Suzuki et al. For the above reasons, the rejections are being maintained.

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RCE ✓
JFW

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. 1450
Alexandria, VA 22313-1450

NOV 14 2005
PATENT AND TRADEMARK OFFICE

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR § 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 C.F.R. § 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.
      i. ☐ Consider the amendment(s)/reply under 37 C.F.R. § 1.116 previously filed on
      (Any unentered amendment(s) referred to above will be entered).
      ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on
      iii. ☐ Other _____

   b. ☒ Enclosed
      i. ☒ Amendment/Reply
      ii. ☐ Affidavit(s)/Declaration(s)
      iii. ☒ Information Disclosure Statement (IDS)
      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) required)

   b. ☒ Other 6 Declarations Pursuant to 37 C.F.R. 1.131

3. Fees The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.

   a. ☒ The Director is hereby authorized to charge the following fees, or credit any overpayments, to Deposit Account No. 02-2666.
      i. ☒ RCE fee required under 37 C.F.R. § 1.17(e) and any additional claims fee(s)
      ii. ☒ Extension of time fee (37 C.F.R. § 1.136 and 1.17)
      iii. ☐ Other: Additional claim fee ($.00)

   11/15/2005 SSITHIB1 00000025 10324227
   01 FC:1801 790.00 OP
   02 FC:1202 50.00 OP

   b. ☒ Check in the amount of $1,860.00 enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosd)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name *(Print/Type)*	Angelo J. Gaz	*Registration No. (Attorney/Agent)*	45,907
Signature		Date	11/9/05

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Name *(Print/Type)*	Amber D. Saunders		
Signature		Date	11/9/05

Based on PTO/SB/30 (09-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 02/10/2004.
SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

OIPE
NOV 14 2005
IAP15
PATENT & TRADEMARK OFFICE

Docket No. 005513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Edward G. Shapiro, et al.	Examiner: Allen C. Ho
Application No.: **10/324,227**	Art Unit: 2882
Filed: **December 18, 2002**	Confirmation No.: **4627**
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

AMENDMENT AND RESPONSE TO OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P. O. 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Final Office Action mailed May 10, 2005 and the Advisory Action mailed August 2, 2005, please amend the above-identified patent application as follows and consider the following remarks.

11/15/2005 SSITHIB1 00000025 10324227
03 FC:1253 1020.00 OP

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AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

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18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

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26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

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35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

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42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

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49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

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REMARKS

Claims 1-54 were examined and rejected. Applicants prior amendments, after final rejection, to the specification and claims have been entered. Herein, Applicants amend claims 1, 14, 16, 21, 34, 42, 45, 52 and 54 and add new claim 55. Applicants assert that no new matter is added herein as new claim 55 is supported at paragraphs 31 and 40 of the application as filed. Applicants respectfully request reconsideration of claims 1-55, as amended, in view of at least the following remarks.

I. Claims Rejected Under 35 U.S.C. § 102

The Patent Office rejects claims 45-51, 53 and 54 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,842,502 B2 to Jaffray et al (Jaffray). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference.

Applicants overcome the above rejections by the Rule 131 Declarations and supporting evidence enclosed herewith (Attachments A-H), which show that the subject matter of the rejected claims enjoys an earlier date of invention than the priority date of Jaffray. Specifically, independent claims 45 and 54 claim features which the declarations and supporting evidence show to enjoy an earlier date of invention. Accordingly, Applicants seek reconsideration and withdrawal of the above rejection.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

II. Claims Rejected Under 35 U.S.C. § 103

The Patent Office rejects claims 1-3, 5-23, 25-33, 39-41 and 43 under 35 U.S.C. 103(a) as being unpatentable over Jaffray in view of U.S. Patent No. 6,590,953 B2 to Suzuki, et al ("Suzuki"). To render a claim obvious, all limitations of that claim must be taught or suggest at least when properly combined reference.

Applicants overcome the rejections above by the Rule 131 Declarations and supporting evidence enclosed herewith, which show that the subject matter of the

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rejected claims enjoys an earlier date of invention than the priority date of Jaffray or Suzuki. Accordingly, Applicants seek reconsideration and withdrawal of the above rejection.

Specifically, independent claims 1, 14, 21 and 34 claim features which the declarations and supporting evidence show enjoy an earlier date of invention than the priority date of Jaffray or Suzuki.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

Next, the Patent Office rejects claims 42 under 35 U.S.C. § 103 as being unpatentable over Jaffray and Suzuki as applied to claim 16 above, and further, in view of U.S. Patent Nos. 6,744,848 B2 to Stanton, et al ("Stanton").

Applicants assert that Stanton fails to cure the shortcomings of Jaffray and Suzuki. Stanton discloses cone beam imaging with an array detector including a plurality of sensor modules removably mounted in a mounting frame (see U.S. Pat. No. 6,448,544 to Stanton, et al., incorporated in Stanton by reference at column 2, lines 14-22). Moreover, Stanton discloses producing volumetric images using low-dose imaging for mammograms. However, the Patent Office has not identified and Applicants are unable to find any teaching or description in Stanton of a flat-panel imager, a treatment plan, or megavoltage radiation source as required by Applicants claims. Thus Applicants respectfully request that the Patent Office withdraw the rejection of dependent claim 42.

Finally, the Patent Office rejects claim 52 under 35 U.S.C. § 103(a) as being unpatentable over Jaffray, as applied to claim 45 above and further in view of Suzuki.

Applicants submit that dependent claim 52 being dependent upon allowable base claim 45, as amended, are patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request that the Patent Office withdraw the rejection of dependent claims 52.

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CONCLUSION

In view of the foregoing, it is believed that all claims now pending patentably define the subject invention over the prior art of record and are in condition for allowance, and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17. If a telephone interview would expedite the prosecution of this Application, the Examiner is invited to contact the undersigned at (310) 207-3800.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 11/09, 2005 By: _____
Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
(310) 207-3800

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

_____ 11/9/05
Amber D. Saunders Date

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:

Edward Shapiro

Serial No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

OIPE NOV 14 2005 PATENT & TRADEMARK OFFICE IAP15

Examiner: Allen C. Ho

Art Unit: 2882

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ATTACHMENT A
DECLARATION OF EDWARD SHAPIRO
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Edward Shapiro, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 2107 Manzanita Avenue, Menlo Park, California 94025.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from February 12, 2000 through December 19, 2002.

5. My title is Senior Scientist

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; and U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000 (the examiner has cited Jaffray and Suzuki, along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, and Attachment H - Cone beam CT with a Si. The images and supporting documents of Attachments G-H were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-H demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-H pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac In 1998 with RNSH Hospital, Sydney, Australia, as well as Kilavoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Thus, those images show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of

the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray or Suzuki.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: Oct. 11, 2005

Edward Shapiro

Edward Shapiro

Full Name: Edward G. Shapiro
Citizenship: U.S.
Residence: 2107 Manzanita Avenue
Menlo Park, CA 94025

Attachment: Current Claims

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a

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large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

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34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

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41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a

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treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is

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capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

OIPE IAP15 NOV 14 2005 PATENT & TRADEMARK OFFICE

In re Application for:

Edward Shapiro

Serial No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Examiner: Allen C. Ho

Art Unit: 2882

ATTACHMENT B
DECLARATION OF EDWARD SEPPI
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Edward Seppi, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 320 Dadalera Drive, Portola Valley, California 94028.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from February 12, 2000 through December 19, 2002.

5. My title is Principal Scientist

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

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8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; and U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000 (the examiner has cited Jaffray and Suzuki, along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, and Attachment H - Cone beam CT with a Si. The images and supporting documents of Attachments G-H were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-H demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-H pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac In 1998 with RNSH Hospital, Sydney, Australia, as well as Kilavoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Thus, those images show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of

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the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray or Suzuki.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated Oct 10, 2005

Edward Seppi

Full Name: Edward J. Seppi
Citizenship: U.S.
Residence: 320 Dedalera Drive
Portola Valley, CA 94028

Attachment: Current Claims

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CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a

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large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

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34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

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41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a

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treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is

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capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

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OIPE WP15 NOV 14 2005 PATENT & TRADEMARK OFFICE

Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:

Edward Shapiro

Serial No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Examiner: Allen C. Ho

Art Unit: 2882

ATTACHMENT C
DECLARATION OF JOHN PAVKOVICH
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, John Pavkovich, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 2945 Alexis Drive, Palo Alto, California 94304.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from February 12, 2000 through December 19, 2002.

5. My title is SENIOR SCIENTIST.

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

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8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; and U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000 (the examiner has cited Jaffray and Suzuki, along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, and Attachment H - Cone beam CT with a Si. The images and supporting documents of Attachments G-H were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-H demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-H pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac In 1998 with RNSH Hospital, Sydney, Australia, as well as Kilavoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Thus, those images show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of

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the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray or Suzuki.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: Oct 11, 2005

John Pavkovich

Full Name: John M. Pavkovich
Citizenship: U.S.
Residence: 2945 Alexia Drive
Palo Alto, CA 94304

Attachment: Current Claims

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CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a

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large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

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34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

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41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a

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treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is

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capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

OIPE IAP15 NOV 14 2005 PATENT & TRADEMARK OFFICE

Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:

Edward Shapiro

Serial No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Examiner: Allen C. Ho

Art Unit: 2882

ATTACHEMENT D
DECLARATION OF PETER MUNRO
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Peter Munro, hereby declare that:

1. I am a citizen of Canada.

2. I currently reside at 173 Sierra Vista Ave. #17, Mountain View, California 94043.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Palo Alto, California.

4. I was employed by VMS, Inc. from May 7, 2001 through December 19, 2002.

5. My title is _____Product Manager_____

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; and U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000 (the examiner has cited Jaffray and Suzuki, along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, and Attachment H - Cone beam CT with a Si. The images and supporting documents of Attachments G-H were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-H demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-H pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac In 1998 with RNSH Hospital, Sydney, Australia, as well as Kilavoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Thus, those images show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of

the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray or Suzuki.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: 13 OCT., 2005

Peter Munro

Full Name: Peter Munro
Citizenship: Canadian
Residence: 173 Sierra Vista Ave. #17
Mountain View, CA 94043

Attachment: Current Claims

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a

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large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

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34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

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41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a

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treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is

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capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:

Edward Shapiro

Serial No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Examiner: Allen C. Ho

Art Unit: 2882

ATTACHMENT E
DECLARATION OF STANLEY JOHNSEN
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Stanley Johnsen, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 3842 LaDonna Avenue, Palo Alto, California 94306.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from February 12, 2000 through December 19, 2002.

5. My title is Senior Scientist.

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; and U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000 (the examiner has cited Jaffray and Suzuki, along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, and Attachment H - Cone beam CT with a Si. The images and supporting documents of Attachments G-H were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-H demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-H pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac In 1998 with RNSH Hospital, Sydney, Australia, as well as Kilavoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Thus, those images show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of

the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray or Suzuki.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: October 10, 2005

Stanley Johnsen

Full Name: Stanley W. Johnsen
Citizenship: U.S.
Residence: 3842 LeDonna Avenue
Palo Alto, CA 94306

Attachment: Current Claims

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CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a

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large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

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34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

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41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a

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treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is

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capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

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PATENT & TRADEMARK OFFICE

Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:	Examiner: Allen C. Ho
Edward Shapiro	Art Unit: 2882
Serial No.: 10/324,227	
Filed: December 18, 2002	
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

ATTACHMENT F
DECLARATION OF RICHARD COLBETH
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Richard Colbeth, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 1243 Richardson Avenue, Los Altos, California 94024.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from February 12, 2000 through December 19, 2002.

5. My title is R+D Manager, X-Ray Products, Imaging Panels

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; and U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000 (the examiner has cited Jaffray and Suzuki, along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, and Attachment H - Cone beam CT with a Si. The images and supporting documents of Attachments G-H were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-H demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-H pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac In 1998 with RNSH Hospital, Sydney, Australia, as well as Kilavoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Thus, those images show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of

the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray or Suzuki.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: 10/19, 2005

Richard Colbeth

Full Name: Richard E. Colbeth
Citizenship: U.S.
Residence: 1243 Richardson Avenue
Los Altos, CA 94024

Attachment: Current Claims

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume ~~while continuously rotating about a target volume~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Original) The apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data.

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9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data; and

~~continuously rotating the imager about a target volume while capturing; and~~

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

15. (Original) The method of claim 14, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Currently Amended) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through ~~the~~ a target volume.

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17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Original) The method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data for generating a treatment plan for a target volume~~, wherein the flat-panel imager is operable to capture the image projection data while continuously rotating about a target volume~~.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a

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large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Original) The apparatus of claim 21, further comprising:

means for generating the treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

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34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~; and

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

35. (Original) The machine-readable medium of claim 34, further comprising:

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Original) The machine-readable medium of claim 34, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

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41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data ~~while continuously rotating about a target volume~~ to generate cone-beam computed tomography (CT) volumetric image data to generate a

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treatment plan for a target volume;

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Currently Amended) The apparatus of claim 45, wherein the rotatable gantry is

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capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data ~~while the imager continuously rotates about a target volume~~;

generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and

radiating the target volume with a megavoltage radiation source.

55. (NEW) The apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source.

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Oncology Systems Memo

Date: March 3, 1997

To: Willi Fencl

From: Edward Shapiro

Subject: **RTIS CT Requirements** file: as_ct01.doc

cc: E. Seppi, J. Pavkovich, R. Staehelin, R. Filiberti, J. Myles, B. Pearman

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Preliminary Systems Specifications: for RTIS CT Option and Tests

In order to do CT scans with the RTIS Detector-B (30 x 40 cm) version of the a-Si panels, the following signals and data collection modes are required. Detector-B with readout along the 40 cm side is large enough to generate the 48 cm diameter body scans achieved on the current Ximatron CT Option. Whether the a-Si detector system has sufficient sensitivity and large enough signal to noise ratio shall be determined first by the Detector-A studies at GRC.

Initially the Detector-A (26 x 26 cm) panel version shall be used for the evaluation of small, less than 35 cm body phantoms. The CT tests with this small detector can be performed without many of the extra signal identified below. The signal requirements for these tests are specified below. Based upon the performance of these studies, estimate can then be made as to the expected performance of the larger and future Detector-B.

In addition to single slice CT operation, there is also multi-slice CT mode which acquires 3 to 5 slices simultaneously. Even more slices can be achieved with a cone beam approach which uses a larger 2-D section of the array to reconstruct a greater number of slices. Initially, only the single slice mode requirements will be implemented with Detector-A. Tests will then be performed to estimate the possibility of multi-slice scanning with Detector-B. The requirements for multi-slice and cone beam in relation to the speed and amount of data will be directly related to the number of lines of detector data required. Incorporation of these spec.'s will be entered later into these RTIS CT requirements.

A proper system's requirement specification using the right template shall be generated from this document. Drawings to help clarify the hardware setups and scanning geometries will also be added.

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1.0 Single Slice CT Mode

1.1 Additional Data Inputs for CT Option

The following data signals need to be received by the IAS2a and processed for insertion into the detector data stream on a line and frame basis. Additional IAS2a hardware is therefore necessary to receive these inputs and process them for insertion into the transmitted data stream. Note, preliminary GRC tests on Detector -A can be performed with a sub set of these CT data input requirements.

1.1.1 Gantry Angle:

The gantry angular position is to reside in a 16-bit word which is inserted into the detector data on a line basis. The twelve LS bits are reserved for data, the MS bit for the top-dead-center (TDC) flag bit and 3 spare bits.

Two-phase differential TTL logic signals A and B from a gantry encoder with approximate resolution of 0.1 degrees per count are to be sent to the IAS2a. The phase of the A signal with respect to the B signal indicates the direction of motion clockwise (CW) or counter-clockwise (CCW) as well. Encoder decode logic plus an up/down counter are required to convert this to a 12 bit gantry angle word.

Note, the hardware logic to perform this function has been implemented previously on the CT-Option Control Board (CCU) and the GRC a-Si prototype detector controller. These schematics are available.

1.1.2 Gantry Angle for Detector-A Studies:

Detector-A studies at GRC can be performed with an existing stepper-motor and rotary table which produces uniform and repeatable rotation speed. Thus, the gantry angles can be assumed uniformly spaced with data collection and the word does not need to be inserted in the data stream.

1.1.3 Norm Detector:

The norm detector signal is a current between 10 - 200 nA's which is proportional to the pre-patient x-ray intensity. The signal is integrated and held for each line of detector readout and reset only at the end of the frame, i.e. completion of the last line of data. The signal is to be digitized by the IAS2a ADC and inserted into the processor data stream at the end of each line. The signal is used to normalize the detector reading for x-ray tube output fluctuations.

Note, the hardware analog and digital circuitry to perform this function has been implemented previously on the CT-Option Control Board (CCU) and more specifically on the GRC a-Si prototype detector controller.

1.1.4 Norm Detector for Detector-A studies:

Detector-A studies at GRC can be performed by using the first four a-Si columns of detector data. The setup must be arranged such that these channels must are not obstructed by the phantom at any time during the data collection. These readings can be used to normalize the detector data for x-ray tube output fluctuations. Thus, no extra norm detector needs to be inserted into the detector data stream. This method cannot be used on the actual product, since the patient size and shape are not predictable.

1.2 Additional Control Signals for CT Option

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The following additional control signals need to be received by the IAS2a for controlling the data collection and transmission of data to the workstation Additional IAS2a hardware is therefore necessary to receive these control inputs and process them for insertion into the transmitter data stream. Note, preliminary GRC tests on Detector -A can be performed with a sub set of these CT control requirements.

1.2.1 Synch Control:

The data collection of the a-Si array needs to be synchronized to the 50/60 Hz line frequency. Within the IAS2a a phase-locked-loop(PLL) circuit needs to generate the clock timing which is in synch with the line for reading out the array. This is required so that each frame start is in synch with x-ray generator output which can be single or 3-phase line rectified. Also, line synch operation reduces line pickup and power supply modulations on the detector array. Note, line synch operation of the current CT-Option with high frequency switching generators has also proven to work well.

Note, the hardware logic to perform this PPL function has been implemented previously on the CT-Option Control Board (CCU) and on the GRC a-Si prototype detector controller. These schematics are available for reference. In this case even the high frequency clock timing was synched to the line, i.e. no crystal timing was used. It is probably OK to use crystal timing as long as the frame start is line synch.'d.

1.2.2 Synch for Detector-A Studies:

Detector-A studies at GRC can be performed by using the IAS2a Clinac synch or trigger input which enables synching the frame start to a 360 pps signal. That is, a separate external PPL box exists which can be used to generate a 360 pps signal from the 60 Hz linc.

1.2.3 CT Scan Start:

The CT Scan Start signal is required to initiate background data collections or non gantry rotating test scans. When in the CT mode of operation, the frame rate shall be synchronized to the line frequency as specified above. The imager shall be running continuously at a frame rate of 1/5th the power line frequency. Note, only one central block of 64 lines constitute a CT frame. Although the imager is running, data shall not be collected or processed until it is requested by the workstation. A CT Scan Start signal from the workstation shall initiate the data transfer of 760 frames of data. If a second Scan Start is received during the data transfer, then the process of sending the 760 frames shall be restarted at the beginning of the next frame.

1.2.4 CT Scan Start for Detector-A Studies:

A CT Scan Start signal is required to initiate background data collection. The imager shall be running as above in 1.2.3, but data not processed or saved until Start signal is received.

1.2.5 TDC:

The Top-Dead-Center TTL differential logic signal is used to indicate the gantry position with x-ray source in P-A (posterior-anterior), i.e. source up position. This signal is used to start the scan when requested and to preset the gantry angle counter logic depending upon the direction of gantry rotation. Preset to zero when counting up and 3FF(H) when counting down. At the end of 360 degrees of rotation, the second TDC signal shall set high the MS bit in the gantry angle encoder word. This is used to then calibrate the angle encoder counts in degrees.

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1.2.6 TDC for Detector-A Studies:

The TDC signal for the GRC studies will only be needed to initiate rotating scan data collections. This will insure that the image is displayed in the same orientation after each scan and that the prior normalization phantom scan is applied in the same orientation each time. The direction information shall not be necessary, test scan can be performed in one direction only.

1.2.7 Scan Enable:

A Scan Enable signal pulse is required from the Workstation to enable the data collection for the CT scan. When the Scan Enable is sent then data collection will start when the gantry starts rotating and a TDC signal is received. Logic within the IAS2a is then to inhibit the restart of the scan when the gantry passes through TDC again on the same scan. That is, each scan requires more than 360 degrees of rotation. There is approximately an overlap of 8 degrees of rotation in either direction on the Ximatron.

1.2.8 Scan Enable for Detector-A Studies:

A Scan Enable Signal is not necessary if the TDC signal is allowed to generate a data collection on every other occurrence.

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1.3 Additional Data Outputs for CT Option

The following additional data outputs are required for the a-Si CT Option. Note, preliminary GRC tests on Detector -A can be performed with a sub set of these CT data output requirements.

1.3.1 Additional Line Data:

The actual a-Si CT product shall require that the detector line data plus gantry angle, detector data and others be sent over the high speed serial data link. The order of the data is as follows:

- First line of detector data, 1024 words
- Three spare data words for expansion
- Norm channel data word
- Gantry angle data word
- Line number data word
- Second line of detector data
- ... repeat of above

Note, it would also be of value for trouble shooting to have a line number data word from 0 to 767 decimal. This word should also have a bit in the MS 1/2 byte (most significant half byte) for the Fluoro or Rad mode setting on the ASIC. Thus, a maximum of 1030 words shall be transmitted for each line of the array. The number of lines transmitted in a frame is dependent on the selection of gate drivers. The minimum number of full lines shall be one block of 64. This would result in 64 x 1030 = 65,940 words per frame. This would be reduced proportionately if line more than one line is selected at a time and if pixel binning is used.

1.3.2 Additional Line Data for Detector-A Studies:

There shall be no additional line data required, only detector data of 512 words. The Norm data and gantry angle data shall be handled as described in section 1.1.2 and 1.1.4. The number of lines collected per frame shall be also be 64. The possibility of at least 1,2 or 4 lines collected simultaneously would be desirable. Also, binning of 1, 2 or 4 detector pixels in each line would be desirable. This will significantly reduce the IAS2a data storage requirements for CT.

1.3.3 Frame Data:

The frame data for the CT Option scan shall actually be less than the amount for a normal Rad or Fluoro image. The minimum number of lines in a frame shall be one gate driver block of 64. This shall define a 2.5 cm slice of data at the detector face since the Detector-B pixels are 392 um. The slice referred to iso-center for the detector FID of 150cm would be 1.67 cm. Thus, only one 1 cm slice or two to three 5mm slices could be obtained simultaneously from this single 64 line block of data. As stated above there shall be 65,920 words in a minimum size frame of data.

The number of frames of data collected in a CT scan will vary with 50/60 Hz systems. The current Xim CT-Option on a 50 Hz system collect 650 projections or frames which is one per 5 power line cycles or 100msec. The 60 Hz collect 760 projections, which is also one per 5 power line cycles or 83.33 msec. The scan time is approximate 1 minute plus in both cases. Note, there are only two lines of data collected in each projection for the current Xim CT-Option. Thus, the data rates will be at least 32 times faster.

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1.3.4 Frame Data for Detector-A Studies:

The maximum number of lines in a frame for Detector-A studies shall also be 64. Therefore, a frame of data shall be a maximum of 512 x 64 = 32,768 words. No additional words are inserted. The option of reading 1, 2 or 4 line at a time would be desirable. Also, selection of binning pixels 2 or 4 at time would be desirable. so if 2 x 2 binning was achieved, then the a frame of data would have only 8,192 words.

The maximum frame rate shall be one frame per 83.33 msec. This yields a maximum word rate of one per 2.5 usec or a 0.8 Mbytes/sec rate. Note, the equivalent slice width at the detector for 64 lines is 64 x 508um = 3.25 cm. Referred to iso-center this would be 2.16 cm which would cover 1 to two 1 cm body slices.

1.3.4 Data Collection:

There are two types of data collections; Background and Scan.

- Background data collection: The Scan Start signal is issued from the workstation. The gantry is typically stationary with beam off. The number of background frames collected is typically 50, which is 4.2 or 5 seconds for 60/50 Hz. The number of background scans accepted is limited by the workstation.
- Scan data collection: The gantry is rotating with beam on. The data transmission & collection starts at the beginning of the first frame after a scan enabled TDC occurs. There shall be at least 760 frames of data transmitted so that both 60 and 50 Hz systems will be satisfied.

1.3.5 Data Collection for Detector-A:

The initial data collections with Detector-A can be performed without the IAS2a differentiating between background and scan data. The external test hardware shall control the operation with or without the TDC signal. The only requirement is that the frames start synchronously with the line frequency and the total amount of data be 760 frames.

1.3.6 Image Scan Data:

The complete set of image scan data would be composed of 760 frames or projections for a 60 Hz system. This would be a maximum of 760 x 65,920 = 50,099,200 words. This would be approximately 100 Mbytes if the data was not binned before storage. Binning of 2 lines at the gate and 2 pixels at the ASIC would reduce this by 1/4th to 25 Mbytes. No processing at the IAS2a is required. The data shall be passed directly to the workstation via the SLRB. Note, 50 Mega words in 63.3 seconds is 0.8 Mega words/sec. which is well within the ADC and the SLRB's capabilities. .

1.3.7 Image Scan Data for Detector-A:

The complete set of image scan data would be composed of 760 frames or projections for a 60 Hz system. This would be a maximum of 760 x 32,768 = 24,903,680 words. This would be approximately 50 Mbytes if the data was not processed before storage. Binning of 2 lines at the gate and 2 pixels at the ASIC would reduce this by 1/4th to 12.5 Mbytes. No processing at the IAS2a is required, only storage of the scan data. The complete set of scan data shall be passed directly to the workstation via the ethernet link at the end of the scan. Therefore, the minimum amount of IAS2a memory data storage for these tests would be 24 Mbytes.

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1.3.8 Data Link:

This hardware interface is defined by the SLRB hardware design document. The SLRB AT board shall be used to interface directly to the Datacube MaxPCI preprocessor board and then to an Alacron type array processor all within the workstation. Potential for eliminating the Datacube board in this link may be possible, however it will still be needed for high frame rate processing and display for fluoroscopy.

1.3.9 Data Link for Detector-A Studies:

For detector-A tests the data interface from the IAS2a to the workstation can be over the ethernet link. The IAS2a needs a minimum of 24 Mbytes of memory to store all the data from one scan with binning of either 2 lines or 2 pixels. The raw detector data will then be sent in a file to the workstation. There shall be no preprocessing of the data in the IAS2a, i.e. no background subtraction, normalization or defect correction. This will all be performed initially in the Alacron array processor within the workstation. No Datacube card will be necessary for these tests.

1.4 Data Handling Requirements for CT Option

1.4.1 Data Storage Requirements:

1.4.2 Data Collection Rates:

2.0 Multi-Slice CT Mode

3.0 Cone Beam CT Mode

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VARIAN
medical systems

Cone Beam CT with a-Si

kVp and MeV imaging with an a-Si Radiotherapy Detector-A system

Contributors:
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John Pavkovich -GTC
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Per Petersen -ISG

Confidential Information

May 11, 1999
file: egs/ as_CTkVMV.ppt

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Purpose: The purpose of this study was to determine the feasibility of using a 2-dimensional a-Si x-ray detector with a cone beam CT reconstruction algorithm. The application is for obtaining volumetric CT imaging on the Ximatron simulator and possibly on the Clinac accelerator. The intent is to provide the new a-Si based simulator with an improved capability over the current ScanVision which is IIT based and yields only a single slice per 1 minute rotation. The Clinac study was to determine the CT capabilities of the a-Si based PortalVision system and the stability requirements for the R-arm.

System: The x-ray images were obtained with two different a-Si Detector-A prototype systems. The diagnostic energy 120kVp images were performed in the Ginzton Technology Center (GTC), Palo Alto. The 6 MeV Clinac images were obtained on the a-Si Detector-A prototype installed at Royal North Shore Hospital (RNSH) Sydney, NSW Australia.

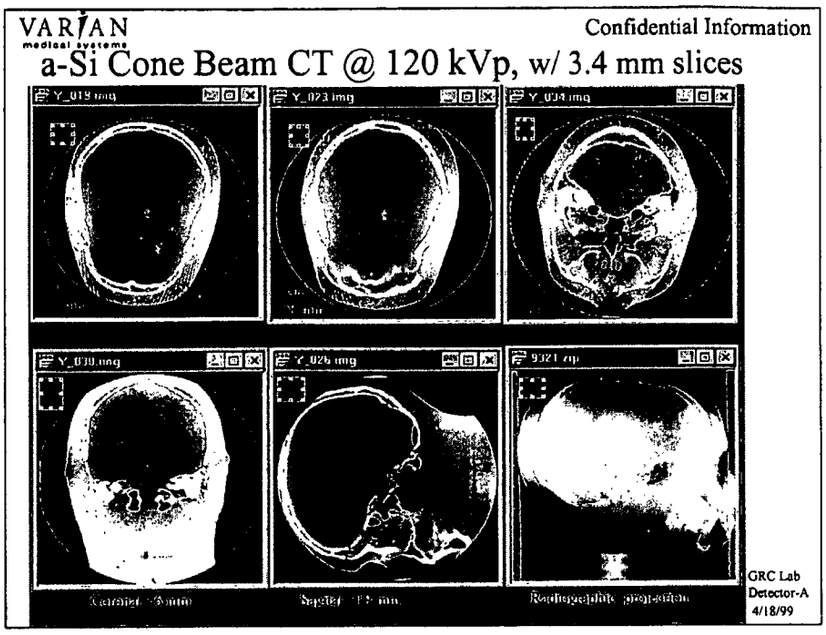
Diagnostic Energy Results: The axial slices had the usual central region ring artifacts due to lack of detector signal stability and sensitivity. Th is artifact translates to slight shits in gray levels or bands in the coronal and sagital cuts. The contrast resolution is only sufficient to resolve the 4% contrast material in the phantom brain and not the 2% material. There were streak artifacts from bony structures resulting from the limited 180 projection data set. At least 360 is needed for the 256x256 pixel reconstructions. Doing body scans with this detector will require much lower electronic noise and higher sensitivity. In addition CsI scintillator vs Lanex is needed plus more than 14-bits of ADC range. Also compensation for x-ray tube output variations is required. Comparisons phantom scans with the current ScanVision system is to be obtained next.

Clinac Results: The Clinac images were done with a different head phantom with segmented sections. Less central artifacts were obtained compared to the 120kVp images due to the higher signal levels from the high dose images. Similar streaking was obtained due to the limited 180 projections. The 26 x26 cm^2 a-Si detector was not large enough to scan the full head at 130cm SID and clear the couch top, so the head was cantilevered on a board. No quantitative information was available with this phantom. The contrast resolution required for Clinac CT images is to be determined from clinical inputs and studies. The dose used for these high energy images was a factor of 100 times too high for practical application. This was partly due to using the standard PV Vision system software and the current Clinac-PV interface. Compensation to the preprocessed data were applied to remove unwanted R-arm mechanical movements.

ATTACHMENT H

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Cone Beam 120kVp CT Head Phantom Images

Setup: Data and calibrations were taken at the GTC lab in August 1998 by Ed Seppi and Ed Shapiro. The x-ray tube and detector were stationary and the head phantom was manually rotated 2 degrees per image projection. A full 360 + degrees of rotation were used. The detector was the prototype a-Si Detector-A PortalVision system with Vision ver. 5.0, operating without the buildup plate and ND filters.

Images: Top row has 3 axial CT slices. Bottom row has 1coronal, 1 sagital and 1 lateral radiographic projection. The CT images are an average of 4 adjacent slices which yields an effective isocenter slice width of 3.4 mm. The isocenter volume covered is a 21 cm cube, which included nearly the entire head.

Reconstructions: Cone beam reconstructions (CBR) by ISG Technologies Inc. of Los Gatos and E. Seppi/ J. Pavkovich.. Produced a 256 x 256 x 256 x 16 bit cube of data, i.e. 32Mbytes. The 512 x 512 detector pixels were effectively binned 2 x 2. Resolution of the voxel element is 0.84 mm per side.

Technique Factor: 120kVp at 2 mA, 3-phase fluoro setting with 90 mils of Al filtration.

Projections: Radiographic images every 2 degrees of rotation for 180 projections total, plus overlap of ~10 degrees. The imager frame rate was 2.15 fps or 0.465 sec/frame with 5 frames averaged/projection. The total time/projection = 2.325 sec.

Dose: Output of 120 kVp at 2 ma for 180 x 2.325 sec = 837 mas. From tube calibrations the above technique translates to 1.75 R/min at 1 meter or 30 mR/sec. The result is 12.6 R/image. This does not factor in bow tie filters or rotation which introduces at least a factor of two reduction, i.e 6 R. This dose is compatible with most diagnostic CT scanner doses today. Also, the current ScanVision CT uses 125 kVp at 10mA for 60 sec. or 600mAs.

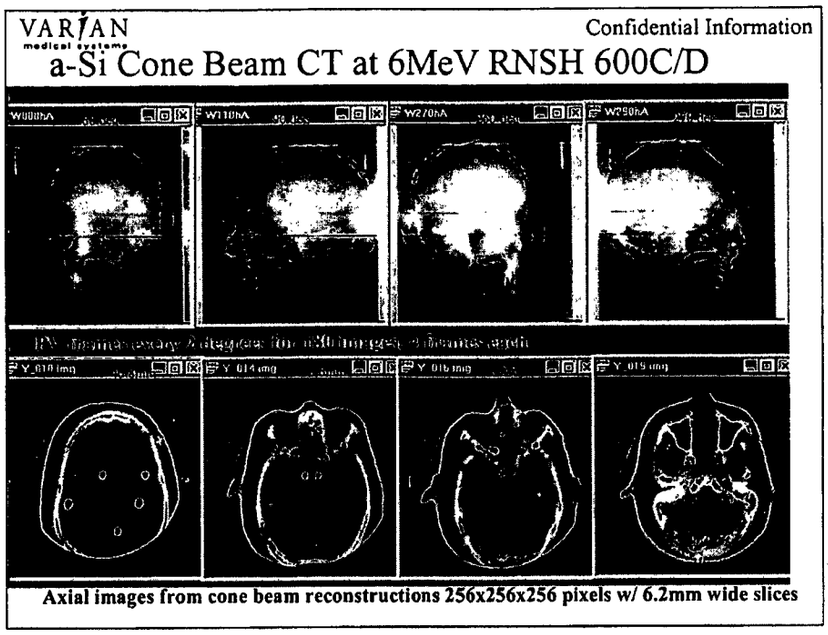
Panel Geometry: Pixel size 0.508 mm in a 512 x 512 matrix. Pixel size at isocenter is 0.508mm/1.21 = 0.42mm. System setup with FAD = 107 cm, FID = 129.5 cm, Magnification = 1.21

Slice Thickness: Four image planes were used for each slice above. This is four of 256 images, which translates to 4 x2 x 0.42mm = 3.36 mm/slice at iso center.

Normalization Phantom and Calibration: A 20 cm diameter by ~ 30 cm tall cylindrical water normalization was used. The exposure was 120 kVp at 2 mA for 20 frames. Horizontal and vertical spatial calibrations were done with the CT lead rulers. Horizontal and vertical centers were found by rotating wires and rulers.

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Axial images from cone beam reconstructions 256x256x256 pixels w/ 6.2mm wide slices

Cone Beam MeV CT Head Phantom Images w/ a-Si

Setup: Data and calibrations taken at Royal North Shore Hospital, Sydney, Australia September 1998 by Ed Seppi, John Pavkovich and Dr. Raj Mallik. The head phantom was attached to a board and placed at the isocenter of a Clinac 600C/D. The prototype Detector-A PortalVision system was used with Vision ver. 5.0. The image projections were taken after the Clinac gantry was rotated in 2 degree increments. A full 360 + degrees of rotation were used.

Images: Top row are 4 a-Si PV images that were flood field normalized with a 20cm diam.cylindrical water phantom. Bottom row are 4 axial CT CBRs at various offsets from the central axis (CAX) cut. The CT images are an average of 8 adjacent slices which yields an effective isocenter slice width of 6.2 mm. The isocenter volume covered is a 20 cm cube, which included nearly the entire head.

Reconstructions: Cone beam reconstructions (CBR) by ISG Technologies Inc. of Los Gatos and E. Seppi/ J. Pavkovich.. Produced a 256 x 256 x 256 x 16 bit cube of data, i.e. 32Mbytes. The 512 x 512 detector pixels were effectively binned 2 x 2. Resolution of the voxel element is 0.78 mm per side.

Technique Factor: 6 MeV at 200MU/min dose rate.

Projections: Every 2 degrees of rotation for 180 projections total plus overlap ~10 degrees. The frame rate was 3.16 fps with 8 frames averaged/projection. The total time/projection = 2.53 sec.

Dose: Dose for the above image set was ~1500 MU. This is too large by a factor of ~ 100, see next page for details and possible dose reduction techniques.

Panel Geometry: Pixel size 0.508 mm in a 512 x 512 matrix. Pixel size at isocenter is 0.508mm/1.3 = 0.39mm. System setup with SAD = 100 cm, SID = 130 cm, magnification = 1.3

Reconstruction matrix: 256 x 256 x 256 x 16 bit, so pixels were effectively binned 2 x 2.

Slice Thickness: Eight image planes were used for each slice above. This is 8 of 256 images, which translates to 8 x2 x 0.39mm = 6.24 mm/slice at iso center.

Normalization Phantom and Calibration: A 20 cm diameter by ~ 30 cm tall cylindrical water normalization was used. The exposure was 120 kVp at 2 mA for 20 frames and rotating ever 20 degrees. Only used 1! Horizontal and vertical spatial calibrations were done with the CT lead rulers. Horiz. and Vert. centers were found by rotating wires and rulers. R-arm instabilities with rotation were calibrated out with lead markers attached to the pre-patient collimator.

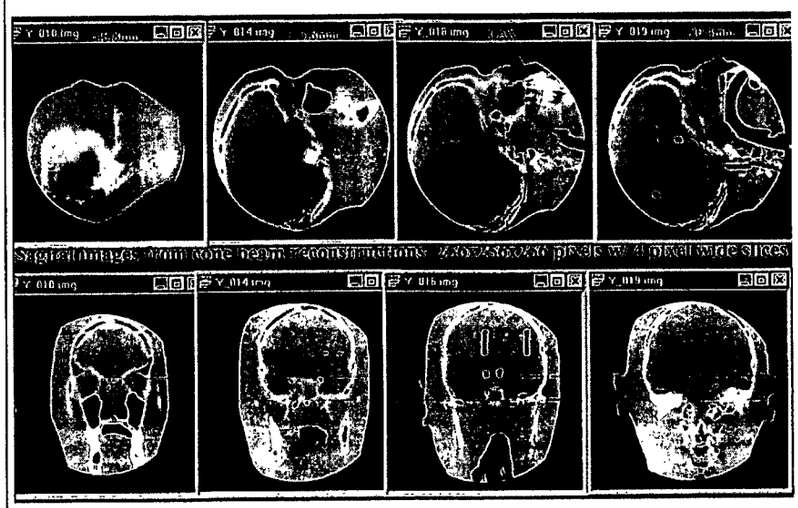
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VARIAN medical systems

Confidential Information

a-Si Cone Beam CT at 6MeV RNSH 600C/D



Coronal images from cone beam reconstructions- 256x256x256 pixels w/ 6.2 mm slices

Cone Beam MeV CT Head Phantom Images w/ a-Si

Images: Top row are 4 direct sagital CT images selected from the 256x256 x256 cube of CBR data. Bottom row are 4 direct coronal CT images with offsets specified from the same cube of data. The images are an average of 8 adjacent slices which yields an effective isocenter slice width of 6.2 mm.

Dose: Clinac 600C/D dose rate of 200 MU/min. with the dose rate servo off. For 2.53 sec/projection there are 8.4 MU/projection. With 180 projections there were ~ 1,500 MU used to generate the above images. This is of course a factor of 100 times too high for a patient exposure. A factor of 8 reduction can be achieved by averaging just 1 frame per projection., which would yield ~ 190 MU/scan. This is still too high since it is equivalent to a full treatment fraction.

Dose Reduction: The very minimum dose for a Clinac CT scan would be for each projection to have only one beam pulse. For this 600C/D the 200 MU/min rate was achieved with a beam rep rate of 87 Hz. Therefore, the dose per beam pulse was ~ 38 mMU. For a 2 degree per projection scan, i.e. 180 projections, this would yield a patient dose of 6.9 MU/scan. This is similar in dose to a diagnostic CT scan and thus very acceptable, however achieving reasonable image quality with this low dose shall be challenging. This will be difficult due to the current a-Si PV efficiency of detecting high energy x-ray photons. With the current PV buildup and phosphor screen only ~ 2% of the 6 MeV x-rays are detected. More work on the increasing this to 10% or more shall be necessary. Using thick collimated scintillators an approach that is being investigated at GTC.

File: as_CTkVMV.ppt/ E. Shapiro/

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Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**



Art Group: 2882

Examiner: Ho, Allen C.

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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The submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made in the subject application and is not to be construed as an admission that the information cited in this statement is material to patentability.

Please charge any fees due to Deposit Account 02-2666. A duplicate copy of the Fee Transmittal (PTO/SB/17) is enclosed for this purpose.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 11/9/05

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard, 7th Floor
Los Angeles, CA 90025
Telephone: (310) 207-3800

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Amber D. Saunders 11/9/05

Amber D. Saunders *Date*

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete If Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-6,661,870	12-09-2003	Kapatoes et al.	
		US-			
		US-			
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] - Number[4] - Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

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[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

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FEE TRANSMITTAL for FY 2005

Applicant fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($)	1,860.00

	Complete if Known
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below	=	Fee Paid
Total Claims	55	- 54** =	1	X	50.00	=	$50.00
Independent Claims	6	- 6** =	0	X	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	300	2204	150	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

**or number previously paid, if greater, For Reissues, see below

SUBTOTAL (1) ($) 50.00

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	1,020.00
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)				Additional claim fee	

SUBTOTAL (2) ($) 1,810.00

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	11/9/05

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission: 10	Attorney Docket Number: 5513P009

ENCLOSURES ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Response
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☒ Information Disclosure Statement
  - ☒ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
- ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
- ☐ After Allowance Communication to Group
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below):*

Return Receipt Postcard
Copies of 3 Prior Art References

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	11/10/05

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Signature		Date	11/10/05

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FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT	($)

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

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☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
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1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

SUBTOTAL (2) ($)

SUBMITTED BY Complete (if applicable)

Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	11/10/05

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NOV 16 2005
PATENT & TRADEMARK OFFICE

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Art Group: 2882

Examiner: Ho, Allen C.

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 11/10/05

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard, 7th Floor
Los Angeles, CA 90025
Telephone: (310) 207-3800

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet 1 of 1

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Kudo et al., "Feasible cone beam scanning methods for exact reconstruction in three-dimensional tomography," J. Opt. Soc. Am. A; 7, 2169 (1990).	
		Rizo et al., "Comparison of two three-dimensional x-ray cone-beam-reconstruction algorithms with circular source trajectories," J. Opt. Soc. Am. A, 10, 1639 (1991).	
		Yan et al., "Derivation and analysis of a filtered backprojection algorithm for cone beam projection," IEEE Trans. Medical Imaging, 10, 462 (1991).	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Applicant's unique citation designation number. [2]Applicant is to place a check mark here if English language Translation is attached.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

8791 7590 12/09/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
HO, ALLEN C	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 12/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-55* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-55* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *14112005,16112005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3, 5-23, 25-33, 39, 40, 41, 43, 45-47, 49-51, and 53-55 are rejected under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Patent No. 6,842,502 B2).

With regard to claims 1 and 21, Jaffray *et al.* disclosed an apparatus, comprising: a rotatable gantry (**406**); a cone-beam radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**), wherein the flat-panel imager captures image projection data to generate cone-beam tomography (CT) volumetric image data to generate a treatment plan for a target volume (column 23, lines 8-11).

With regard to claims 2 and 22, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7).

With regard to claims 3 and 23, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claims 5 and 25, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (column 4, lines 30-33).

With regard to claims 6 and 26, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of generating image projection data at 15-30 frames per second (column 18, lines 61-64).

With regard to claims 7 and 27, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, further comprising a computing unit (column 24, lines 39-40).

With regard to claims 8 and 28, Jaffray *et al.* disclosed the apparatus of claims 7 and 27, wherein the computing unit generates the treatment plan based on the image projection data (column 26, line 39- column 28, line 10).

With regard to claims 9 and 29, Jaffray *et al.* disclosed the apparatus of claims 7 and 28, wherein the computing unit generates a three-dimensional image (column 24, line 61 - column 25, line 6).

With regard to claims 10 and 30, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6).

With regard to claims 11, 12, 31, and 32, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, further comprising a translatable treatment couch (column 25, lines 15-29).

With regard to claims 13 and 33, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the rotatable gantry is capable of 360-degree rotation (column 24, lines 52 - 53).

With regard to claims 39 and 40, Jaffray *et al.* disclosed the apparatus of claim 21, further comprising means for treating a patient according to the treatment plan (**409**) including providing synchronization and gate control between the imager and the radiation beam during treatment (column 24, lines 39-60).

With regard to claim 43, Jaffray *et al.* disclosed the apparatus of claim 1, further comprising a megavoltage radiation source (**409**).

With regard to claims 14 and 16, Jaffray *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine (cone beam CT) to capture image projection data from a flat-panel imager (**404**) for generating cone-beam computed tomography (CT) volumetric image data; and generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data (column 26, line 39- column 28, line 10).

With regard to claim 15, Jaffray *et al.* disclosed the method of claim 14, further comprising transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan (column 27, lines 15-23).

With regard to claim 17, Jaffray *et al.* disclosed the method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frame per second (column 18, lines 61-64).

With regard to claim 18, Jaffray *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (column 4, lines 30-33).

With regard to claim 19, Jaffray *et al.* disclosed the method of claim 14, wherein the radiation source (**402**) is a kilovoltage radiation source.

With regard to claim 20, Jaffray *et al.* disclosed the method of claim 14, further comprising using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source (**409**) into position to align the treatment volume with the therapeutic radiation.

With regard to claim 41, Jaffray *et al.* disclosed the method of claim 14, further comprising: deriving a master clock signal from a synchronization signal of the radiation source; using the master clock to generate a first control pulse to gate the radiation source and a second control pulse to trigger reading of an image from the imager; and selecting a timing of the first control pulse and the second control pulse to readout the image while the radiation source is off (column 24, lines 39-60).

With regard to claim 45, Jaffray *et al.* disclosed an apparatus, comprising: a rotatable gantry (**408**); a cone-beam imager radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**) coupled to the rotatable gantry, wherein the flat-panel imager captures image projection data to generate cone-beam computed tomography (CT) volumetric image data to generate a treatment plan for a target volume (column 23, lines 8-11); and a megavoltage radiation source (**409**) coupled to the rotatable gantry to radiate the volume with radiation.

With regard to claim 46, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7).

With regard to claim 47, Jaffray *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6), and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claim 49, Jaffray *et al.* disclosed the apparatus of claim 45, further comprising: a computing unit (column 24, lines 39-40).

With regard to claim 50, Jaffray *et al.* disclosed the apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data (column 24, line 61 - column 25, line 6).

With regard to claim 51, Jaffray *et al.* disclosed the apparatus of claim 45, further comprising a translatable treatment couch (column 25, lines 15-29).

With regard to claim 53, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the megavoltage radiation source comprises a source of between 4 and 25 megavolts of radiation (column 20, lines 13-15).

With regard to claim 54, Jaffray *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine to capture image projection data from a flat-panel imager (**404**) for generating cone-beam computer tomography (CT) volumetric image data; generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data (column 24, line 61 - column 25, line 6); and radiating the target volume with a megavoltage radiation source (**409**).

With regard to claim 55, Jaffray *et al.* disclosed the apparatus of claim 48, wherein the treatment plan may be modified by image projection data produced using the megavoltage radiation source (column 25, line 30- column 26, line 38).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4, 24, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claims 3, 23, and 47 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4, 24, and 48, Jaffray *et al.* disclosed the apparatus of claims 3, 23, and 47. However, Jaffray *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

5. Claims 34-38 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claims 14, 15, 17, and 20 above.

With regard to claims 34-37, Jaffray *et al.* disclosed the method of claims 14, 15, 17, and 20. However, Jaffray *et al.* failed to teach that the method is in the form of computer instructions stored on a computer-readable medium.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the method in the form of computer instructions stored on a computer-readable medium, since a person would be motivated to control the clinical simulator machine and the clinical treatment machine using a computer.

With regard to claim 38, Jaffray *et al.* disclosed the machine-readable medium of claim 34. However, Jaffray *et al.* failed to teach instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to instruct the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size, since a person would be motivated to image a treatment volume that is located anywhere in a patient.

With regard to claim 44, Jaffray *et al.* disclosed the machine-readable medium of claim 34, further comprising a megavoltage radiation source (**409**) to radiate the target volume with radiation.

6. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claim 16 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2) and Stanton *et al.* (U. S. Patent No. 6,744,848 B2).

With regard to claim 42, Jaffray *et al.* disclosed the method of claim 16. However, Jaffray *et al.* failed to teach continuously rotating the radiation source about the target volume while capturing image projection data, and one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Stanton *et al.* disclosed a CT system and a method that comprises the step of capturing radiation at non-uniformly spaced angles with respect to the rotation (column 2, line 59 - column 3, line 14). Stanton *et al.* taught that this method uses less radiation dose than a conventional screening methods (column 2, lines 5-16; column 3, lines 15-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to of capture radiation at non-uniformly spaced angles with respect to the rotation, since a person would be motivated to reduce a patient's exposure to radiation.

7. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claim 45 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

With regard to claim 52, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while rotating about a target volume. However, Jaffray *et al.* failed to disclose

that the imager is capable of capturing image projection data while continuously rotating about a target volume.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Response to Arguments

8. Applicant's arguments filed 14 November 2005 have been fully considered but they are not persuasive.

9. The declarations filed on 14 November 2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the Jaffray (U. S. Patent No. 6,842,502 B2) reference.

10. The evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of the Jaffray reference.

The evidence submitted is incommensurate with the claimed subject matter. Specifically, the evidence fails to show that the applicants had a cone beam CT that generates a treatment plan from volumetric image data. Therefore, the rejections are being maintained.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Allen C. Ho

Allen C. Ho
Primary Examiner
Art Unit 2882

07 December 2005

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PATENT & TRADEMARK OFFICE
IAP15

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
ACH		US-6,661,870	12-09-2003	Kapatoes et al.	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] - Number[4] - Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T*

Examiner Signature	Allen C. Ho	Date Considered	06 Dec. 2005

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Based on PTO/SB/08A (08-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wtr) 08/11/2003.

Send To: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

NOV 18 2005
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	1

Complete if Known	
Application Number	10/324,227
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First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T²
ACH		Kudo et al., "Feasible cone beam scanning methods for exact reconstruction in three-dimensional tomography," J. Opt. Soc. Am. A; 7, 2169 (1990).	
ACH		Rizo et al., "Comparison of two three-dimensional x-ray cone-beam-reconstruction algorithms with circular source trajectories," J. Opt. Soc. Am. A, 10, 1639 (1991).	
ACH		Yan et al., "Derivation and analysis of a filtered backprojection algorithm for cone beam projection," IEEE Trans. Medical Imaging, 10, 462 (1991).	

Examiner Signature	Allen C. Ho	Date Considered	06 Dec. 2005

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

¹Applicant's unique citation designation number. ²Applicant is to place a check mark here if English language Translation is attached.

Based on PTO/SB/08B (08-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 08/11/2003.
Send To: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

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WP37

IFW 2882

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission	7
Attorney Docket Number	5513P009

ENCLOSURES ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Response
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☒ Information Disclosure Statement
  - ☒ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below):*

Return Receipt Postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	12/7/05

CERTIFICATE OF MAILING/TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Typed or printed name	Amber D. Saunders		
Signature		Date	12/7/05

Based on PTO/SB/21 (09-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 11/30/2005.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

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FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT	($)	50.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	55	- 54* =	1	x	50.00	=	$50.00
Independent Claims	6	- 6* =	0	x	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	300	2204	150	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (1) ($) 50.00

***or number previously paid, if greater, For Reissues, see below*

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1808	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)					

SUBTOTAL (2) ($)

SUBMITTED BY					Complete (if applicable)
Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	12/7/05

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

12/13/2005 HLE333 00000002 022666 10324227

01 FC:1202 50.00 DA

OIPE
DEC 12 2005
PATENT & TRADEMARK OFFICE

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Art Group: 2882

Examiner: Ho, Allen C.

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure, enclosed is a copy of IDS Citation Form PTO/SB/08 or PTO-1449, together with copies of the documents cited on that form, except for copies not required to be submitted (e.g., copies of U.S. patents and U.S. published patent applications need not be enclosed). This IDS and IDS Citation Form are being submitted before the mailing of a first Office Action. It is respectfully requested that the cited references be considered and that the enclosed copy of PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

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The submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made in the subject application and is not to be construed as an admission that the information cited in this statement is material to patentability.

Please charge any fees due to Deposit Account 02-2666. A duplicate copy of the Fee Transmittal (PTO/SB/17) is enclosed for this purpose.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 12/7/05

Angelo J. Gaz, Reg. No. 45,907

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Telephone: (310) 207-3800

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12/7/05

Amber D. Saunders ***Date***

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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete If Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] *(if known)*	Publication Date or Issue Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-6,914,959			
		US-			
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] - Number[4] - Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Based on PTO/SB/08A (08-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 08/11/2003.

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OIPE IAP86
MAY 12 2006
PATENT & TRADEMARK OFFICE

IFW 2882

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission	22
Attorney Docket Number	5513P009

ENCLOSURES ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☒ Amendment / Response
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☒ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
  - ☐ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
- ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below):*

return receipt postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	May 9, 2006

CERTIFICATE OF MAILING/TRANSMISSION

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Typed or printed name	**Amber D. Saunders**		
Signature		Date	**May 9, 2006**

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FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 950.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	61	- 55* =	6	x	50.00	=	$300.00
Independent Claims	7	- 6* =	1	x	200.00	=	$200.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	790	2204	395	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

***or number previously paid, if greater, For Reissues, see below*

SUBTOTAL (1) ($) 500.00

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	450.00
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

SUBTOTAL (2) ($) 450.00

SUBMITTED BY				Complete (if applicable)	
Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	05/09/06

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wir) 12/15/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

05/15/2006 NHGUYEN1 00000009 022666 10324227
01 FC:1252 450.00 DA

OIPE
MAY 12 2006
PATENT & TRADEMARK OFFICE

PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Edward G. Shapiro, et al. Application No.: 10/324,227 Filed: December 18, 2002 For: **A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager**	Examiner: Allen C. Ho Art Unit: 2882 Confirmation No.: 4627

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

AMENDMENT AND RESPONSE TO OFFICE ACTION

In response to the Office Action mailed December 9, 2005, in connection with the above referenced patent application, Applicants respectfully request entry of the following amendments and request reconsideration in view of the following remarks.

05/15/2006 NNGUYEN1 00000009 022666 10324227
02 FC:1201 200.00 DA
03 FC:1202 300.00 DA

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry, said gantry disposed on one of a radiation simulation system or a radiation treatment system;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data ~~to generate a treatment plan for a target volume~~, wherein the gantry continues to rotate while capturing the image projection data.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Currently Amended) The apparatus of claim 7, wherein the computing unit generates ~~the~~ a treatment plan based on the image projection data.

9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data~~; and generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data~~, wherein a gantry of the simulator machine continues to rotate while capturing the image projection data.

15. (Currently Amended) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

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16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Original) The method of claim 14, wherein the radiation source is a kilovoltage radiation source.

20. (Currently Amended) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry, said gantry disposed on one of a radiation simulation system or a radiation treatment system;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a ~~patients~~patient's anatomy~~for generating a treatment plan for a target volume~~.

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22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Currently Amended) The apparatus of claim 21, further comprising:

means for generating ~~the~~ a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

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32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data~~; and generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data~~, wherein a gantry of the simulator machine continues to rotate while capturing the image projection data.

35. (Currently Amended) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Currently Amended) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

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_____using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Currently Amended) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 14, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

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one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate the target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data ~~to generate a treatment plan for a target volume;~~

~~a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation~~.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

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49. (Currently Amended) The apparatus of claim 45, further comprising:

a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Currently Amended) The apparatus of claim 45, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data;

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~~generating a treatment plan for clinical treatment of a target volume based on the cone-beam volumetric image data; and~~

~~radiating the target volume with a megavoltage radiation source.~~

55. (Currently Amended) The apparatus of claim 48, further comprising:
radiating the target volume with a megavoltage radiation source,

wherein the ~~treatment plan~~ volume may be modified by image projection data produced using the megavoltage radiation source.

Please consider additional claims:

56. (New) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

57. (New) The method of claim 14, further comprising:

modifying a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

58. (New) The method of claim 14, further comprising:

positioning a patient based on the cone-beam volumetric image data.

59. (New) The apparatus of claim 45, wherein the apparatus is part of a clinical simulator system or a radiation therapy system.

60. (New) The method of claim 54, wherein the apparatus is part of a clinical simulator system or a radiation therapy system.

61. (New) A method to perform a clinical treatment, comprising:

using a clinical radiation therapy system to capture fluoroscopic or cone-

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beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

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REMARKS

Claims 1-55 were examined and rejected. Applicants amend claims 1, 14-15, 20-21, 28, 34-35, 37, 39, 45, 49 and 53-55; and add new claims 56-61. Applicants assert that no new matter is added herein as new claims 56-64 are supported by the specification and claims, as filed. For example, Amendments to claims for a gantry disposed on one of a radiation simulation system or a radiation treatment system, are supported at paragraphs 5 and 39-40 of the application as originally filed (and claims 45 and 54 as originally presented). Applicants respectfully request reconsideration of claims 1-55, as amended, and consideration of additional claims 56-61 in view of at least the following remarks.

I. Claims Rejected Under 35 U.S.C. § 102

The Patent Office rejects claims 1-3, 5-23, 25-33, 39-41, 43, 45-47, 49-51 and 53-55 under 35 USC § 102(e) as being anticipated by US Patent No. 6,842,502 to Jaffray ("Jaffray"). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference.

Applicants overcome the above rejections by the Rule 131 Declarations and supporting evidence (Attachments A-H) previously mailed on November 9, 2005 in response to the Final Office Action mailed May 10, 2005 and the Advisory Action mailed August 2, 2005. Those declarations and supporting evidence show that the subject matter of the rejected claims as amended, to the extent taught in Jaffray, enjoys an earlier date of invention than the priority date of Jaffray. Specifically, independent claims 1, 14, 21, 45 and 54 claim features which the declarations and supporting evidence show to enjoy an earlier date of invention than the priority date of Jaffray.

Moreover, Applicants now address the response to arguments section of the current Office Action which states that the previously submitted Attachments A-H were ineffective to overcome Jaffray as they failed to show that the Applicants had a cone beam CT that generates a treatment plan from volumetric image data. Applicants do not agree, but do not argue this point, as it is moot in view of the amended claims.

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Applicants have amended independent claims 1, 14, 21, 45 and 54 to no longer positively require a treatment plan.

In addition, Applicants point to the following sections of the supporting evidence (Attachments A-H) previously mailed on November 9, 2005 that support amendments to the independent claims. Amendments to claims 1 and 14 for the gantry continues to rotate while capturing the image projection data, are supported at sections 1.2.7 pg. 4, and 1.3.4 pg. 6 of Attachment G. Amendments to claims 1 and 14 for said gantry disposed on one of a radiation simulation system or a radiation treatment system, are supported at section "Purpose" on pg. 1, and at pages 3-4 of Attachment H. Amendment to claim 21 is supported by figures and descriptions of Attachment H. Amendments to claims 45 and 54, for fluoroscopic image data are supported at sections 1.3.1 pg. 5, and 1.3.8 pg. 7 of Attachment G; and at section "Technique Factor" pg. 2 of Attachment H. Amendments to claims 45 and 54, for CT imaging image projection data are supported at sections 1.3 pg. 5 of Attachment G; and at pages 2-3, etc. and images of Attachment H.

Thus, those claims have been reduced to practice by the previously filed Attachments A-H. Accordingly, Applicants seek reconsideration and withdrawal of the above rejection.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

II. Claims Rejected Under 35 U.S.C. § 103(a)

The Patent Office rejects claims 4, 24 and 48 under 35 USC § 103(a) as being unpatentable over Jaffray as applied to claims 3, 23 and 47 above, and further in view of US Patent No. 5,956,382 to Wiener-Avnear et al. ("Wiener-Avnear"). To render a claim obvious, all limitations of that claims must be taught or suggested by at least one properly combined reference.

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Applicants overcome the rejection above by the Rule 131 Declarations and supporting evidence previously mailed on November 9, 2005. An argument analogous to the one above with respect to the 32 U.S.C. 35 USC § 102(e) rejection of claim 1 applies here as well to show that the subject matter of the rejected claims enjoys an earlier date of invention than the priority date of Jaffray. Specifically, independent claim 1 claims features which the declarations and supporting evidence (Attachments A-H) show to enjoy an earlier date of invention. Accordingly, Applicants, seek reconsideration and withdrawal of the above rejection.

Applicants assert that Wiener-Avnear fails to cure the shortcomings of Jaffray for independent claims 1, 21 and 45 (e.g., from which claims 4, 24 and 48 depend respectively). Wiener-Avnear discloses an x-ray focal plane array (XFPA) detector fabricated by a laser micro-milling method under strict process control conditions (see Abstract).

However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Winer-Avnear of a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data, wherein the gantry continues to rotate while capturing the image projection data, as required by independent claim 1 (e.g., from which claim 4 depends).

In addition, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Winer-Avnear of a means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patients anatomy, as required by independent claim 21 (e.g., from which claim 24 depends).

However, the Patent Office has not identified and Applicants are unable to find any teaching or suggestion in Winer-Avnear of a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data, as required by independent claim 45 (e.g., from which claim 48 depends).

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Thus, Applicants respectfully request the Patent Office withdraw the rejection above.

The Patent Office rejects claims 34-38 and 44 under 35 USC § 103(a) as being unpatentable over Jaffray as applied to claims 14-15, 17 and 20 above.

Applicants overcome the rejection above by the Rule 131 Declarations and supporting evidence previously mailed on November 9, 2005. An argument analogous to the one above with respect to claim 1 applies here as well to show that the subject matter of the rejected claims enjoys an earlier date of invention than the priority date of Jaffray. Specifically, independent claim 34 claims features which the declarations and supporting evidence (Attachments A-H) show to enjoy an earlier date of invention. Accordingly, Applicants, seek reconsideration and withdrawal of the above rejection.

In addition, Applicant traverses that it would have been obvious to provide the method in the form of computer instructions stored on a computer-readable medium, and respectfully requests the Patent Office provide a reference to support that position in accordance with MPEP 2144.03. Specifically, although a person may be motivated to create computer instructions to perform a task, that motivation does not support enablement that such instructions can be, or have been created.

Likewise, Applicant traverses that it would have been obvious to instruct a clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size, and respectfully request the Patent Office provide a reference in support of that position under MPEP 2144.03.

The Patent Office rejects claim 42 under 35 USC § 103(a) as being unpatentable over Jaffray as applied to claim 16 above, and further in view of US Patent No. 6,590,953 to Suzuki et al. ("Suzuki") and US Patent No. 6,744,848 to Stanton et al. ("Stanton").

Applicants overcome the above rejections by the Rule 131 Declarations and supporting evidence (Attachments A-H) previously mailed on November 9, 2005, which show that the subject matter of the rejected claims enjoy an earlier date of invention than the priority date of Jaffray or Suzuki. An argument analogous to the one above with respect to claim 1 applies here as well.

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In addition, Applicants assert that Stanton fails to cure the shortcomings of Jaffray and Suzuki. Stanton discloses cone beam imaging with an array detector including a plurality of sensor modules removably mounted in a mounting frame (see US Patent No. 6,448,544 to Stanton et al., incorporated in Stanton by reference in column 2, lines 14-22). Moreover, Stanton discloses producing volumetric images using low-dose imaging for mammograms. However, the Patent Office has not identified and Applicants are unable to find any teaching or description in Stanton of a flat panel imager, a treatment plan, or megavoltage radiation sources as required by Applicant's claims. Thus, Applicants respectfully request the Patent Office withdraw the rejection of dependent claim 42.

Finally, the Patent Office rejects claim 52 under 35 USC § 103(a) as being unpatentable over Jaffray, as applied to claim 45 above and further in view of Suzuki.

Applicants submit that dependent claim 52 being dependent upon allowable base claim 45, as amended, is patentable over the cited references for at least the reasons cited above. Thus, Applicants respectfully request the Patent Office withdraw the rejection of dependent claim 52.

In addition, Applicants overcome the above rejections by the Rule 131 Declarations and supporting evidence (Attachments A-H) previously mailed on November 9, 2005, which show that the subject matter of the rejected claims enjoy an earlier date of invention than the priority date of Jaffray or Suzuki. An argument analogous to the one above with respect to claim 1 applies here as well.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

III. Addressing the Response to Arguments Section of the Current Office Action

In the Response to Arguments Section of the current Office Action, the Patent Office asserts that "the declarations filed on 14 November 2005 under 37 CFR 1.131 has been considered but is ineffective to overcome the Jaffray (US Patent No. 6,842,502 B2)

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reference. The evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of the Jaffray reference. The evidence submitted is incommensurate with the claimed subject matter. Specifically, the evidence fails to show that the applicants had a cone beam CT that generates a treatment plan from volumetric image data. Therefore, the rejections are being maintained."

Applicants respectfully disagree that the evidence did not show a reduction to practice of the invention as previously claimed (e.g., as amended in the Response to Office Action mailed on November 9, 2005), but that Applicants have mooted the issue for purposes of prosecution (e.g., as the claims as currently amended no longer positively require the existence or creation of a plan).

IV. Additional Claims 56-61

Applicants assert that additional claims 56-61 are patentable over the cited references for at least the reason the reasons given above in support of their base claims.

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CONCLUSION

In view of the foregoing, it is believed that all claims now are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: May 9, 2006

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Blvd.
Seventh Floor
Los Angeles, California 90025
(310) 207-3800

CERTIFICATE OF MAILING:

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Amber D. Saunders 5/9/06

Amber D. Saunders Date

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OIPE
MAY 19 2006
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2882

IFW

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission	8
Attorney Docket Number	5513P009

ENCLOSURES *(check all that apply)*

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment / Response
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [x] Information Disclosure Statement
  - [x] PTO/SB/08
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Basic Filing Fee
  - [ ] Declaration/POA
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s)
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) *(please identify below):*

Copy of 1 cited reference; return receipt postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	5/17/06

CERTIFICATE OF MAILING/TRANSMISSION

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Typed or printed name	Suzanne Johnston		
Signature		Date	5/17/06

Based on PTO/SB/21 (09-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 11/30/2005.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

OIPE MAY 19 2006 PATENT & TRADEMARK OFFICE

FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 180.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☐ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below	=	Fee Paid
Total Claims	55	- 55** =	0	x	50.00	=	$0.00
Independent Claims	6	- 6** =	0	x	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	790	2204	395	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (1) ($) 0.00

***or number previously paid, if greater, For Reissues, see below*

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	180.00
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1 129(b))	
Other fee (specify)					

SUBTOTAL (2) ($) 180.00

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	5/17/06

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

OIPE
MAY 19 2006
PATENT & TRADEMARK OFFICE

Docket No.: 5513P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

EDWARD G. SHAPIRO, ET AL.

Application No.: 10/324,227

Filed: December 18, 2002

For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**

Art Group: 2882

Examiner: Ho, Allen C.

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In accordance with the duty of disclosure, enclosed is a copy of IDS Citation Form PTO/SB/08 or PTO-1449, together with copies of the documents cited on that form, except for copies not required to be submitted (e.g., copies of U.S. patents and U.S. published patent applications need not be enclosed). This IDS and IDS Citation Form are being submitted before the mailing of a final Office Action. It is respectfully requested that the cited references be considered and that the enclosed copy of PTO/SB/08 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

05/22/2006 AKELECH1 00000021 10324227
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The submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made in the subject application and is not to be construed as an admission that the information cited in this statement is material to patentability.

The fee set in the amount of $180.00 for submission of the Information Disclosure Statement is enclosed herewith. Please charge any additional fees due to Deposit Account 02-2666. A duplicate copy of the Fee Transmittal (PTO/SB/17) is enclosed for this purpose.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 5/17/06

Angelo J. Gaz, Reg. No. 45,907

12400 Wilshire Boulevard, 7th Floor
Los Angeles, CA 90025
Telephone: (310) 207-3800

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Suzanne Johnston 5/17/06

Date

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	1

Complete If Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		Jaffray, David A. et al., "Flat-Panel Cone-Beam Computed Tomography for Image-Guided Radiation Therapy", Int. J. Radiation Oncology Biol. Phys., Vol. 53, No. 5 (2002), pp. 1337-1349	

Examiner Signature		Date Considered	

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Applicant's unique citation designation number. [2]Applicant is to place a check mark here if English language Translation is attached.

Based on PTO/SB/08B (08-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 08/11/2003.
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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
10/324,227		2882	28M1

Correspondence Address / Fee Address Change

The following fields have been set to Customer Number 45288 on 07/14/2006

- Correspondence Address
- Maintenance Fee Address

The address of record for Customer Number 45288 is:
VARIAN/BLAKELY
12400 WILSHIRE BOULEVARD, SEVENTH FLOOR
LOS ANGELES,CA 90025-1030

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

45288 7590 08/16/2006

VARIAN/BLAKELY
12400 WILSHIRE BOULEVARD, SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
HO, ALLEN C	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 08/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 February 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *121205,190506*.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the a translatable treatment couch that is capable of movement in three planes plus angulation as claimed in claims 11, 12, 31, 32, and 51 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claim 19 is objected to because of the following informalities:

Claim 19 recites the limitation "the radiation source". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

3. Claim 41 is objected to because of the following informalities:

(1) Claim 41 recites the limitation "the radiation source". There is insufficient antecedent basis for this limitation in the claim.

(2) Claim 41 recites the limitation "the master clock" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

4. Claim 42 is objected to because of the following informalities:

(1) Claim 42 recites the limitations "the radiation source". There is insufficient antecedent basis for this limitation in the claim.

(2) Claim 42 recites the limitation "the target volume". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

5. Claim 43 is objected to because of the following informalities:

Claim 43 recites the limitation "the target volume". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

6. Claim 60 is objected to because of the following informalities:

(1) Claim 60 recites the limitation "the apparatus". There is insufficient antecedent basis for this limitation in the claim.

(2) Claim 60 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 60 recites a clinical simulator system, which is already recited in claim 54.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-13, 21-33, 39, 40, 43, 59 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-13, 21-33, 39, 40, 43 recite a gantry that is disposed on one of a radiation simulation system or a radiation treatment system. This recitation is indefinite since the structures of the radiation simulation system and the radiation treatment system are not defined. Furthermore, it is unclear how the gantry is disposed on the radiation simulation system or the radiation treatment system because their structures are not defined.

Claim 59 recites the apparatus is part of a clinical simulator system or a radiation therapy system. This recitation is indefinite since the structures of the radiation simulation system and the radiation treatment system are not defined.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 45-47, 54, 59, and 60 are rejected under 35 U.S.C. 102(b) as being anticipated by Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 45, Roos *et al.* disclosed an apparatus, comprising: a rotatable gantry (**16**); a cone-beam radiation source (**18**) coupled to the rotatable gantry; and a flat-panel imager (**20**) coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

With regard to claim 46, Roos *et al.* disclosed the apparatus of claim 46, wherein the flat-panel imager includes an amorphous silicon sensor array (column 6, lines 4-9) capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (column 7, lines 15-28).

With regard to claim 47, Roos *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source (x-ray tube), and the flat-panel imager includes a cesium iodide scintillator (column 6, lines 4-9).

With regard to claim 54, Roos *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine to capture fluoroscopic or cone-beam CT imaging projection data from a flat-panel imager (**20**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

With regard to claims 59 and 60, Roos *et al.* disclosed the apparatus of claim 45, wherein the apparatus is part of a clinical simulator system (the entire system).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1-3, 5-11, 13-20, 34-38, 41, 44, and 56-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) in view of Roos *et al.* (U. S. Patent No. 6,041,097) and Ning *et al.* (U. S. Patent No. 6,075,836).

With regard to claim 1, Swerdloff *et al.* disclosed an apparatus, comprising: a rotatable gantry (**44**), the gantry disposed on a radiation simulation system (**11**) or a radiation treatment system (**10**); a radiation source (**46**) coupled to the rotatable gantry; and an imager (**50**) coupled to the rotatable gantry.

However, Swerdloff *et al.* failed to disclose a cone-beam radiation source, and a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data, wherein the gantry continues to rotate while capturing the image projection data.

Roos *et al.* disclosed a cone-beam CT apparatus that comprises a cone-beam radiation source (**18**); and a flat-panel imager (**20**) coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data (column 4, lines 15-26). Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

Ning *et al.* taught that a cone-beam CT operating in a spiral mode reduces volume scanning time of a three-dimensional object (column 1, lines 46-56).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the cone-beam CT apparatus to run in a spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

With regard to claim 2, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array (Roos *et al.*, column 6, lines 4-9).

With regard to claim 3, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator (Roos *et al.*, column 6, lines 4-9).

With regard to claim 5, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographing imaging, and cone-beam CT imaging (Roos *et al.*, column 7, lines 15-28).

With regard to claim 6, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second (Ning *et al.*, column 18, line 60 - column 19, line 9).

With regard to claim 7, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, further comprising: a computing unit (Roos *et al.* **38**), coupled to the rotatable gantry via a communication network, to store the image projection data captured by the flat-panel imager.

With regard to claim 8, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data (Swerdloff *et al.*, column 7, lines 59-67).

With regard to claim 9, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the

target volume based on the captured image projection data (Swerdloff *et al.*, column 7, lines 39-67).

With regard to claim 10, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source (Roos *et al.*, x-ray tube **18**).

With regard to claim 11, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communication network (a translatable treatment couch is required to perform a spiral CT scan).

With regard to claim 13, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation (Roos *et al.*, column 4, lines 54-60).

With regard to claim 14, Swerdloff *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical simulator machine (**11**) to capture image projection data from an imager.

However, Swerdloff *et al.* failed to disclose a flat-panel imager for generating cone beam computed tomography (CT) volumetric image data, wherein a gantry of the simulator machine continues to rotate while capturing the image projection data.

Roos *et al.* disclosed a cone-beam CT apparatus that comprises a cone-beam radiation source (**18**); and a flat-panel imager (**20**) coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data (column 4, lines 15-26). Roos *et al.* taught that such a

cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

Ning *et al.* taught that a cone-beam CT operating in a spiral mode reduces volume scanning time of a three-dimensional object (column 1, lines 46-56).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the cone-beam CT apparatus to run in a spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

With regard to claim 15, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14, further comprising: generating a treatment plan for a clinical treatment machine (**10**) based on the cone-beam volumetric data (column 7, lines 59-67); and transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

With regard to claim 16, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

With regard to claim 17, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14. However, although Ning *et al.* disclosed that a flat-panel imager is capable of capturing image projection data at a frame rate in the range of 15-30 frames per second (column 18, line 60 - column 19, line 9), Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose capturing the image projection data at a frame rate in the range of 15-30 frames per second.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to capture the image projection data at a frame rate in the range of 15-30 frames per second, since a person would be motivated to expedite CT imaging by capturing image projection data at a high frame rate.

With regard to claim 18, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (Roos *et al.*, column 5, lines 44-54).

With regard to claim 19, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14, wherein the radiation source is a kilovoltage radiation source (Roos *et al.*, x-ray tube **18**).

With regard to claim 20, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14, further comprising: using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation (Swerdloff *et al.*, column 7, lines 5-37). However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to generate a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to generate a treatment plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claims 34-37, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claims 14, 15, 17, and 20. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose a machine-readable medium having instructions to cause a machine to perform the method of claims 14, 15, 17, and 20.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a machine-readable medium having instructions to cause a machine to perform the method of claims 14, 15, 17, and 20, since the clinical simulator machine is controlled by a computer.

With regard to claim 38, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the machine-readable medium of claim 34. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to teach instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to instruct the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size, since a person would be motivated to image a treatment volume that is located anywhere in a patient.

With regard to claim 41, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14, further comprising: deriving a master clock signal from a synchronization signal of the radiation source; using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager; and selecting a timing of the first control pulse as compared to the second control pulse to read out the image (Roos *et al.*, column 3, line 56 - column 4, line 26).

With regard to claim 44, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source (Swerdloff *et al.*, **12**) to radiate the target volume with radiation.

With regard to claim 56, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to generate a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to generate a treatment plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claim 57, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose modifying a treatment plan for a clinical treatment machine based on the cone-beam volumetric data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify a treatment plan for a clinical treatment machine based on the cone-beam volumetric data, since a person would be motivated to change the treatment as the shape and/or size of a tumor changes.

With regard to claim 58, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 14. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose positioning a patient based on the bone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to position a patient based on the bone-beam volumetric image data, since a person would be motivated to position a target at the isocenter of the clinical simulator machine.

13. Claims 21-23, 25, 27-30, 33, 39, 40, 45-47, 49, 50, 59, and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) in view of Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 21, Swerdloff *et al.* disclosed an apparatus, comprising: a rotatable gantry (**44**), the gantry disposed on one of a radiation simulation system (**11**) or a radiation treatment system (**10**); means (**46**) for applying a computed tomography (CT) radiation beam coupled to the rotatable gantry; and means for capturing image projection data with an imager (**50**), coupled to the rotatable gantry.

However, Swerdloff *et al.* failed to disclose means for applying a cone-beam computed tomography (CT) radiation beam, and means for capturing image projection data with a flat-panel imager to generate cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a cone-beam CT apparatus that comprises means (**18**) for applying a cone-beam computed tomography (CT) radiation beam; and means (**20**) for capturing image projection data with a flat-panel imager to generate cone-beam computed tomography (CT) volumetric image data (column 4, lines 15-26). Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 22, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array (Roos *et al.*, column 6, lines 4-9).

With regard to claim 23, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 22, wherein the means for capturing includes cesium iodide scintillator (Roos *et al.*, column 6, lines 4-9).

With regard to claim 25, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the means for capturing in capable of fluoroscopic imaging, radiographing imaging, and cone-beam CT imaging (Roos *et al.*, column 7, lines 15-28).

With regard to claim 27, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, further comprising: means (Roos *et al.* **38**) for storing the captured image projection data is coupled to the rotatable gantry via a communication network.

With regard to claim 28, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, further comprising: means (**51**) for generating a treatment plan based on the image projection data coupled to the means for capturing via a communication network.

With regard to claim 29, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data (Swerdloff *et al.*, column 7, lines 39-67).

With regard to claim 30, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source (Roos *et al.*, x-ray tube **18**).

With regard to claim 33, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation (Roos *et al.*, column 4, lines 54-60).

With regard to claims 39 and 40, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, further comprising: means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment (Roos *et al.*, column 3, line 56 - column 4, line 26). However, Swerdloff *et al.* and Roos *et al.* failed to disclose means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to

generate a treatment plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claim 45, Swerdloff *et al.* disclosed an apparatus, comprising: a rotatable gantry (**44**); a radiation source (**46**) coupled to the rotatable gantry; and an imager (**50**) coupled to the rotatable gantry.

However, Swerdloff *et al.* failed to disclose a cone-beam radiation source, and flat-panel imager, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a cone-beam CT apparatus that comprises a cone-beam radiation source (**18**); and a flat-panel imager (**20**) coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging projection data to generate fluoroscopic (column 5, lines 44-54) or cone-beam computed tomography (CT) volumetric image data. (column 4, lines 15-26). Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 46, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array (Roos *et al.*, column 6, lines 4-9) capable of fluoroscopic imaging, radiographing imaging, and cone-beam CT imaging.

With regard to claim 47, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source (Roos *et al.*, x-ray tube), and the flat-panel imager includes a cesium iodide scintillator (Roos *et al.*, column 6, lines 4-9).

With regard to claims 49 and 50, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 45, further comprising: a computing unit (Swerdloff *et al.* **51**), coupled to the rotatable gantry via a communications network, to store the image projection data, wherein the computing unit generates the treatment plan based on the image projection data (Swerdloff *et al.*, column 7, lines 59-67). However, Swerdloff *et al.* and Roos *et al.* failed to disclose a computing unit that stores image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a computing unit that stores image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data, since a person would be motivated to generate a treatment plan from fluoroscopic or cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claim 61, Swerdloff *et al.* disclosed a method to perform a clinical treatment, comprising: using a clinical radiation therapy system to capture CT imaging image projection data from an imager (**50**) for generating CT volumetric image data.

However, Swerdloff *et al.* failed to disclose capturing fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a method that comprises capturing fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager (**20**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data. Roos *et al.* taught that such a method would improve spatial resolution and reduce patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data, since a person would be motivated to improve spatial resolution and reduce patient scan time.

14. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773), Roos *et al.* (U. S. Patent No. 6,041,097), and Ning *et al.* (U. S. Patent No. 6,075,836) as applied to claim 3 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 3. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

15. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773), Roos *et al.* (U. S. Patent No. 6,041,097), and Ning *et al.* (U. S. Patent No. 6,075,836) as applied to claim 11 above, and further in view of Pflaum *et al.* (U. S. Patent No. 6,416,219 B1).

With regard to claim 12, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 11. However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose a translatable couch that is capable of movement in three planes plus angulation.

Pflaum *et al.* disclosed a translatable couch that is capable of movement in three planes plus angulation.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a translatable couch that is capable of movement in three planes plus angulation, since a person would be motivated to position a target at the isocenter of the apparatus for CT imaging.

16. Claims 24 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 23 and 47 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 24 and 48, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 23 and 47. However, Swerdloff *et al.* and Roos *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

17. Claims 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 21 above, and further in view of Ning *et al.* (U. S. Patent No. 6,075,836).

With regard to claim 26, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21. However, Swerdloff *et al.* and Roos *et al.* failed to disclose the means for capturing captures the image data at 15 to 30 frames per second.

Ning *et al.* disclosed that a flat-panel imager is capable of capturing the image data at 15 to 30 frames per second (column 18, line 60 - column 19, line 9).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to capture the image projection data at a frame rate in the range of 15-30 frames per second, since a person would be motivated to expedite CT imaging by capturing image projection data at a high frame rate.

18. Claims 31, 32, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 21 and 45 above, and further in view of Pflaum *et al.* (U. S. Patent No. 6,416,219 B1).

With regard to claims 31, 32, and 51, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 21 and 45. However, Swerdloff *et al.* and Roos *et al.* failed to disclose a translatable couch that is capable of movement in three planes plus angulation.

Pflaum *et al.* disclosed a translatable couch that is capable of movement in three planes plus angulation.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a translatable couch that is capable of movement in three planes plus angulation, since a person would be motivated to position a target at the isocenter of the apparatus for CT imaging.

19. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773), Roos *et al.* (U. S. Patent No. 6,041,097), and Ning *et al.* (U. S. Patent No. 6,075,836) as applied to claim 16 above, and further in view of Stanton *et al.* (U. S. Patent No. 6,744,848 B2).

With regard to claim 42, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the method of claim 16, further comprising continuously rotating the

Stanton *et al.* disclosed a CT system and a method that comprises the step of capturing radiation at non-uniformly spaced angles with respect to the rotation (column 2, line 59 - column

3, line 14). Stanton *et al.* taught that this method uses less radiation dose than a conventional screening methods (column 2, lines 5-16; column 3, lines 15-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to of capture radiation at non-uniformly spaced angles with respect to the rotation, since a person would be motivated to reduce a patient's exposure to radiation.

20. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773), Roos *et al.* (U. S. Patent No. 6,041,097), and Ning *et al.* (U. S. Patent No. 6,075,836) as applied to claim 1 above, and further in view of Cash, Jr. *et al.* (U. S. Patent No. 6,125,295).

With regard to claim 43, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* disclosed the apparatus of claim 1, further comprising a radiation source (Swerdloff *et al.* **12**).

However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose the energy of the radiation source.

Cash, Jr. *et al.* disclosed that radiation therapies utilize photons with energy in excess of 1 MeV because the target receives a more uniform dose at this energy range (column 1, lines 34-46).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a megavoltage radiation source to radiate a target volume, since a person would be motivated to confine the radiation dose at the target.

21. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 45 above, and further in view of Ning *et al.* (U. S. Patent No. 6,075,836).

With regard to claim 52, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation.

However, Swerdloff *et al.* and Roos *et al.* failed to disclose that the flat-panel imager is capable of capturing image projection data while continuously rotating about a target volume.

Ning *et al.* taught that a cone-beam CT operating in a spiral mode reduces volume scanning time of a three-dimensional object (column 1, lines 46-56).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the cone-beam CT apparatus to run in a spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

22. Claims 53 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 45 and 48 above, and further in view of Cash, Jr. *et al.* (U. S. Patent No. 6,125,295).

With regard to claims 53 and 55, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 45 and 48, further comprising a radiation source (Swerdloff *et al.* **12**).

However, Swerdloff *et al.*, Roos *et al.*, and Ning *et al.* failed to disclose the energy of the radiation source.

Cash, Jr. *et al.* disclosed that radiation therapies utilize photons with energy in excess of 1 MeV because the target receives a more uniform dose at this energy range (column 1, lines 34-46).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a megavoltage radiation source to radiate a target volume, since a person would be motivated to confine the radiation dose at the target.

Response to Arguments

23. Applicant's arguments filed 12 May 2006 with respect to the rejection(s) of claim(s) 1-3, 5-23, 25-33, 39, 40, 41, 43, 45-47, 49-51, and 53-55 under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Swerdloff *et al.* (U. S. Patent No. 5,661,773), Roos *et al.* (U. S. Patent No. 6,041,097), and Ning *et al.* (U. S. Patent No. 6,075,836).

Conclusion

24. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Allen C. Ho

Allen C. Ho, Ph.D.
Primary Examiner
Art Unit 2882

11 August 2006

DEC 12 2005
PATENT & TRADEMARK OFFICE

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number - Kind Code[2] (if known)	Publication Date or Issue Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
ACH		US-6,914,959	07-2005	Bailey et al.	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] - Number[4] - Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

Examiner Signature	/Allen C. Ho/	Date Considered	08/09/2006

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication.

[1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Based on PTO/SB/08A (08-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 08/11/2003.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	1

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T²
ACH		Jaffray, David A. et al., "Flat-Panel Cone-Beam Computed Tomography for Image-Guided Radiation Therapy", Int. J. Radiation Oncology Biol. Phys., Vol. 53, No. 5 (2002), pp. 1337-1349	

Examiner Signature	/Allen C. Ho/	Date Considered	08/09/2006

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Deliver to: Ho, Allen C., USPTO
Art Group: 2882
Facsimile No.: (571) 273-8300
Date: January 16, 2007
From: Angelo J. Gaz, Reg. No. 45,907
Our Docket No.: 5513P009
Number of pages 24 including this sheet.
Application No.: 10/324,227
Filing Date: 12/18/2002
Docket Due Date(s): 1/16/2007

Enclosed are the following documents:

☒ Amendment: After Final (20 pgs)	☐ Issue Fee Transmittal
☐ Appeal Brief (pgs)	☐ Notice of Appeal
☐ Application:	☐ Petition for:
(pgs) w/cover & abstract)	☐ Request for Continued Examination (RCE)
☐ Assignment & Cover Sheet (pgs)	☐ Reply Brief (pgs)
☒ Certificate of Facsimile	☐ Request & Certification Under 35 USC 122(b)(2)(B)(i)
☐ Continued Prosecution Application (CPA)	☐ Request to Rescind Previous Nonpublication Request
☐ Declaration & POA (pgs)	☐ Response to Notice of Missing Parts & Formalities Letter
☐ Drawings: sheets, figures	☐ Response to Written Opinion (pgs)
☒ Extension of Time: two (2) months	☐ Terminal Disclaimer
☒ Fee Transmittal (in duplicate)	☐ Transmittal of Publication Fee Due
☐ IDS & PTO/SB/08 (pgs)	☒ Transmittal Letter
☐ Other	

CERTIFICATE OF MAILING/TRANSMISSION (37 CFR 1.8A)

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	☐ Request for Continued Examination (RCE)
☐ Assignment & Cover Sheet (pgs)	☐ Reply Brief (pgs)
☒ Certificate of Facsimile	☐ Request & Certification Under 35 USC 122(b)(2)(B)(i)
☐ Continued Prosecution Application (CPA)	☐ Request to Rescind Previous Nonpublication Request
☐ Declaration & POA (pgs)	☐ Response to Notice of Missing Parts & Formalities Letter
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☐ Other	

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PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Edward G. Shapiro, et al. Application No.: 10/324,227 Filed: December 18, 2002 For: **A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager**	Examiner: Allen C. Ho Art Unit: 2882 Confirmation No.: 4627

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Alexandria, Virginia 22313-1450

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION

Dear Sir:

In response to the Final Office Action mailed August 16, 2006, in connection with the above referenced patent application, Applicants respectfully request entry of the following amendments and request reconsideration in view of the following remarks.

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01 FC:1252 450.00 DA

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PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Edward G. Shapiro, et al. Application No.: 10/324,227 Filed: December 18, 2002 For: **A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager**	Examiner: Allen C. Ho Art Unit: 2882 Confirmation No.: 4627

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PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Examiner: Allen C. Ho
Edward G. Shapiro, et al.	Art Unit: 2882
Application No.: 10/324,227	Confirmation No.: 4627
Filed: December 18, 2002	
For: A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager	

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AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry, said gantry rotatably coupled to a frame of~~disposed on~~ one of a radiation simulation system capable of determining a patient position and~~or~~ a radiation treatment system capable of implementing a treatment plan;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data~~, wherein the gantry continues to rotate while capturing the image projection data~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

PAGE 6/24 * RCVD AT 1/16/2007 7:47:54 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-2/1 * DNIS:2738300 * CSID:3108205988 * DURATION (mm-ss):07-18

8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data~~, wherein a gantry of the simulator machine continues to rotate while capturing the image projection data~~.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image

PAGE 7/24 * RCVD AT 1/16/2007 7:47:54 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-2/1 * DNIS:2738300 * CSID:3108205988 * DURATION (mm-ss):07-18

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projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Currently Amended) The method of claim ~~14~~16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry, said gantry rotatably coupled to a frame of ~~disposed on~~ one of a radiation simulation system capable of determining a patient position and ~~or~~ a radiation treatment system capable of implementing a treatment plan;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

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23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

PAGE 9/24 * RCVD AT 1/16/2007 7:47:54 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-2/1 * DNIS:2738300 * CSID:3108205988 * DURATION (mm-ss):07-18

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data, ~~wherein a gantry of the simulator machine continues to rotate while capturing the image projection data~~.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to

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capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Currently Amended) The method of claim ~~14~~16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate ~~the~~ a target volume with radiation.

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44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry rotatably coupled to a frame of one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

PAGE 12/24 * RCVD AT 1/16/2007 7:47:54 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-2/1 * DNIS:2738300 * CSID:3108205988 * DURATION (mm-ss):07-18

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50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry rotatably coupled to a frame of a clinical simulator machine or a radiation treatment system capable of implementing a treatment plan;

using ~~a~~ the clinical simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The apparatus of claim 48, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

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generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

positioning a patient based on the cone-beam volumetric image data.

59. (Currently Amended) The apparatus of claim 45, wherein the apparatus is part of a clinical simulator system capable of determining a patient position or a radiation therapy system.

60. (Currently Amended) The method of claim 54, wherein the ~~apparatus is part of a~~ clinical simulator system is also ~~or~~ a radiation therapy system.

61. (Previously Presented) A method to perform a clinical treatment, comprising:

using a clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (New) The apparatus of claim 1, wherein the frame comprises a drive stand.

63. (New) The method of claim 14, wherein the frame comprises a drive stand.

64. (New) The machine-readable medium of claim 34, wherein the frame comprises a drive stand.

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REMARKS

Claims 1-61 were examined and rejected. The drawings are also objected to. Applicants amend claims 1, 14, 19, 21, 34, 41, 43, 45, 54 and 59-61; and submits additional claims 62-64. Applicants assert that no new matter is added herein as amendments to claim 1, 19, 21, 41, 43, 45, 54 and 59-61; and additional claims 62-64 are supported at least at Figures 1 and 3; and in paragraphs 5, 9, 12, 13 and 28 of the Application as originally filed. Also, amendment to claim 60 to specify that the clinical simulation machine is also a radiation therapy system is supported at least at paragraphs 39-41 of the Application as originally filed. Applicants respectfully request reconsideration of claims 1-61, as amended, and consideration of claims 62-64 in view of at least the following remarks.

I. Final Rejection

The Patent Office issues the current rejection mailed August 16, 2006 as a final rejection because the prior amendments necessitated a new ground of rejection. Applicants disagree and assert that the finality of current rejection is improper. For example, in the Response to Arguments Section, Section 23 on page 25 of the current office action, the Patent Office indicates that the prior arguments filed May 12, 2006 with respect to claims, including claim 14 (Applicants note that claim 34 should be included in this group), were fully considered and found persuasive. Therefore, the Patent Office withdrew the prior rejection and provided new ground of rejection in view of new references. Specifically, Applicants note that the prior arguments for claims 14 and 34 were persuasive, and that the amendments mailed May 9, 2006 are substantially similar to amendments for claims 14 and 34 previously considered by the Patent Office (see amendments to claims 14 and 34 submitted with Applicants' response to Final Office Action mailed July 11, 2005, entered, and considered). Thus, for at least the reason that independent claims 14 and 34 did not necessitate new grounds of rejection, Applicants respectfully request that the Patent Office withdraw the finality of the current rejection.

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II. Drawings

The Patent Office objects to the drawings under 37 CFR § 1.83(a) as the drawings do not show a translatable treatment couch that is capable of movement in three planes plus angulation as claimed in claims 11, 12, 31, 32 and 51. Applicants respectfully disagree, as the feature of the translatable couch as claimed is shown in an example as couch 218 in Figure 1 and described at paragraph 14, and is shown in an example by couch 418 of Figure 3 and described in paragraph 29 of the Application as originally filed. Examples of directions of movement of an object in multiple planes plus angulation are known in the art (e.g., kinematics) without a figure showing such example directions. Thus, Applicants respectfully request that the Patent Office withdraw the objection above.

III. Claim Objections

The Patent Office objects to claim 19 because the limitation 'the radiation source' has insufficient antecedent basis. Applicants amend claim 19 to depend from claim 16, thus curing the antecedent basis problem. Hence, Applicants respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 41 because 'the radiation source' has insufficient antecedent basis. Applicants amend claim 41 to depend from claim 16 to cure the antecedent basis problem. Hence, Applicants respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 41 because the limitation 'the master clock' has insufficient antecedent basis. Applicants amend claim 41 to depend to require 'the master clock signal'. Thus Applicants assert that claim 41 has proper antecedent basis and respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 42 because 'the radiation source' and 'the target volume' have insufficient antecedent basis. Applicants disagree as claim 42 depends from claim 16, which provides those terms with proper antecedent basis. Hence, Applicants respectfully request that the Patent Office withdraw the objection above.

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The Patent Office objects to claim 43 because 'the target volume' has insufficient antecedent basis. Applicants amend claim 43 to require 'a target volume'. Hence, Applicants assert that claim 43 has proper antecedent basis and respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 60 because the limitation 'the apparatus' has insufficient antecedent basis. Applicants amend claim 60 to remove those terms. Also, the Patent Office objects to claim 60 as being improper dependent form for failing to further limit the subject matter of claim 54. Applicants amend claim 60 to require that the clinical simulator system is also a radiation therapy system. Hence, Applicants assert that claim 60 is proper and respectfully request that the Patent Office withdraw the objection above.

IV. Claim Rejections Under 35 U.S.C. §112

The Patent Office rejects claims 1-13, 21-33, 39, 40 and 43 under 35 USC § 112 second paragraph for reciting a gantry disposed on one of a radiation simulation system of a radiation treatment system which do not have defined structures. Applicants amend claim 1 and 21 to specify that the radiation simulation system is capable of determining a patient position, and that the radiation treatment system is capable of implementing a treatment plan. The Patent Office also rejects those claims because it is unclear how the gantry is disposed on the systems. Applicants amend claims 1 and 21 to specify that the gantry is rotatably coupled to a frame of the systems. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for those claims.

The Patent Office rejects claim 59 under 35 USC § 112 second paragraph since the structures of the systems are not defined. Applicants amend claims 45 and 59 to further describe the systems, as noted above for claims 1 and 21. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for claim 59.

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V. Claim Rejections Under 35 U.S.C. § 102

The Patent Office rejects claims 45-47, 54, 59 and 60 under 35 USC § 102(b) as being anticipated by US Patent No. 6,041,097 to Roos et al. ("Roos"). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference.

Applicants respectfully disagree for at least the reason that Roos does not disclose, suggest or teach a cone-beam radiation source and a flat-panel imager coupled to a rotatable gantry which is coupled to a radiation simulation system or a radiation treatment system to generate volumetric image data, as required by amended claims 45 and 54.

Roos describes a cone beam pattern source (see Col. 4 lines 10-17) and an imaging system that can be characterized as a fluoroscopic imaging system that has the capability of performing volume data acquisition in the same system (see Col. 7 lines 15-19).

Consequently, the Patent Office has not identified and Applicant is unable to find any disclosure, suggestion or teaching in Roos of the above noted radiation simulation system or radiation treatment system limitations of amended claims 45 and 54. Hence, for at least this reason, Applicants respectfully request the Patent Office withdraw the rejection above.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

VI. Claims Rejected Under 35 U.S.C. § 103(a)

The Patent Office rejects claims 1-3, 5-11, 13-20, 34-38, 41, 44 and 56-58 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,661,773 to Swerdloff et al. ("Swerdloff") in view of U.S. Patent no. 6,041,097 to Roos et al. ("Roos") and U.S. Patent No. 6,075,836 to Ning et al. ("Ning"). To render a claim obvious, all limitations of that claims must be taught or suggested by at least one properly combined reference.

Applicants respectfully disagree with the rejection above of claim 1 for at least the reason that the cited references can not be properly combined to teach or suggest a

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cone-beam radiation source and a flat-panel imager coupled to a rotatable gantry which is coupled to a radiation simulation system or a radiation treatment system to generate volumetric image data, as required by amended independent claim 1.

As noted above, Roos teaches a cone beam pattern source (see Col. 4 lines 10-17) and an imaging system, but fails to teach the above noted radiation simulation system or radiation treatment system limitation of amended independent claim 1.

Also, Ning teaches a cone-beam x-ray source and a 2-D detector (see Abstract), but fails to teach the above noted radiation simulation system or radiation treatment system limitation of amended independent claim 1.

On the other hand, Swerdloff teaches fan beam CT imaging and fan beam treatment (see col. 5 lines 19-29 and col. 6 lines 27-34). However, Swerdloff does not teach a cone beam or a flat panel imager to generate volumetric image data.

Moreover, the fan beam CT imaging and sinogram principle of operation of Swerdloff does not allow it to be properly combined with the cone beam imaging of either Roos or Ning. Specifically, Swerdloff is directed to sequential planar CT imaging and treatment (see claim 1 and col. 16 lines 24-28). The treatment planning method taught in Swerdloff uses individual planar tomographic images to define dose maps in each plane from which a treatment sinogram is computed (Id.). A sinogram is a construct that only has meaning in planar or helical slice geometry. Using the individual planar tomographic images to define dose maps in each plane is a principle of operation of Swerdloff because Swerdloff teaches benefits of using a one for one relationship for each planar tomographic image, dose map and treatment sonogram (see the preferred embodiment at col. 17 lines 8-15). One such benefit is reduced calculations by back projecting data from the image to calculate the dose map (see col. 11 line 55 – col. 12 line 65). Additionally, Swerdloff teaches comparing a post radiation tomographic image to the pre-radiation calculated dose map to compute a post-radiation dose error. It also teaches using a pre-treatment test tomogram as a precheck. The benefit here is that allowing an operator to easily alter the quantum of radiation directed toward each zone identified on a tomographic patient slice image (see col. 3

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lines 17-34). Again, all of these concepts apply to individual planes and all have a one for one relationship.

Consequently, using CBCT based on Roos or Ning prohibits the above noted principle of operation of Swerdloff. To use CBCT to generate the pretreatment tomographic images would require additional means (e.g., hardware, software, design, and algorithms) to dimensionally transform the 2-dimensional CBCT imager data into the 1-dimensional fan based imager data of Swerdloff to provide the one for one relationship for each planar tomographic image, dose map and treatment sonogram. For example Figure 4 of Swerdloff shows both detectors 50 and 50' are connected to a common data acquisition system and reconstructor. Swapping out 50 with a flat panel detector of Roos or Ning would require separate means for both the data acquisition system and reconstructor of Swerdloff.

Also, using CBCT of Roos or Ning which is a volumetric reconstruction to create the slice by slice tomographic images of Swerdloff requires separate steps and means to calculate the needed slice by slice data and means to establish a one for one relationship to the treatment dose maps and sinograms. Specifically, additional means would be necessary to correlate a location of each transformed 1-dimensional fan based image from the 2-dimensional CBCT imager data. Compounding the problem, the need for such additional means would apply to both the tomographic images used for the original plan as well as the test pre-treatment tomographic images described in column 18 starting with line 30 of Swerdloff. Slice by slice acquisition is directly analogous to the slice by slice treatment as acknowledged in column 11 starting with line 55 of Swerdloff.

It can be appreciated that implementing such additional means would obviate the above noted advantages of Swerdloff. Moreover, such implementation would also obviate the advantage of using a CBCT in the first place. For instance, Ning teaches against a standard CT on a spiral CT by contrasting such a practice with a superior cone-shaped x-ray beam that has isotropic spatial resolution on three axes (see column 1, lines 45-56).

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Thus, the suggested combination would require significant cost, hardware, software and computational overhead simply to reproduce the result Swerdloff already achieves without the suggested combination!

Hence, for at least the reasons above, a practitioner would not be motivated to try to use a cone beam source and flat panel imager with the fan beam technology of Swerdloff. Thus, for at least the reasons above, Applicants submit the combination is improper and respectfully request the Patent Office withdraw the rejection above for claim 1.

As can be seen from the foregoing, the Office Action's purported motive for the combination is improper. As pointed out above, deconstructing the volumetric image data by dimensionally transforming and locating the slices for Swerdloff from the 2 dimensional imager data would require additional processing and time. However, this combination is against the cited motivation to "reduce patient scan time" for combining Swerdloff and Roos and against the cited motivation to "reduce the time required to perform a three-dimensional CT imaging of a large target volume" for combining Swerdloff and Ning (see page 7 of the current office action). Similarly, this combination is against the motivations of Swerdloff (see col. 2 lines 24-44). Hence, Applicants can only conclude that this motivation is gleaned only from Applicant's claims.

Hence, for at least the additional reasons above, Applicants submit that the combination is improper and respectfully request the Patent Office withdraw the rejection above for claim 1.

Next, Applicants also disagree with the rejection above for independent claims 14 and 34. An argument analogous to the one above for claim 1 applies here as well. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above of claims 14 and 34.

The Patent Office rejects claims 21-23, 25, 27-30, 33, 39, 40, 45-47, 49, 50, 59 and 61 under 35 U.S.C. § 103(a) as being unpatentable over Swerdloff in view of Roos.

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Applicants also disagree with the rejection above for independent claims 21 and 45. An argument analogous to the one above for claim 1 applies here as well. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above of claims 21 and 45.

Under 35 U.S.C. § 103(a), the Patent Office rejects dependent claim 4 as being unpatentable over Swerdloff, Roos, and Ning as applied to claim 3 above, and further in view of U.S. Patent No. 5,956,382 to Wiener-Avnear ("Wiener-Avnear"); claim 12 as being unpatentable over Swerdloff, Roos, and Ning as applied to claim 11 above, and further in view of U.S. Patent No. 6,416,219 to Pflaum et al. ("Pflaum"); claims 24 and 48 as being unpatentable over Swerdloff and Roos as applied to claims 23 and 47 above, and further in view of Wiener-Avnear; claim 26 as being unpatentable over Swerdloff and Roos as applied to claim 21 above, and further in view of Ning; claims 31, 32 and 51 as being unpatentable over Swerdloff and Roos as applied to claims 21 and 45 above, and further in view of Pflaum; claim 42 as being unpatentable over Swerdloff, Roos, and Ning as applied to claim 16 above, and further in view of U.S. Patent No. 6,744,848 to Stanton et al. ("Stanton"); claim 43 as being unpatentable over Swerdloff, Roos, and Ning, as applied to claim 1 above, and further in view of U.S. Patent No. 6,125,295 to Cash, Jr. et al. ("Cash"); and claim 53 and 55 as being unpatentable over Swerdloff and Roos as applied to claims 45 and 48 above, and further in view of Cash.

Each dependent claim is submitted as not being obvious for at least the same reasons given above in support of its base claim, in addition to the further non-obvious limitation added by each dependent claim. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above for the dependent claims.

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VII. Additional Claims 62-64

Applicants assert that additional claims 62-64 are allowable as they depend from base claims 1, 14, and 34, which are allowable as noted above, in addition to the further non-obvious limitation added by each dependent claim.

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CONCLUSION

In view of the foregoing, it is believed that all claims now are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: January 16, 2007

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I hereby certify that this correspondence is being transmitted via facsimile on the date shown below to the United States Patent and Trademark Office.

Amber D. Saunders 1/16/2007
Amber D. Saunders Date

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FEE TRANSMITTAL for FY 2006

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT	($)	450.00

Complete if Known	
Application Number	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Examiner Name	Ho, Allen C.
Art Unit	2882
Attorney Docket No.	5513P009

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. ☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	55	- 64* =	0	x	50.00	=	$0.00
Independent Claims	6	- 7* =	0	x	200.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	790	2204	395	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

"or number previously paid, if greater; For Reissues, see below

SUBTOTAL (1) ($) 0.00

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	450.00
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)					

SUBTOTAL (2) ($) 450.00

SUBMITTED BY				Complete (if applicable)	
Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
Signature				Date	01/16/07

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
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1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
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Other fee (specify)					

SUBTOTAL (2) ($) 450.00

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Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907	Telephone	(310) 207-3800
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

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Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission: 23	Attorney Docket Number: 5513P009

ENCLOSURES *(check all that apply)*

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☒ Amendment / Reply
  - ☒ After Final
  - ☐ Affidavits/declaration(s)
- ☒ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
  - ☐ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) *(please identify below):*

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Angelo J. Gaz, Reg. No. 45,907 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	January 16, 2007

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Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Total Number of Pages in This Submission: 23	Attorney Docket Number: 5513P009

ENCLOSURES *(check all that apply)*

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☒ Amendment / Reply
  - ☒ After Final
  - ☐ Affidavits/declaration(s)
- ☒ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
  - ☐ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) *(please identify below):*

Remarks

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

45288 7590 02/01/2007

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EXAMINER	
HO, ALLEN C	

ART UNIT	PAPER NUMBER
2882	

MAIL DATE	DELIVERY MODE
02/01/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action Before the Filing of an Appeal Brief	Application No. 10/324,227	Applicant(s) SHAPIRO ET AL.	
	Examiner Allen C. Ho	Art Unit 2882	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 1/16/07 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☐ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires 5 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☒ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☐ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: _____.
   Claim(s) rejected: _____.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). _____
13. ☐ Other: _____.

Allen C. Ho

Allen C. Ho
Primary Examiner
Art Unit: 2882

Continuation of 11. does NOT place the application in condition for allowance because:

The applicants argue that the final rejection is improper because the prior arguments filed on 12 May 2006 were fully considered and found persuasive. This argument is not persuasive. The applicants presented arguments with respect to the amendments to the independent claims on page 13 of their response filed 12 May 2006, and it is these new amendments that necessitated new grounds of rejections. The applicants further argue that the amendments filed 12 May 2006 are substantially similar to amendments for claims 14 and 34 previously considered. Thus, the amended independent claims 14 and 34 did not necessitate new grounds of rejection. The examiner respectfully disagrees. Claims 14 and 34 filed on 12 May 2006 are amended and are different in scope from claims 14 and 34 filed on 14 November 2005, which necessitated new grounds of rejections to address the new limitations.

Therefore, the final rejection is deemed proper in view of the amendment filed on 12 May 2006.

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Deliver to: Ho, Allen C., USPTO
Art Group: 2882
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Date: February 7, 2007
From: Angelo J. Gaz, Reg. No. 45,907
Our Docket No.: 5513P009
Number of pages 22 including this sheet.
Application No.: 10/324,227
Filing Date: 12/18/2002
Docket Due Date(s): 2/16/2007

Enclosed are the following documents:

☒ Amendment: After Final (19 pgs)	☐ Issue Fee Transmittal
☐ Appeal Brief (pgs)	☐ Notice of Appeal
☐ Application: (pgs) w/cover & abstract)	☐ Petition for:
	☒ Request for Continued Examination (RCE)
☐ Assignment & Cover Sheet (pgs)	☐ Reply Brief (pgs)
☒ Certificate of Facsimile	☐ Request & Certification Under 35 USC 122(b)(2)(B)(i)
☐ Continued Prosecution Application (CPA)	☐ Request to Rescind Previous Nonpublication Request
☐ Declaration & POA (pgs)	☐ Response to Notice of Missing Parts & Formalities Letter
☐ Drawings: sheets, figures	☐ Response to Written Opinion (pgs)
☒ Extension of Time: three (3) months	☐ Terminal Disclaimer
☐ Fee Transmittal (in duplicate)	☐ Transmittal of Publication Fee Due
☐ IDS & PTO/SB/08 (pgs)	☐ Transmittal Letter
☐ Other	

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PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Edward G. Shapiro, et al. Application No.: 10/324,227 Filed: December 18, 2002 For: **A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager**	Examiner: Allen C. Ho Art Unit: 2882 Confirmation No.: 4627

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AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION AND ADVISORY ACTION

Dear Sir:

In response to the Final Office Action mailed August 16, 2006 and Advisory Action mailed February 1, 2007, in connection with the above referenced patent application, Applicants respectfully request entry of the following amendments and request reconsideration in view of the following remarks.

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02 FC:1253 1020.00 DA
03 FC:1202 150.00 DA

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AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

a rotatable gantry, said gantry rotatably coupled to a frame of~~disposed on~~ one of a radiation simulation system capable of determining a patient position and~~or~~ a radiation treatment system capable of implementing a treatment plan;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data~~, wherein the gantry continues to rotate while capturing the image projection data~~.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Original) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

10. (Original) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

using a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data~~, wherein a gantry of the simulator machine continues to rotate while capturing the image projection data~~.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image

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projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Currently Amended) The method of claim ~~14~~16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

a rotatable gantry, said gantry rotatably coupled to a frame of ~~disposed on~~ one of a radiation simulation system capable of determining a patient position and ~~or~~ a radiation treatment system capable of implementing a treatment plan;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

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23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Original) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

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33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

instructing a clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data, ~~wherein a gantry of the simulator machine continues to rotate while capturing the image projection data~~.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to

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capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Currently Amended) The method of claim ~~14~~16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate ~~the~~ a target volume with radiation.

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44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry rotatably coupled to a frame of one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan;

a cone-beam radiation source coupled to the rotatable gantry; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

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50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 45, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry rotatably coupled to a frame of a clinical simulator machine or a radiation treatment system capable of implementing a treatment plan;

using ~~a~~ the clinical simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The apparatus of claim 48, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

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generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

positioning a patient based on the cone-beam volumetric image data.

59. (Currently Amended) The apparatus of claim 45, wherein the apparatus is part of a clinical simulator system capable of determining a patient position or a radiation therapy system.

60. (Currently Amended) The method of claim 54, wherein the ~~apparatus is part of a~~ clinical simulator system is also ~~or~~ a radiation therapy system.

61. (Previously Presented) A method to perform a clinical treatment, comprising:

using a clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (New) The apparatus of claim 1, wherein the frame comprises a drive stand.

63. (New) The method of claim 14, wherein the frame comprises a drive stand.

64. (New) The machine-readable medium of claim 34, wherein the frame comprises a drive stand.

PAGE 13/22 * RCVD AT 2/7/2007 6:53:54 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-2/1 * DNIS:2738300 * CSID:3108205988 * DURATION (mm-ss):06-42

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REMARKS

Claims 1-61 were examined and rejected. The drawings are also objected to. Applicants amend claims 1, 14, 19, 21, 34, 41, 43, 45, 54 and 59-61; and submits additional claims 62-64. Applicants assert that no new matter is added herein as amendments to claim 1, 19, 21, 41, 43, 45, 54 and 59-61; and additional claims 62-64 are supported at least at Figures 1 and 3; and in paragraphs 5, 9, 12, 13 and 28 of the Application as originally filed. Also, amendment to claim 60 to specify that the clinical simulation machine is also a radiation therapy system is supported at least at paragraphs 39-41 of the Application as originally filed. Applicants respectfully request reconsideration of claims 1-61, as amended, and consideration of claims 62-64 in view of at least the following remarks.

I. Drawings

The Patent Office objects to the drawings under 37 CFR § 1.83(a) as the drawings do not show a translatable treatment couch that is capable of movement in three planes plus angulation as claimed in claims 11, 12, 31, 32 and 51. Applicants respectfully disagree, as the feature of the translatable couch as claimed is shown in an example as couch 218 in Figure 1 and described at paragraph 14, and is shown in an example by couch 418 of Figure 3 and described in paragraph 29 of the Application as originally filed. Examples of directions of movement of an object in multiple planes plus angulation are known in the art (e.g., kinematics) without a figure showing such example directions. Thus, Applicants respectfully request that the Patent Office withdraw the objection above.

II. Claim Objections

The Patent Office objects to claim 19 because the limitation 'the radiation source' has insufficient antecedent basis. Applicants amend claim 19 to depend from claim 16, thus curing the antecedent basis problem. Hence, Applicants respectfully request that the Patent Office withdraw the objection above.

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The Patent Office objects to claim 41 because 'the radiation source' has insufficient antecedent basis. Applicants amend claim 41 to depend from claim 16 to cure the antecedent basis problem. Hence, Applicants respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 41 because the limitation 'the master clock' has insufficient antecedent basis. Applicants amend claim 41 to depend to require 'the master clock signal'. Thus Applicants assert that claim 41 has proper antecedent basis and respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 42 because 'the radiation source' and 'the target volume' have insufficient antecedent basis. Applicants disagree as claim 42 depends from claim 16, which provides those terms with proper antecedent basis. Hence, Applicants respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 43 because 'the target volume' has insufficient antecedent basis. Applicants amend claim 43 to require 'a target volume'. Hence, Applicants assert that claim 43 has proper antecedent basis and respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 60 because the limitation 'the apparatus' has insufficient antecedent basis. Applicants amend claim 60 to remove those terms. Also, the Patent Office objects to claim 60 as being improper dependent form for failing to further limit the subject matter of claim 54. Applicants amend claim 60 to require that the clinical simulator system is also a radiation therapy system. Hence, Applicants assert that claim 60 is proper and respectfully request that the Patent Office withdraw the objection above.

III. Claim Rejections Under 35 U.S.C. §112

The Patent Office rejects claims 1-13, 21-33, 39, 40 and 43 under 35 USC § 112 second paragraph for reciting a gantry disposed on one of a radiation simulation system of a radiation treatment system which do not have defined structures. Applicants amend claim 1 and 21 to specify that the radiation simulation system is

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capable of determining a patient position, and that the radiation treatment system is capable of implementing a treatment plan. The Patent Office also rejects those claims because it is unclear how the gantry is disposed on the systems. Applicants amend claims 1 and 21 to specify that the gantry is rotatably coupled to a frame of the systems. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for those claims.

The Patent Office rejects claim 59 under 35 USC § 112 second paragraph since the structures of the systems are not defined. Applicants amend claims 45 and 59 to further describe the systems, as noted above for claims 1 and 21. Hence, Applicants respectfully request that the Patent Office withdraw the rejection above for claim 59.

IV. Claim Rejections Under 35 U.S.C. § 102

The Patent Office rejects claims 45-47, 54, 59 and 60 under 35 USC § 102(b) as being anticipated by US Patent No. 6,041,097 to Roos et al. ("Roos"). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference.

Applicants respectfully disagree for at least the reason that Roos does not disclose, suggest or teach a cone-beam radiation source and a flat-panel imager coupled to a rotatable gantry which is coupled to a radiation simulation system or a radiation treatment system to generate volumetric image data, as required by amended claims 45 and 54.

Roos describes a cone beam pattern source (see Col. 4 lines 10-17) and an imaging system that can be characterized as a fluoroscopic imaging system that has the capability of performing volume data acquisition in the same system (see Col. 7 lines 15-19).

Consequently, the Patent Office has not identified and Applicant is unable to find any disclosure, suggestion or teaching in Roos of the above noted radiation simulation system or radiation treatment system limitations of amended claims 45 and 54. Hence, for at least this reason, Applicants respectfully request the Patent Office withdraw the rejection above.

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Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

V. Claims Rejected Under 35 U.S.C. § 103(a)

The Patent Office rejects claims 1-3, 5-11, 13-20, 34-38, 41, 44 and 56-58 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,661,773 to Swerdloff et al. ("Swerdloff") in view of U.S. Patent no. 6,041,097 to Roos et al. ("Roos") and U.S. Patent No. 6,075,836 to Ning et al. ("Ning"). To render a claim obvious, all limitations of that claims must be taught or suggested by at least one properly combined reference.

Applicants respectfully disagree with the rejection above of claim 1 for at least the reason that the cited references can not be properly combined to teach or suggest a cone-beam radiation source and a flat-panel imager coupled to a rotatable gantry which is coupled to a radiation simulation system or a radiation treatment system to generate volumetric image data, as required by amended independent claim 1.

As noted above, Roos teaches a cone beam pattern source (see Col. 4 lines 10-17) and an imaging system, but fails to teach the above noted radiation simulation system or radiation treatment system limitation of amended independent claim 1.

Also, Ning teaches a cone-beam x-ray source and a 2-D detector (see Abstract), but fails to teach the above noted radiation simulation system or radiation treatment system limitation of amended independent claim 1.

On the other hand, Swerdloff teaches fan beam CT imaging and fan beam treatment (see col. 5 lines 19-29 and col. 6 lines 27-34). However, Swerdloff does not teach a cone beam or a flat panel imager to generate volumetric image data.

Moreover, the fan beam CT imaging and sinogram principle of operation of Swerdloff does not allow it to be properly combined with the cone beam imaging of either Roos or Ning. Specifically, Swerdloff is directed to sequential planar CT imaging and treatment (see claim 1 and col. 16 lines 24-28). The treatment planning method taught in Swerdloff uses individual planar tomographic images to define dose maps in each plane from which a treatment sinogram is computed (Id.). A sinogram is a

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construct that only has meaning in planar or helical slice geometry. Using the individual planar tomographic images to define dose maps in each plane is a principle of operation of Swerdloff because Swerdloff teaches benefits of using a one for one relationship for each planar tomographic image, dose map and treatment sonogram (see the preferred embodiment at col. 17 lines 8-15). One such benefit is reduced calculations by back projecting data from the image to calculate the dose map (see col. 11 line 55 – col. 12 line 65). Additionally, Swerdloff teaches comparing a post radiation tomographic image to the pre-radiation calculated dose map to compute a post-radiation dose error. It also teaches using a pre-treatment test tomogram as a precheck. The benefit here is that allowing an operator to easily alter the quantum of radiation directed toward each zone identified on a tomographic patient slice image (see col. 3 lines 17-34). Again, all of these concepts apply to individual planes and all have a one for one relationship.

Consequently, using CBCT based on Roos or Ning prohibits the above noted principle of operation of Swerdloff. To use CBCT to generate the pretreatment tomographic images would require additional means (e.g., hardware, software, design, and algorithms) to dimensionally transform the 2-dimensional CBCT imager data into the 1-dimensional fan based imager data of Swerdloff to provide the one for one relationship for each planar tomographic image, dose map and treatment sonogram. For example Figure 4 of Swerdloff shows both detectors 50 and 50' are connected to a common data acquisition system and reconstructor. Swapping out 50 with a flat panel detector of Roos or Ning would require separate means for both the data acquisition system and reconstructor of Swerdloff.

Also, using CBCT of Roos or Ning which is a volumetric reconstruction to create the slice by slice tomographic images of Swerdloff requires separate steps and means to calculate the needed slice by slice data and means to establish a one for one relationship to the treatment dose maps and sinograms. Specifically, additional means would be necessary to correlate a location of each transformed 1-dimensional fan based image from the 2-dimensional CBCT imager data. Compounding the problem, the need for such additional means would apply to both the tomographic images used for the

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original plan as well as the test pre-treatment tomographic images described in column 18 starting with line 30 of Swerdloff. Slice by slice acquisition is directly analogous to the slice by slice treatment as acknowledged in column 11 starting with line 55 of Swerdloff.

It can be appreciated that implementing such additional means would obviate the above noted advantages of Swerdloff. Moreover, such implementation would also obviate the advantage of using a CBCT in the first place. For instance, Ning teaches against a standard CT on a spiral CT by contrasting such a practice with a superior cone-shaped x-ray beam that has isotropic spatial resolution on three axes (see column 1, lines 45-56).

Thus, the suggested combination would require significant cost, hardware, software and computational overhead simply to reproduce the result Swerdloff already achieves without the suggested combination!

Hence, for at least the reasons above, a practitioner would not be motivated to try to use a cone beam source and flat panel imager with the fan beam technology of Swerdloff. Thus, for at least the reasons above, Applicants submit the combination is improper and respectfully request the Patent Office withdraw the rejection above for claim 1.

As can be seen from the foregoing, the Office Action's purported motive for the combination is improper. As pointed out above, deconstructing the volumetric image data by dimensionally transforming and locating the slices for Swerdloff from the 2 dimensional imager data would require additional processing and time. However, this combination is against the cited motivation to "reduce patient scan time" for combining Swerdloff and Roos and against the cited motivation to "reduce the time required to perform a three-dimensional CT imaging of a large target volume" for combining Swerdloff and Ning (see page 7 of the current office action). Similarly, this combination is against the motivations of Swerdloff (see col. 2 lines 24-44). Hence, Applicants can only conclude that this motivation is gleaned only from Applicant's claims.

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Hence, for at least the additional reasons above, Applicants submit that the combination is improper and respectfully request the Patent Office withdraw the rejection above for claim 1.

Next, Applicants also disagree with the rejection above for independent claims 14 and 34. An argument analogous to the one above for claim 1 applies here as well. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above of claims 14 and 34.

The Patent Office rejects claims 21-23, 25, 27-30, 33, 39, 40, 45-47, 49, 50, 59 and 61 under 35 U.S.C. § 103(a) as being unpatentable over Swerdloff in view of Roos.

Applicants also disagree with the rejection above for independent claims 21 and 45. An argument analogous to the one above for claim 1 applies here as well. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above of claims 21 and 45.

Under 35 U.S.C. § 103(a), the Patent Office rejects dependent claim 4 as being unpatentable over Swerdloff, Roos, and Ning as applied to claim 3 above, and further in view of U.S. Patent No. 5,956,382 to Wiener-Avnear ("Wiener-Avnear"); claim 12 as being unpatentable over Swerdloff, Roos, and Ning as applied to claim 11 above, and further in view of U.S. Patent No. 6,416,219 to Pflaum et al. ("Pflaum"); claims 24 and 48 as being unpatentable over Swerdloff and Roos as applied to claims 23 and 47 above, and further in view of Wiener-Avnear; claim 26 as being unpatentable over Swerdloff and Roos as applied to claim 21 above, and further in view of Ning; claims 31, 32 and 51 as being unpatentable over Swerdloff and Roos as applied to claims 21 and 45 above, and further in view of Pflaum; claim 42 as being unpatentable over Swerdloff, Roos, and Ning as applied to claim 16 above, and further in view of U.S. Patent No. 6,744,848 to Stanton et al. ("Stanton"); claim 43 as being unpatentable over Swerdloff, Roos, and Ning, as applied to claim 1 above, and further in view of U.S. Patent No. 6,125,295 to

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Cash, Jr. et al. ("Cash"); and claim 53 and 55 as being unpatentable over Swerdloff and Roos as applied to claims 45 and 48 above, and further in view of Cash.

Each dependent claim is submitted as not being obvious for at least the same reasons given above in support of its base claim, in addition to the further non-obvious limitation added by each dependent claim. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above for the dependent claims.

VI. Additional Claims 62-64

Applicants assert that additional claims 62-64 are allowable as they depend from base claims 1, 14, and 34, which are allowable as noted above, in addition to the further non-obvious limitation added by each dependent claim.

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CONCLUSION

In view of the foregoing, it is believed that all claims now are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: February 7, 2007

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CERTIFICATE OF FACSIMILE
I hereby certify that this correspondence is being transmitted via facsimile on the date shown below to the United States Patent and Trademark Office.

Amber D. Saunders 2/7/07
Amber D. Saunders Date

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REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. 1450
Alexandria, VA 22313-1450

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR § 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application.

1. **Submission required under 37 CFR 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on ____

      ii. ☐ Other _____

   b. ☒ Enclosed

      i. ☒ Amendment/Reply

      ii. ☐ Affidavit(s)/Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. **Miscellaneous**

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. **Fees** The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☒ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 02-2666. I have enclosed a duplicate copy of this sheet.

      i. ☒ RCE fee required under 37 CFR 1.17(e)

      ii. ☒ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☒ Other: 3 additional dependent claims

   b. ☐ Check in the amount of $1,510.00 enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print/Type)	Angelo J. Gaz	Registration No. (Attorney/Agent)	45,907
Signature		Date	2/7/2007

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being transmitted via facsimile on the date shown below to the United States Patent and Trademark Office.

Name (Print/Type)	Amber D. Saunders		
Signature	Amber D. Saunders	Date	2/7/07

Based on PTO/SB/30 (04-05) as modified by Blakely, Sokoloff, Taylor & Zafman (rce) 10/12/2006.
SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

45288 7590 03/05/2007

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EXAMINER	
HO, ALLEN C	
ART UNIT	**PAPER NUMBER**
2882	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 February 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the translatable treatment couch capable of movement in three planes plus angulation claimed in claims 12 and 32 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 9, 29, and 50 are objected to because of the following informalities:

Claims 9, 29, and 50 recite the limitation "the target volume". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

3. Claim 53 is objected to because of the following informalities:

Claim 53 recite the limitation "the volume". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

4. Claim 55 is objected to because of the following informalities:

Claim 55 recites a method step.

Appropriate correction is required.

5. Claim 59 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-13, 21-33, 39, 40, 43, 45-49, 50-53, 55, 59, and 62 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The recitation of a rotatable gantry rotatably coupled to a frame of one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan is indefinite. Since the radiation simulation system and the radiation treatment system are recited passively, it is unclear whether or not the apparatus includes the radiation simulation system or the radiation treatment system. There are two ways to interpret this recitation: (1) The apparatus comprises a rotatably gantry rotatably coupled to a frame. It is irrelevant whether or not the frame is part of a radiation simulation system or a radiation treatment system because these systems are not included in the apparatus; and (2) The apparatus comprises a radiation simulation system or a radiation treatment system. In the latter case, the claims should be amended to recite the radiation simulation system and the radiation treatment system positively, *i. e.*, An apparatus comprises a radiation simulation system or a radiation treatment system.

Furthermore, the recitation of a radiation simulation system and a radiation treatment system is indefinite as the structures of these systems are unknown.

As noted in MPEP § 2114, claims directed to an apparatus must be distinguished from the prior art in terms of structure. If the structure is indefinite, its patentability cannot be ascertained.

8. Claims 59, 60, 63, and 64 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 59 recites "a clinical simulator system". It is unclear whether or not it is the same as the clinical simulation system recited in claim 45.

Claim 60 recites "the clinical simulator system is also a radiation therapy system". This recitation is indefinite since claim 54 recites a clinical simulator machine that is separate from a radiation treatment system.

Claim 63 recites the limitation "the frame". There is insufficient antecedent basis for this limitation in the claim.

Claim 64 recites the limitation "the frame". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1-3, 5, 7, 10, 13, 14, 16-19, 21-23, 25, 27, 30, 33, 41, 45-47, 54, 59, and 62 are rejected under 35 U.S.C. 102(b) as being anticipated by Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claims 1 and 21, Roos *et al.* disclosed an apparatus that comprises: a rotatable gantry (**16**), the rotatable gantry rotatably coupled to a frame (**12**, **14**) of a radiation simulation system capable of determining a patient position; a cone-beam radiation source (**18**) coupled to the rotatable gantry; and a flat-panel imager (**20**) coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data.

With regard to claims 2 and 22, Roos *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes an amorphous silicon sensor array (column 3, lines 43-50).

With regard to claims 3 and 23, Roos *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 5, line 64 - column 6, line 9).

With regard to claims 5 and 25, Roos *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (column 3, line 56 - column 4, line 5).

With regard to claims 7 and 27, Roos *et al.* disclosed the apparatus of claims 1 and 21, further comprising a computing unit (**36**).

With regard to claims 10 and 30, Roos *et al.* disclosed the apparatus of claims 1 and 21, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6).

With regard to claims 13 and 33, Roos *et al.* disclosed the apparatus of claims 1 and 21, wherein the rotatable gantry is capable of 360-degree rotation (column 4, lines 54-60).

With regard to claim 62, Roos *et al.* disclosed the apparatus of claim 1, wherein the frame comprises drive stand (**14**).

With regard to claim 14, Roos *et al.* disclosed a method to perform a clinical treatment, the method comprises: using a clinical simulator machine to capture image projection data from a flat-panel imager (**20**) for generating cone-beam computed tomography (CT) volumetric image data.

With regard to claim 16, Roos *et al.* disclosed the method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source (**18**) passing through a target volume.

With regard to claim 17, Roos *et al.* disclosed the method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second (column 4, lines 54-60).

With regard to claim 18, Roos *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (column 3, line 56 - column 4, line 5).

With regard to claim 19, Roos *et al.* disclosed the method of claim 16, wherein the radiation source is a kilovoltage radiation source.

With regard to claim 41, Roos *et al.* disclosed the method of claim 16, the method further comprises: deriving a master clock signal from a synchronization signal of the radiation source; using the master clock to generate a first control pulse to gate the radiation source and a second control pulse to trigger reading of an image from the imager; and selecting a timing of the first control pulse and the second control pulse to readout the image while the radiation source is off (column 3, line 56 - column 4, line 5).

With regard to claim 45, Roos *et al.* disclosed an apparatus that comprises: a rotatable gantry (**16**) coupled to a frame (**12, 14**) of a radiation simulation system capable of determining a patient position; a cone-beam radiation source (**18**) coupled to the rotatable gantry; and a flat-panel imager (**20**) coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data (column 3, line 56 - column 4, line 5).

With regard to claim 46, Roos *et al.* disclosed the apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array (column 3, lines 43-50).

With regard to claim 47, Roos *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 5, line 64 - column 6, line 9).

With regard to claim 59, Roos *et al.* disclosed the apparatus of claim 45, wherein the apparatus is part of a clinical simulator system capable of determining a patient position.

With regard to claim 54, Roos *et al.* disclosed a method to perform a clinical treatment, the method comprises: rotating a gantry (**16**) rotatably coupled to a frame (**12, 14**) of a clinical simulator machine; and using the clinical simulator machine to capture fluoroscopic or cone-beam CT image projection data from a flat-panel imager (**20**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data (column 3, line 56 - column 4, line 5).

11. Claims 1-3, 5-23, 25-33, 39-41, 43, 45-47, 49-51, 53, 54, 56-58, 60, and 61 are rejected under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Patent No. 6,842,502 B2).

With regard to claims 1 and 21, Jaffray *et al.* disclosed an apparatus that comprises: a rotatable gantry (**408**), the gantry rotatably coupled to a frame (**406**) of one of a radiation simulation system (cone-beam CT) capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan; a cone beam radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**) coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data (column 9, line 33 - column 10, line 8).

With regard to claims 2 and 22, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7).

With regard to claims 3 and 23, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claims 5 and 25, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (column 4, lines 30-33).

With regard to claims 6 and 26, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the flat-panel imager is capable of generating image projection data at 15-30 frames per second (column 18, lines 61-64).

With regard to claims 7 and 27, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, the method further comprises: a computing unit (column 24, lines 39-40).

With regard to claims 8 and 28, Jaffray *et al.* disclosed the apparatus of claims 7 and 21, wherein the computing unit generates the treatment plan based on the image projection data (column 26, line 39- column 28, line 10).

With regard to claims 9 and 29, Jaffray *et al.* disclosed the apparatus of claims 7 and 28, wherein the computing unit generates a three-dimensional image (column 24, line 61 - column 25, line 6).

With regard to claims 10 and 30, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6).

With regard to claims 11, 12, 31, and 32, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, further comprising a translatable treatment couch (column 25, lines 15-29).

With regard to claims 13 and 33, Jaffray *et al.* disclosed the apparatus of claims 1 and 21, wherein the rotatable gantry is capable of 360-degree rotation (column 24, lines 52 - 53).

With regard to claims 39 and 40, Jaffray *et al.* disclosed the apparatus of claim 21, the apparatus further comprises: means for treating a patient according to the treatment plan (**409**) including providing synchronization and gate control between the imager and the radiation beam during treatment (column 24, lines 39-60).

With regard to claim 43, Jaffray *et al.* disclosed the apparatus of claim 1, the apparatus further comprises: a megavoltage radiation source (**409**).

With regard to claim 14, Jaffray *et al.* disclosed a method to perform a clinical treatment, the method comprises: using a clinical simulator machine (cone-beam CT) to capture image

projection data from a flat-panel imager (**404**) for generating cone-beam computed tomography (CT) volumetric image data.

With regard to claim 15, Jaffray *et al.* disclosed the method of claim 14, the method further comprises: generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data (column 26, line 39- column 28, line 10); and transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan (column 27, lines 15-23).

With regard to claim 16, Jaffray *et al.* disclosed the method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source (**402**) passing through a target volume (**444**).

With regard to claim 17, Jaffray *et al.* disclosed the method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frame per second (column 18, lines 61-64).

With regard to claim 18, Jaffray *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (column 4, lines 30-33).

With regard to claim 19, Jaffray *et al.* disclosed the method of claim 16, wherein the radiation source (**402**) is a kilovoltage radiation source (column 20, lines 2-7).

With regard to claim 20, Jaffray *et al.* disclosed the method of claim 14, the method further comprises: generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data (column 26, line 39- column 28, line 10); and using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation

source (**409**) into position to align the treatment volume with the therapeutic radiation (column 27, line 24-39).

With regard to claim 41, Jaffray *et al.* disclosed the method of claim 16, the method further comprises: deriving a master clock signal from a synchronization signal of the radiation source; using the master clock to generate a first control pulse to gate the radiation source and a second control pulse to trigger reading of an image from the imager; and selecting a timing of the first control pulse and the second control pulse to readout the image while the radiation source is off (column 24, lines 39-60).

With regard to claim 56, Jaffray *et al.* disclosed the method of claim 14, the method further comprises: generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data (column 26, line 39- column 28, line 10).

With regard to claim 57, Jaffray *et al.* disclosed the method of claim 14, the method further comprises: modifying a treatment plan for clinical treatment machine based on the cone-beam volumetric image data (column 26, line 64 - column 27, line 14).

With regard to claim 58, Jaffray *et al.* disclosed the method of claim 14, the method further comprises: positioning a patient based on the cone-beam volumetric image data (column 26, line 64 - column 27, line 14).

With regard to claim 45, Jaffray *et al.* disclosed an apparatus that comprises: a rotatable gantry (**408**) rotatably coupled to a frame (**406**) of one of a radiation simulation system (cone-beam CT) capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan; a cone beam radiation source (**402**) coupled to the rotatable gantry; and a flat-panel imager (**404**) coupled to the rotatable gantry, wherein the flat-panel

imager captures fluoroscopic or cone-beam CT image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data (column 4, lines 30-33).

With regard to claim 46, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7).

With regard to claim 47, Jaffray *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6), and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claim 49, Jaffray *et al.* disclosed the apparatus of claim 45, the method further comprises: a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager (column 24, lines 39-40), wherein the computing unit generates a treatment plan based on the image projection data (column 26, line 39- column 28, line 10).

With regard to claim 50, Jaffray *et al.* disclosed the apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data (column 24, line 61 - column 25, line 6).

With regard to claim 51, Jaffray *et al.* disclosed the apparatus of claim 45, the apparatus further comprises: a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation (column 25, lines 15-29).

With regard to claim 53, Jaffray *et al.* disclosed the apparatus of claim 45, the apparatus further comprises: a megavoltage radiation source coupled to the rotatable gantry to radiate the

volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 megavolts of radiation (column 20, lines 13-15).

With regard to claim 54, Jaffray *et al.* disclosed a method to perform a clinical treatment, the method comprises: rotating a gantry (**408**) coupled to a frame (**406**) of a clinical simulator machine (cone-beam CT) or a radiation treatment system capable of implementing a treatment plan; using the clinical simulator machine to capture fluoroscopic or cone-beam CT image projection data from a flat-panel imager (**404**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

With regard to claim 60, Jaffray *et al.* disclosed the method of claim 54, wherein the clinical simulator system is also a radiation therapy system.

With regard to claim 61, Jaffray *et al.* disclosed a method to perform a clinical treatment, the method comprises: using a clinical radiation therapy system to capture fluoroscopic or cone-beam CT image projection data from a flat-panel imager (**404**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 4, 24, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 3, 23, and 47 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4, 24, and 48, Roos *et al.* disclosed the apparatus of claims 3, 23, and 47. However, Roos *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

14. Claims 34 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 34, Roos *et al.* disclosed the method of claim 14. However, Roos *et al.* failed to teach that the method is in the form of computer instructions stored on a computer-readable medium.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the method in the form of computer instructions stored on a computer-readable medium, since a person would be motivated to control the clinical simulator machine using a computer.

With regard to claim 64, Roos *et al.* disclosed the machine-readable medium of claim 34, wherein the frame comprises a drive stand (**14**).

15. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 16 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2) and Stanton *et al.* (U. S. Patent No. 6,744,848 B2).

With regard to claim 42, Roos *et al.* disclosed the method of claim 16. However, Roos *et al.* failed to teach continuously rotating the radiation source about the target volume while capturing image projection data, and one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Roos *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Stanton *et al.* disclosed a CT system and a method that comprises the step of capturing radiation at non-uniformly spaced angles with respect to the rotation (column 2, line 59 - column 3, line 14). Stanton *et al.* taught that this method uses less radiation dose than a conventional screening methods (column 2, lines 5-16; column 3, lines 15-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to of capture radiation at non-uniformly spaced angles with respect to the rotation, since a person would be motivated to reduce a patient's exposure to radiation.

16. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 45 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

With regard to claim 52, Roos *et al.* disclosed the apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while rotating about a target volume. However, Roos *et al.* failed to disclose that the imager is capable of capturing image projection data while continuously rotating about a target volume.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Roos *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

17. Claims 4, 24, 48, and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claims 3, 23, and 47 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4, 24, and 48, Jaffray *et al.* disclosed the apparatus of claims 3, 23, and 47. However, Jaffray *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

With regard to claim 55, Jaffray *et al.* and Wiener-Avnear *et al.* disclosed the apparatus of claim 48, the apparatus further comprises: a megavoltage radiation source (**409**).

18. Claims 34-38 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2).

With regard to claims 34-37, Jaffray *et al.* disclosed the method of claims 14, 15, 17, and 20. However, Jaffray *et al.* failed to teach that the method is in the form of computer instructions stored on a computer-readable medium.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the method in the form of computer instructions stored on a computer-readable medium, since a person would be motivated to control the clinical simulator machine and the clinical treatment machine using a computer.

With regard to claim 38, Jaffray *et al.* disclosed the machine-readable medium of claim 34. However, Jaffray *et al.* failed to teach instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to instruct the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size, since a person would be motivated to image a treatment volume that is located anywhere in a patient.

With regard to claim 44, Jaffray *et al.* disclosed the machine-readable medium of claim 34, further comprising a megavoltage radiation source (**409**) to radiate the target volume with radiation.

19. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claim 16 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2) and Stanton *et al.* (U. S. Patent No. 6,744,848 B2).

With regard to claim 42, Jaffray *et al.* disclosed the method of claim 16. However, Jaffray *et al.* failed to teach continuously rotating the radiation source about the target volume while capturing image projection data, and one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Stanton *et al.* disclosed a CT system and a method that comprises the step of capturing radiation at non-uniformly spaced angles with respect to the rotation (column 2, line 59 - column 3, line 14). Stanton *et al.* taught that this method uses less radiation dose than a conventional screening methods (column 2, lines 5-16; column 3, lines 15-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to of capture radiation at non-uniformly spaced angles with respect to the rotation, since a person would be motivated to reduce a patient's exposure to radiation.

20. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claim 45 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

With regard to claim 52, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while rotating about a target volume. However, Jaffray *et al.* failed to disclose that the imager is capable of capturing image projection data while continuously rotating about a target volume.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray

detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Jaffray *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Response to Amendment

21. Applicant's amendments filed 07 February 2007 with respect to claims 19, 41-43, and 60 have been fully considered and are persuasive. The objections of claims 19, 41-43, and 60 have been withdrawn.

22. Applicant's amendments filed 07 February 2007 with respect to claims 19, 41-43, and 60 have been fully considered and are persuasive. The objections of claims 19, 41-43, and 60 have been withdrawn.

23. Applicant's amendments filed 07 February 2007 with respect to claims 1-13, 21-33, 39, 40, and 43 have been fully considered and are persuasive. The rejection of claims 1-13, 21-33, 39, 40, and 43 under 35 U.S.C. 112, second paragraph, has been withdrawn.

Response to Arguments

24. Applicant's arguments with respect to claims 1-3, 5-11, 13-20, 34-38, 41, 44, 56-58 have been considered but are moot in view of the new ground(s) of rejection.

25. Applicant's arguments filed 07 February 2007 have been fully considered but they are not persuasive.

With regard to the objection of the drawings, the applicants argue that a translatable treatment couch capable of movement in three planes plus angulation is known in the art without figure showing such movement. The examiner respectfully disagrees. This response does not comply with 37 CFR 1.83(a), which states "conventional features disclosed in the description and claims, wherein their detailed illustration is not essential for a proper understanding of the invention, should be illustrated in the drawing in the form of a graphical drawing symbol or a labeled representation".

With regard to the rejection of claims 45-47, 54, 59, and 60 under 35 U.S.C. 102(b) as being anticipated by Roos *et al.* (U. S. Patent No. 6,041,097), the applicants argue that Roos *et al.* failed to disclose a rotatable gantry coupled to a radiation simulation system or a radiation treatment system. The examiner respectfully disagrees. The language of the claims fails to structurally distinguish a radiation simulation system from a cone-beam CT system disclosed by Roos *et al.* As noted in MPEP § 2114, claims directed to an apparatus must be distinguished from the prior art in terms of structure. The only structure being concretely claimed is that of rotatable gantry, a cone-beam radiation source coupled to the rotatable gantry, and a flat-panel imager coupled to the rotatable gantry. The recitation of a radiation simulation system and a radiation treatment system is vague; one cannot ascertain what constitutes theses systems.

Conclusion

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

(1) Ning *et al.* (U. S. Patent No. 5,999,587) disclosed a cone-beam CT that comprises a flat-panel imager.

(2) Baba *et al.* (U. S. Patent No. 5,949,811) disclosed a cone-beam CT that comprises a flat-panel imager.

(3) J. H. Siewerdsen and D. A. Jaffray, Med. Phys. 26, 2635-2647 (1999).

(4) J. H. Siewerdsen and D. A. Jaffray, Med. Phys. 26, 1624-1641 (1999).

(5) D. A. Jaffray *et al.*, SPIE Vol. 3659, 204-214 (1999).

(6) Ruola Ning *et al.*, SPIE Vol. 3659, 192-203 (1999).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 9:00 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Allen C. Ho

Allen C. Ho, Ph.D.
Primary Examiner
Art Unit 2882

27 February 2007

Notice of References Cited	Application/Control No. 10/324,227	Applicant(s)/Patent Under Reexamination SHAPIRO ET AL.	
	Examiner Allen C. Ho	Art Unit 2882	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,999,587	12-1999	Ning et al.	378/4
*	B	US-5,949,811	09-1999	Baba et al.	378/108
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	J. H. Siewerdsen and D. A. Jaffray, Med. Phys. 26, 2635-2647 (1999).
	V	J. H. Siewerdsen and D. A. Jaffray, Med. Phys. 26, 1624-1641 (1999).
	W	D. A. Jaffray et al., SPIE Vol. 3659, 204-214 (1999)
	X	Ruola Ning et al., SPIE Vol. 3659, 192-203 (1999).

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Application Number:	10324227
International Application Number:	
Confirmation Number:	4627
Title of Invention:	Multi-mode cone beam CT radiotherapy simulator and treatment machine with a flat panel imager
First Named Inventor/Applicant Name:	Edward G. Shapiro
Customer Number:	45288
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		5513P009_ROA_030507.pdf	748089 27c29e09f7e9f5e3f14ab4cfceddeb75458b6416	yes	23

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment - After Non-Final Rejection	1	1
Specification	2	2
Claims	3	15
Applicant Arguments/Remarks Made in an Amendment	16	21
Drawings	22	23

Warnings:

Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	8482 d5b4799e0f168f24e2a6e5e1f1430cc19f8bcf22	no	2

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PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Edward G. Shapiro, et al. Application No.: 10/324,227 Filed: December 18, 2002 For: **A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager**	Examiner: Allen C. Ho Art Unit: 2882 Confirmation No.: 4627

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AND RESPONSE TO OFFICE ACTION

Dear Sir:

In response to the Office Action mailed March 5, 2007, in connection with the above referenced patent application, Applicants respectfully request entry of the following amendments and request reconsideration in view of the following remarks.

AMENDMENT TO THE SPECIFICATION

Please amend paragraph [0014] on page 6 and paragraph [0029] on page 12 as follows:

[0014] A treatment couch 218 is positioned adjacent to the gantry 202 to place the patient and the target volume within the range of operation for the radiation source 204 and the imager 206. The couch 218 may be connected to the therapy simulator rotatable gantry via a communications network and is capable of translating in multiple planes plus angulation 219 for positioning and re-positioning the patient 205 and therefore the target volume.

[0029] A treatment couch 418 is positioned adjacent to the gantry 402 to place the patient and the target volume within the range of operation for the radiation source 404 and the imager 406. The couch 418 can be capable of translating in multiple planes plus angulation 419 for positioning and re-positioning the patient 405 and therefore the target volume.

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AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry, said gantry rotatably coupled to a frame of one of a radiation simulation system capable of determining a patient position and~~ a radiation treatment system capable of implementing a treatment plan, the system comprising;

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

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6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Currently Amended) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of ~~the~~ a target volume based on the captured image projection data.

10. (Currently Amended) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan; and

using ~~a clinical simulator~~the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed

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tomography (CT) volumetric image data.

15. (Currently Amended) The method of claim 14, further comprising:

generating a treatment plan for ~~a~~the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Currently Amended) The method of claim 14, further comprising:

generating a treatment plan for ~~a~~ the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry, said gantry rotatably coupled to a frame of~~ one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising;

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a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

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29. (Currently Amended) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of ~~the~~ a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan; and

instructing ~~a clinical simulator~~the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Currently Amended) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for ~~a~~the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

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36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Currently Amended) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for ~~a~~the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Previously Presented) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image

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from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Previously Presented) The apparatus of claim 1, further comprising a megavoltage radiation source to radiate a target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

a rotatable gantry rotatably coupled to a frame of ~~one of a radiation simulation system capable of determining a patient position and~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising;

a frame;

a rotatable gantry coupled to the frame;

a high energy MV radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam KV radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the KV radiation source to generate fluoroscopic or cone-beam computed

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tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Currently Amended) The apparatus of claim 45, further comprising:

a treatment plan for ~~a~~the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Currently Amended) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of ~~the~~ a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

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53. (Currently Amended) The apparatus of claim ~~45~~50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry ~~rotatably~~pivotably coupled to a frame of ~~a clinical simulator machine or~~ a clinical radiation treatment system capable of implementing a treatment plan; and

using the clinical ~~simulator~~ radiation treatment machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Currently Amended) The ~~apparatus~~ method of claim ~~48~~54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Currently Amended) The method of claim 14, further comprising:

generating a treatment plan for ~~a~~the clinical treatment machine based on the cone-beam volumetric image data.

57. (Currently Amended) The method of claim 14, further comprising:

modifying a treatment plan for ~~a~~the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

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60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan; and

using ~~a~~the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Currently Amended) The method of claim 14, wherein the ~~frame~~ clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Currently Amended) The machine-readable medium of claim 34, wherein the ~~frame~~ clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (New) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (New) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising;

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to

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radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (New) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (New) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (New) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (New) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (New) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

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transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (New) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (New) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (New) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (New) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

76. (New) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with

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the therapeutic radiation.

77. (New) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (New) The method of claim 75, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

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REMARKS

Claims 1-64 were examined and rejected. The drawings are also objected to. Applicants amend claims 1, 9, 10, 14, 15, 21, 29, 34, 35, 37, 45, 49, 50, 53-57 and 62-64; and cancel claims 59-60. Applicants submit additional claims 65-78 for consideration. Applicants assert that no new matter is added herein as amend claims 1, 9, 10, 14, 15, 21, 29, 34, 35, 37, 45, 49, 50, 53-57 and 62-64 are supported at least by Figures 3-4; and in paragraphs 28-32 and 39-40 of the Application as originally filed. Also, additional claim 65 is supported at least in paragraphs 3-4 and 38 of the Application as originally filed. Next, additional claims 66-78 are supported at least by the claims, by Figures 1-2, and in paragraphs 13-19 and 24-27 of the Application as originally filed. Thus, Applicants respectfully request reconsideration of claims 1-58 and 61-64; and consideration of additional claims 65-78 in view of at least the following remarks.

I. Drawings

The Patent Office objects to the drawings under 37 CFR § 1.83(a) as the drawings do not show a translatable treatment couch that is capable of movement in three planes plus angulation as claimed in claims 12 and 32. Applicants comply with the Examiner's recommendation by providing replacement Figures 1 and 3 and amending paragraphs 14 and 29 of the specification to identify multiple planes plus angulation 219 for Figure 1 and multiple planes plus angulation 419 for Figure 3. Thus, Applicants respectfully request that the Patent Office withdraw the objection above.

II. Claim Objections

The Patent Office objects to claims 9, 29 and 50 because 'the target volume' has insufficient antecedent basis. Applicants amend claims 9, 29 and 50 to require 'a target volume'. Hence, Applicants assert that claims 9, 29 and 50 have proper antecedent basis and respectfully request that the Patent Office withdraw the objection above.

The Patent Office objects to claim 53 because "the volume" has insufficient antecedent basis. Applicants amend claim 53 to depend from claim 50, thus curing the

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antecedent basis problem. Hence, Applicants respectfully request the Patent Office withdrawn the objection above.

The Patent Office objects to claim 55 because it is an apparatus claim and recites a method step. Applicants amend claim 55 to be a method claim. Hence, Applicants respectfully request the Patent Office withdraw the rejection above.

Claim 59 is objected to as failing to further limit the subject matter of a previous claim. Applicants cancel claim 59.

III. Claim Rejections Under 35 U.S.C. §112

The Patent Office rejects claims 1-13, 21-33, 39, 40, 43, 45-53, 55, and 59-62 under 35 USC § 112 second paragraph for reciting a rotatable gantry rotatably coupled to a frame of one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, which is allegedly indefinite because the radiation simulation system and radiation treatment system are recited passively.

Applicants comply with the Examiner's recommendation by amending claims 1-13, 21-33, 39, 40, 43, 45-53, 55 to positively recite a radiation treatment system, and/or a radiation simulation system having a frame. Thus, Applicants assert that as amended, those claims are proper.

Claims 59-60 are canceled.

Applicants have amended claims 61-62 to recite a step of rotating a gantry pivotally coupled to a frame of a clinical radiation therapy system.

The Patent Office rejects claims 63 and 64 because the limitation "the frame" has insufficient antecedent basis. Applicants amend claims 63 and 64 to remove "the frame". Hence, Applicants respectfully request the Patent Office withdraw the rejections above.

IV. Claim Rejections Under 35 U.S.C. § 102

The Patent Office rejects claims 1-3, 5, 7, 10, 13-14, 16-19, 21-23, 25, 27, 30, 33, 41, 45-47, 54, 59 and 62 under 35 USC § 102(b) as being anticipated by US Patent No.

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6,041,097 to Roos et al. ("Roos"). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference.

Applicants comply with the Examiner's recommendation by amending independent claims 1 and 45 to positively recite a radiation treatment system comprising a frame and a rotatable gantry coupled to the frame, which Roos does not disclose.

Similarly, Applicants comply with the Examiner's recommendation by amending independent claim 21 to positively recite a radiation treatment system or a radiation simulation system comprising a frame and a rotatable gantry pivotably coupled to the frame, which Roos does not disclose.

Also, Applicants comply with the Examiner's recommendation by amending independent claims 14, 34, 54 and 61 to positively recite rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system (claim 61 used "therapy" in place of "treatment"), which Roos does not disclose.

The Patent Office rejects 1-3, 5-23, 25-33, 39-41, 43, 45-47, 49-51, 53-54, 56-58 and 60-61 under 35 U.S.C. § 102(e) as being anticipated by US Patent No. 6,842,502B2 to Jaffray et al. ("Jaffray").

Applicants disagree with the rejection for at least the reason that Applicants have submitted and the Patent Office has accepted Rule 1.31 Declarations and supporting evidence which overcame Jaffray with the Response to Office Action mailed by Applicants on November 9, 2005. Hence, Applicants respectfully request the Patent Office withdraw the rejections above.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims.

V. Claims Rejected Under 35 U.S.C. § 103(a)

The Patent Office rejects claims 4, 24 and 48 under 35 U.S.C. § 103(a) as being unpatentable over Roos as applied to 3, 23 and 47 above, and further in view of US

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Patent No. 5,956,382 to Wiener-Avnear ("Weiner-Avnear"); claims 34 and 64 as being unpatentable over Roos; claim 42 as being unpatentable over Roos as applied to claim 16 above and further in view of US Patent No. 6,590,935B2 to Suzuki et al. ("Suzuki") and US Patent No. 6,744,848B2 to Stanton et al. ("Stanton"); claim 52 as being unpatentable over Roos as applied to claim 45 above and further in view of Suzuki; claims 4, 24, 48 and 55 as being unpatentable over Jaffray as applied to claims 3, 23 and 47 above, and further in view of Wiener-Avnear; claims 34-38 and 44 as being unpatentable over Jaffray; claim 42 as being unpatentable over Jaffray as applied to claim 16 above, and further in view of Suzuki and Stanton; claim 52 as being unpatentable over Jaffray as applied to claim 45 above, and further in view of Suzuki. To render a claim obvious, all limitations of that claims must be taught or suggested by at least one properly combined reference.

Arguments above for independent claim 34 apply here, as well. That is, Applicants comply with the Examiner's recommendation by amending independent claim 34 to positively recite rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system, which Roos does not disclose. Also, Jaffray has been overcome.

Applicants respectfully disagree with and request the Patent Office withdraw the rejection above for claims 4, 24, 48 and 64 for at least the reasons that those claims depend from allowable claims as noted above.

Moreover, Applicants respectfully disagree with the rejection above for claims 4, 24, 34-38, 42, 44, 48, 52 and 55 for at least the reason that Applicants have submitted and the Patent Office has accepted Rule 1.31 Declarations and supporting evidence swearing back the date of invention to earlier than the priority date of Jaffray and of Suzuki in the Response to Office Action mailed by Applicants on November 9, 2005.

In addition, neither Roos nor Wiener-Avnear cures the deficiencies of Jaffray and Suzuki for teaching the limitations of the independent base claims of dependent claims 4, 24, 34, 48 and 64, which Roos and Wiener-Avnear are cited against. Specifically, Applicants have complied with the Examiner's recommendation by amending the independent base claims of dependent claims 4, 24, 34, 48 and 64 to positively recite a

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radiation treatment system, and/or a radiation simulation system having a frame and a rotatable gantry coupled to the frame, which neither Roos nor Wiener-Avnear teach or suggest. Hence, Applicants respectfully request the Patent Office withdraw the rejection above for claims 4, 24, 34, 48 and 64.

VI. Additional Claims 65-78

Applicants respectfully request the Patent Office examine claims 65-78.

Applicants submit that claims 66-78 are allowable as Applicants have complied with the Examiner's recommendation by having these claims positively recite a radiation simulation system having a frame and a rotatable gantry pivotably coupled to the frame, or rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine, which the cited references do not teach or suggest.

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CONCLUSION

In view of the foregoing, it is believed that all claims now are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

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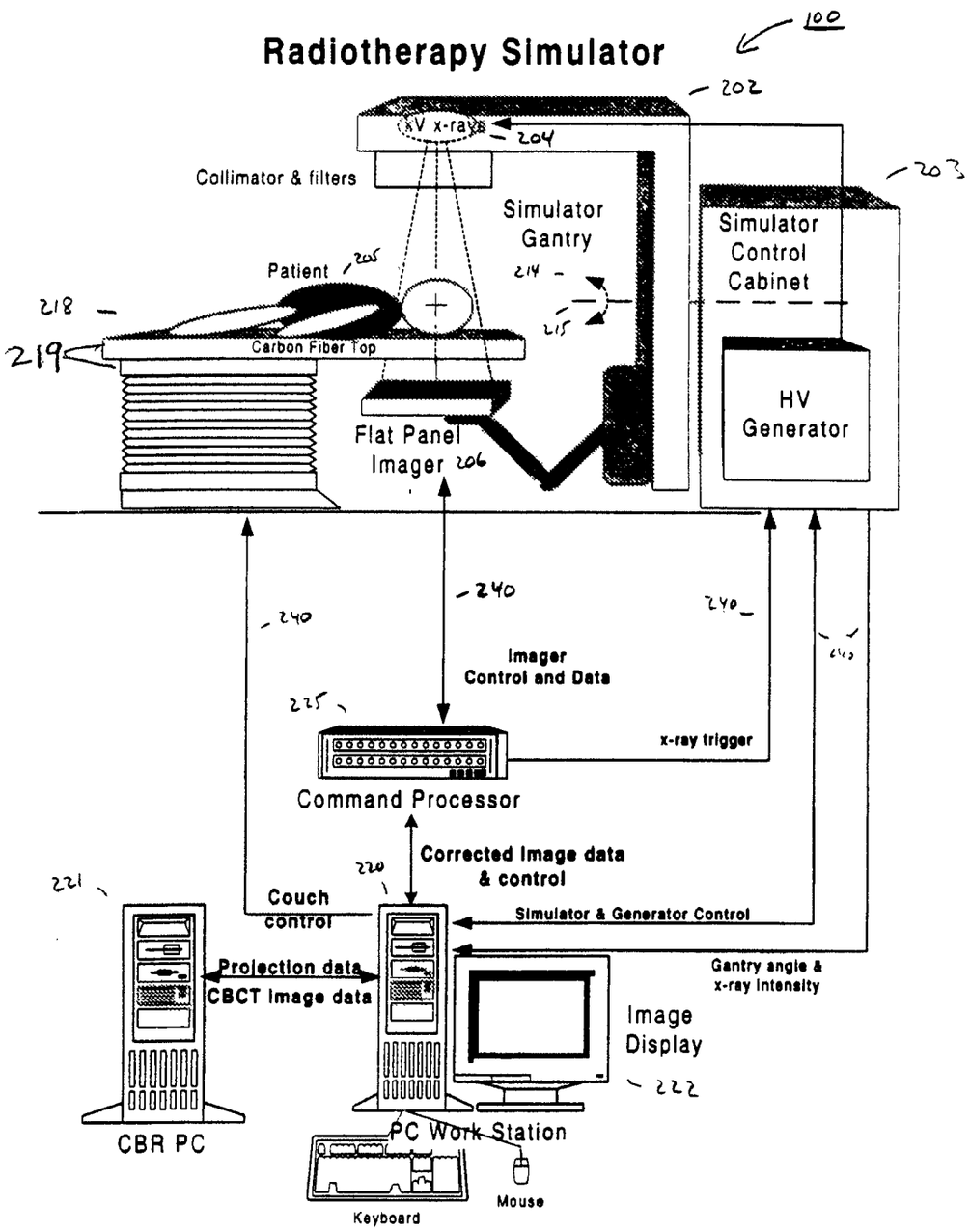


Figure 1- Simulator kV Cone Beam CT Diagram

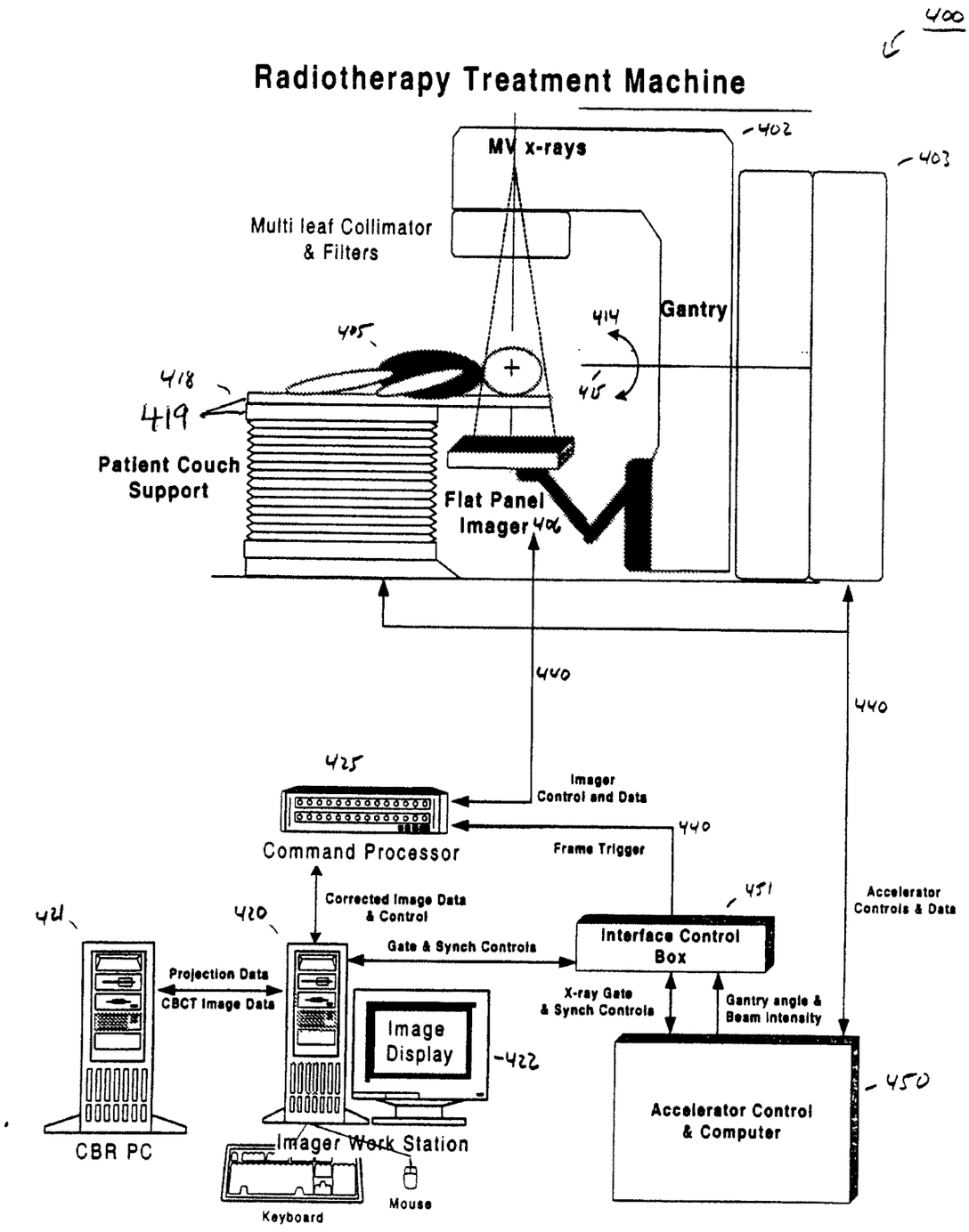


Figure 3- MV Cone Beam CT Diagram

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Document Date - 2007-07-23

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Electronic Patent Application Fee Transmittal	
Application Number:	10324227
Filing Date:	18-Dec-2002
Title of Invention:	Multi-mode cone beam CT radiotherapy simulator and treatment machine with a flat panel imager
First Named Inventor/Applicant Name:	Edward G. Shapiro
Filer:	Angelo Gaz/Nedy Calderon
Attorney Docket Number:	5513P009
Filed as Large Entity	

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	1202	12	50	600
Independent claims in excess of 3	1201	3	200	600
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Extension - 2 months with $0 paid	1252	1	450	450
Miscellaneous:				
			Total in USD ($)	**1650**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/324,227	12/18/2002	Edward G. Shapiro	5513P009	4627

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EXAMINER	
HO, ALLEN C	
ART UNIT	**PAPER NUMBER**
2882	

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10/10/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Elekta_000000559

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Office Action Summary	Application No.	Applicant(s)	
	10/324,227	SHAPIRO ET AL.	
	Examiner	Art Unit	
	Allen C. Ho	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-58 and 61-78* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-58 and 61-78* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 July 2007* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, an apparatus that comprises both a high energy radiation source coupled to a rotatable gantry and a cone-beam radiation source coupled to the rotatable gantry as claimed in claims 1 and 45 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 14, 20, 56, 57, and 63 are objected to because of the following informalities:

Claims 14, 20, 56, 57, and 63 recite the limitation "the clinical radiation treatment machine". There is insufficient antecedent basis for this limitation in these claims.

Appropriate correction is required.

3. Claims 34, 35, 37, and 64 are objected to because of the following informalities:

Claims 34, 35, 37, and 64 recite the limitation "the clinical radiation treatment machine". There is insufficient antecedent basis for this limitation in these claims.

Appropriate correction is required.

4. Claim 38 is objected to because of the following informalities:

Claim 38 recites the limitation "the clinical simulator machine". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

5. Claim 54 is objected to because of the following informalities:

Line 6, "machine" should be replaced by --system--.

Appropriate correction is required.

6. Claim 64 is objected to because of the following informalities:

Claim 64 recites the limitation "the clinical radiation treatment machine". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 43, 45-53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 43 recites "a megavoltage radiation source". It is unclear whether or not it refers to one of the radiation sources recited in claim 1.

Claim 45 recites "a rotatable gantry rotatably coupled to a frame" and "a clinical radiation treatment system comprising" "a frame" and "a rotatable gantry coupled to the frame". It is unclear whether or not they refer to the same frame and the same rotatable gantry.

Claim 53 recites "a megavoltage radiation source". It is unclear whether or not it refers to the same MV radiation source recited in claim 45.

9. Claims 14-20, 34-38, 41, 42, 44, 54-58, 61, 63, 64, and 70-78 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: irradiating a patient with a radiation source. Simply rotating a gantry will not produce image projection data.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

11. Claims 66-70, 72-75, 77, and 78 are rejected under 35 U.S.C. 102(b) as being anticipated by Ning *et al.* (IEEE Transactions on Medical Imaging, Vol. 19, No. 9, 2000).

With regard to claim 66, Ning *et al.* disclosed an apparatus that comprises: a radiation treatment simulation system comprising: a frame (to support a rotatable gantry); a rotatable gantry pivotably coupled to the frame; a cone-beam imaging radiation source (x-ray tube) coupled to the rotatable gantry to radiate a patient; a flat-panel imager (FPD) coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient (p. 950, column 2, A. Prototype CBVCTA System).

With regard to claim 67, Ning *et al.* disclosed the apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array (p. 950, column 1, lines 44-51) and a cesium iodide scintillator (p. 950, column 2, A. Prototype CBVCTA System), and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (p. 950, column 2, A. Prototype CBVCTA System).

With regard to claim 68, Ning *et al.* disclosed the apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage (p. 950, column 2, A. Prototype CBVCTA System) image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

With regard to claim 69, Ning *et al.* disclosed the apparatus of claim 69, the apparatus further comprises a computing unit, coupled to the rotatable gantry via a communication network, to store the image projection data captured by the flat-panel image and to generate a three-dimensional image of a target volume based on the captured image projection data (B. CBVCTA Acquisition Procedure).

With regard to claim 70, Ning *et al.* disclosed a method to perform a clinical treatment simulation, the method comprises: rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine (p. 950, A. Prototype CBVCTA System); using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data (p. 950, A. Prototype CBVCTA System).

With regard to claim 72, Ning *et al.* disclosed the method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing from a cone-beam computed tomography radiation source (x-ray tube) passing through a target volume.

With regard to claim 73, Ning *et al.* disclosed the method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 74, Ning *et al.* disclosed the method of claim 70, the method further comprises using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data (p. 950, column 2, A. Prototype CBVCTA System).

With regard to claim 75, Ning *et al.* disclosed a method to perform a clinical treatment simulation, the method comprises: rotating a gantry pivotably coupled to a frame of a clinical simulator machine; using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data forma flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data (p. 950, column 2, A. Prototype CBVCTA System).

With regard to claim 77, Ning *et al.* disclosed the method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 78, Ning *et al.* disclosed the method of claim 75, the method further comprises: using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data (p. 950, column 2, A. Prototype CBVCTA System).

12. Claims 1-3, 5-13, 43, 45-47, 49-51, 53, 62, and 65 are rejected under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Patent No. 6,842,502 B2).

With regard to claim 1, Jaffray *et al.* disclosed an apparatus that comprises: a radiation treatment system, the radiation treatment system comprising: a frame (**406**); a rotatable gantry (**408**) coupled to the frame; a high-energy radiation source (**409**) coupled to the rotatable gantry to radiate a patient with therapeutic radiation; a cone-beam radiation source (**402**) coupled to the rotatable gantry to radiate the patient; and a flat-panel imager (**404**) coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient

from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

With regard to claim 2, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7).

With regard to claim 3, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claim 5, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (column 4, lines 30-33).

With regard to claim 6, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15-30 frames per second (column 18, lines 61-64).

With regard to claim 7, Jaffray *et al.* disclosed the apparatus of claim 1, the method further comprises: a computing unit (column 24, lines 39-40).

With regard to claim 8, Jaffray *et al.* disclosed the apparatus of claim 7, wherein the computing unit generates the treatment plan based on the image projection data (column 26, line 39- column 28, line 10).

With regard to claim 9, Jaffray *et al.* disclosed the apparatus of claim 7, wherein the computing unit generates a three-dimensional image (column 24, line 61 - column 25, line 6).

With regard to claim 10, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the high-energy radiation source is a megavoltage radiation source (column 20, lines 2-6, lines 13-15).

With regard to claims 11 and 12, Jaffray *et al.* disclosed the apparatus of claim 1, further comprising a translatable treatment couch (column 25, lines 15-29).

With regard to claim 13, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the rotatable gantry is capable of 360-degree rotation (column 24, lines 52 - 53).

With regard to claim 43, Jaffray *et al.* disclosed the apparatus of claim 1, the apparatus further comprises a megavoltage radiation source (column 20, lines 13-15).

With regard to claim 62, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatably gantry (the frame is the drive stand).

With regard to claim 65, Jaffray *et al.* disclosed the apparatus of claim 1, wherein the flat-panel kV imager, the apparatus further comprises a flat-panel MV portal imager (**446**) coupled to the rotatable gantry (column 25, lines 30-38).

With regard to claim 45, Jaffray *et al.* disclosed an apparatus that comprises: a clinical radiation treatment system capable of implementing a treatment plan, the system comprising: a frame (**406**); a rotatable gantry (**408**) coupled to the frame; a high energy MV radiation source (**409**) coupled to the rotatable gantry to radiate a patient with therapeutic radiation; a cone-beam kV radiation source (**402**) coupled to the rotatable gantry to radiate the patient; and a flat-panel imager (**404**) coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the kV radiation source to

generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

With regard to claim 46, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array (column 20, lines 6-7) capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging (column 4, lines 30-33).

With regard to claim 47, Jaffray *et al.* disclosed the apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source (column 20, lines 2-6), and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging (column 18, lines 17-22).

With regard to claim 49, Jaffray *et al.* disclosed the apparatus of claim 45, the method further comprises: a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager (column 24, lines 39-40), wherein the computing unit generates a treatment plan based on the image projection data (column 26, line 39- column 28, line 10).

With regard to claim 50, Jaffray *et al.* disclosed the apparatus of claim 49, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data (column 24, line 61 - column 25, line 6).

With regard to claim 51, Jaffray *et al.* disclosed the apparatus of claim 45, the apparatus further comprises: a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation (column 25, lines 15-29).

With regard to claim 53, Jaffray *et al.* disclosed the apparatus of claim 50, the apparatus further comprises: a megavoltage radiation source (**409**) coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 megavolts of radiation (column 20, lines 13-15).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 4 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claims 3 and 47 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4 and 48, Jeffrey *et al.* disclosed the apparatus of claims 3 and 47. However, Jeffrey *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

15. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jaffray *et al.* (U. S. Patent No. 6,842,502 B2) as applied to claim 45 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2).

With regard to claim 52, Jaffray *et al.* disclosed the apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while rotating about a target volume.

However, Jaffray *et al.* failed to disclose that the imager is capable of capturing image projection data while continuously rotating about a target volume.

Suzuki *et al.* taught spiral CT enables a substantial reduction in the time required to perform a three-dimensional CT imaging by continuously rotating the x-ray tube and the x-ray detector around a subject while moving a table on which the subject is placed (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to configure the apparatus disclosed by Roos *et al.* to run in the spiral CT mode, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

16. Claims 1-3, 5, 7-9, 13-16, 18, 20-23, 25, 27-29, 33-38, 39-41, 44, 54, 56-58, 61-64, and 66-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) in view of Roos *et al.* (U. S. Patent No. 6,041,097).

With regard to claim 1, Swerdloff *et al.* disclosed an apparatus that comprises: a radiation treatment system capable of implementing a treatment plan, the system comprising: a frame (necessary to support a rotatable gantry); a rotatable gantry (44) coupled to the frame; a high

energy radiation source (**12**) coupled to the rotatable gantry to radiate a patient with therapeutic radiation; a radiation source (**46**) coupled to the rotatable gantry to radiate the patient; and an imager (**50**) coupled to the rotatable gantry, wherein the imager is operable to capture image projection data of the patient from the radiation source to generate computed tomography (CT) image data of the patient (column 6, lines 27-61).

However, Swerdloff *et al.* failed to disclose a cone-beam radiation source, and a flat-panel imager, wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a cone-beam CT apparatus that comprises a cone-beam radiation source (**18**); and a flat-panel imager (**20**), wherein the flat-panel imager is operable to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data (column 4, lines 15-26). Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 2, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array (Roos *et al.*, column 6, lines 4-9).

With regard to claim 3, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator (Roos *et al.*, column 6, lines 4-9).

With regard to claim 5, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographing imaging, and cone-beam CT imaging (Roos *et al.*, column 7, lines 15-28).

With regard to claim 7, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 1, further comprising: a computing unit (Roos *et al.* **38**), coupled to the rotatable gantry via a communication network, to store the image projection data captured by the flat-panel imager.

With regard to claim 8, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data (Swerdloff *et al.*, column 7, lines 59-67).

With regard to claim 9, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 7, wherein the computing unit generates a three-dimensional image of the target volume based on the captured image projection data (Swerdloff *et al.*, column 7, lines 39-67).

With regard to claim 13, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation (Roos *et al.*, column 4, lines 54-60).

With regard to claim 62, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 1, wherein the frame comprises a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 14, Swerdloff *et al.* disclosed a method to perform a clinical treatment, the method comprises: rotating a gantry (**44**) pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan; using the clinical radiation treatment machine to capture image projection data from an imager (**50**) for generating computed tomography (CT) image data.

However, Swerdloff *et al.* failed to disclose the step of using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a method that comprises capturing image projection data from a flat-panel imager (**20**) for generating cone-beam computed tomography (CT) volumetric image data (column 4, lines 15-26). Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 15, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14, further comprising: generating a treatment plan for a clinical treatment machine (Swerdloff *et al.* **10**) based on the cone-beam volumetric data (Swerdloff *et al.*, column 7, lines 59-67); and transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

With regard to claim 16, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

With regard to claim 41, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14, the method further comprises: deriving a master clock signal from a synchronization signal of the radiation source; using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager; and selecting a timing of the first control pulse as compared to the second control pulse to read out the image (Roos *et al.*, column 3, line 56 - column 4, line 26).

With regard to claim 18, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14, wherein the image projection data is fluoroscopic image projection data (Roos *et al.*, column 5, lines 44-54).

With regard to claims 20 and 56, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14, further comprising: using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation (Swerdloff *et al.*, column 7, lines 5-37). However, Swerdloff *et al.* and Roos *et al.* failed to disclose generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to generate a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to generate a treatment

plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claim 57, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14. However, Swerdloff *et al.* and Roos *et al.* failed to disclose modifying a treatment plan for a clinical treatment machine based on the cone-beam volumetric data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify a treatment plan for a clinical treatment machine based on the cone-beam volumetric data, since a person would be motivated to change the treatment as the shape and/or size of a tumor changes.

With regard to claim 58, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14. However, Swerdloff *et al.* and Roos *et al.* failed to disclose positioning a patient based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to position a patient based on the bone-beam volumetric image data, since a person would be motivated to position a target at the isocenter of the clinical radiation treatment machine.

With regard to claim 63, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 21, Swerdloff *et al.* disclosed an apparatus that comprises: one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising: a frame; a rotatable

gantry (**44**) pivotably coupled to the frame; means (**46**) for applying a computed tomography (CT) radiation beam coupled to the rotatable gantry; and means for capturing image projection data with an imager (**50**), coupled to the rotatable gantry, to generate computed tomography (CT) image data of a patient's anatomy (column 6, lines 27-61).

However, Swerdloff *et al.* failed to disclose means for applying a cone-beam computed tomography (CT) radiation beam, and means for capturing image projection data with a flat-panel imager to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

Roos *et al.* disclosed a cone-beam CT apparatus that comprises means (**18**) for applying a cone-beam computed tomography (CT) radiation beam, and means for capturing image projection data with a flat-panel imager (**20**) to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy. Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 22, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array (Roos *et al.*, column 6, lines 4-9).

With regard to claim 23, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 22, wherein the means for capturing includes cesium iodide scintillator (Roos *et al.*, column 6, lines 4-9).

With regard to claim 25, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the means for capturing in capable of fluoroscopic imaging, radiographing imaging, and cone-beam CT imaging (Roos *et al.*, column 7, lines 15-28).

With regard to claim 27, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, further comprising: means (Roos *et al.* **38**) for storing the captured image projection data is coupled to the rotatable gantry via a communication network.

With regard to claim 28, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, further comprising: means (Swerdloff *et al.* **51**) for generating a treatment plan based on the image projection data coupled to the means for capturing via a communication network.

With regard to claim 29, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 28, wherein the means for generating generates a three-dimensional image of the target volume based on the captured image projection data (Swerdloff *et al.*, column 7, lines 39-67).

With regard to claim 33, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation (Roos *et al.*, column 4, lines 54-60).

With regard to claims 39 and 40, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 21, further comprising: means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment (Roos *et al.*, column 3, line 56 - column 4, line 26). However, Swerdloff *et al.*

and Roos *et al.* failed to disclose means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to generate a treatment plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claims 34-37, Swerdloff *et al.* and Roos *et al.* disclosed the method of claims 14, 15, 17, and 20. However, Swerdloff *et al.* and Roos *et al.* failed to disclose a machine-readable medium having instructions to cause a machine to perform the method of claims 14, 15, 17, and 20.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a machine-readable medium having instructions to cause a machine to perform the method of claims 14, 15, 17, and 20, since the clinical simulator machine is controlled by a computer.

With regard to claim 38, Swerdloff *et al.* and Roos *et al.* disclosed the machine-readable medium of claim 34. However, Swerdloff *et al.* and Roos *et al.* failed to teach instructing the clinical simulator machine to capture partial cone image data to reconstruct one of a head size and a body size.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to instruct the clinical simulator machine to capture partial cone image data

to reconstruct one of a head size and a body size, since a person would be motivated to image a treatment volume that is located anywhere in a patient.

With regard to claim 44, Swerdloff *et al.* and Roos *et al.* disclosed the machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source (Swerdloff *et al.*, **12**) to radiate the target volume with radiation.

With regard to claim 64, Swerdloff *et al.* and Roos *et al.* disclosed the machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 54, Swerdloff *et al.* disclosed a method to perform a clinical treatment, the method comprises: rotating a gantry (**44**) pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan; and using the clinical radiation treatment system to capture fluoroscopic or CT imaging projection data from an imager (**50**) for generating fluoroscopic or computed tomography (CT) image data.

However, Swerdloff *et al.* failed to disclose the step of using the clinical radiation treatment machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a method that comprises capturing fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager (**20**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data. Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 61, Swerdloff *et al.* disclosed a method to perform a clinical treatment, the method comprises: rotating a gantry (**44**) pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan; and using the clinical radiation therapy system to capture fluoroscopic or CT imaging image projection data from an imager (**50**) for generating fluoroscopic or computed tomography (CT) image data.

However, Swerdloff *et al.* failed to disclose the step of using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a method that comprises capturing fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager (**20**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data. Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 66, Swerdloff *et al.* disclosed an apparatus that comprises: a radiation treatment simulation system capable of determining a patient position, the system comprising: a frame; a rotatable gantry (**44**) pivotably coupled to the frame; an imaging radiation source (**46**) coupled to the rotatable gantry to radiate a patient; and an imager (**50**) coupled to the rotatable gantry, wherein the imager is operable to capture image projection data of the patient to generate computed tomography (CT) image data of the patient.

However, Swerdloff *et al.* failed to disclose a cone-beam imaging radiation source and a flat-panel imager, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

Roos *et al.* disclosed a cone-beam imaging radiation source (**18**) and a flat-panel imager (**20**), wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient. Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 67, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array (Roos *et al.*, column 6, lines 4-9) and a cesium iodide scintillator (Roos *et al.*, column 6, lines 4-9).

With regard to claim 68, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 67, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographing imaging, and cone-beam CT imaging (Roos *et al.*, column 7, lines 15-28).

With regard to claim 69, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claim 66, the apparatus further comprises: a computing unit (Roos *et al.* **38**), coupled to the rotatable gantry via a communication network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

With regard to claim 70, Swerdloff *et al.* disclosed a method to perform a clinical treatment simulation, the method comprises: rotating a gantry (**44**) pivotably coupled to a frame of a clinical treatment simulator machine; and using the clinical treatment simulator machine to capture projection data from an imager (**50**) for generating computed tomography (CT) image data.

However, Swerdloff *et al.* failed to disclose using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a method that comprises capturing image projection data from a flat-panel imager (**20**) for generating cone-beam computed tomography (CT) volumetric image data. Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with

the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 71, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 70. However, Swerdloff *et al.* and Roos *et al.* failed to disclose generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to generate a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to generate a treatment plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claim 72, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing from a cone-beam computed tomography radiation source (Roos *et al.* **18**) passing through a target volume.

With regard to claim 73, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 74, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 70, the method further comprises using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data (Roos *et al.*, column 7, lines 15-28).

With regard to claim 75, Swerdloff *et al.* disclosed a method to perform a clinical treatment simulation, the method comprises: rotating a gantry (**44**) pivotably coupled to a frame of a clinical simulator machine; and using the clinical treatment simulator machine to capture fluoroscopic or CT imaging image projection data from an imager (**50**) for generating fluoroscopic or computed tomography (CT) image data.

However, Swerdloff *et al.* failed to disclose using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

Roos *et al.* disclosed a method that comprises capturing fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager (**20**) for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data. Roos *et al.* taught that such a cone-beam CT apparatus improves spatial resolution and reduces patient scan time (column 2, lines 58-67).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to replace the CT system apparatus (**11**) disclosed by Swerdloff *et al.* with the cone-beam CT apparatus disclosed by Roos *et al.*, since a person would be motivated to improve spatial resolution and reduce patient scan time.

With regard to claim 76, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 75. However, Swerdloff *et al.* and Roos *et al.* failed to disclose generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to generate a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data, since a person would be motivated to generate a treatment plan from cone-beam computed tomography (CT) volumetric image data generated by the flat-panel imager.

With regard to claim 77, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand (the frame) pivotably coupled to the rotatable gantry.

With regard to claim 78, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 75, the method further comprises using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data (Roos *et al.*, column 7, lines 15-28).

17. Claims 4 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 3 and 23 above, and further in view of Wiener-Avnear *et al.* (U. S. Patent No. 5,956,382).

With regard to claims 4 and 24, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 3 and 23. However, Swerdloff *et al.* and Roos *et al.* failed to teach that the cesium iodide crystals are coated with a reflective powder and epoxy mixture.

Wiener-Avnear *et al.* disclosed a matrix of scintillators (**26**) that are coated with a reflective powder (metallic powder) and epoxy mixture to provide optical isolation (column 10, line 36 - column 11, line 19).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to coat the cesium iodide crystals with a reflective powder and epoxy mixture, since a person would be motivated to isolate the crystals to prevent signal cross-talk.

18. Claims 6, 17, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 1, 14, and 21 above, and further in view of Ning *et al.* (IEEE Transactions on Medical Imaging, Vol. 19, No. 9, 2000).

With regard to claims 6, 17, and 26, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 1 and 21 and the method of claim 14. However, Swerdloff *et al.* and Roos *et al.* failed to disclose a flat-panel imager that is capable of generating image projection data at 15 to 30 frames per second.

Ning *et al.* disclosed a flat-panel imager that is capable of generating image projection data at 15 to 30 frames per second (p. 950, column 2, A. Prototype CBVCTA System).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a flat-panel imager that is capable of generating image projection data at 15 to 30 frames per second, since a person would be motivated to expedite CT imaging by capturing image projection data at a high frame rate.

19. Claims 10, 19, 30, 43, and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as

applied to claims 1, 16, 21, and 54 above, and further in view of Brown *et al.* (U. S. Patent No. 5,751,781).

With regard to claims 10, 19, 30, 43, and 55, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 1 and 21 and the method of claims 16 and 54. However, Swerdloff *et al.* and Roos *et al.* failed to disclose the energies of the high energy radiation source and the cone-beam radiation source.

Brown *et al.* disclosed an apparatus that comprises a kilovoltage cone-beam CT radiation source (column 14, lines 37-53) and a megavoltage high energy radiation source (column 14, lines 28-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a kilovoltage cone-beam CT radiation source and a megavoltage high energy radiation source, since a person would be motivate to employ appropriate energies according to applications.

20. Claims 11, 12, 31, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claims 1 and 21 above, and further in view of Pflaum *et al.* (U. S. Patent No. 6,416,219 B1).

With regard to claims 11, 12, 31, and 32, Swerdloff *et al.* and Roos *et al.* disclosed the apparatus of claims 1 and 21. However, Swerdloff *et al.* and Roos *et al.* failed to disclose a translatable couch that is capable of movement in three planes plus angulation.

Pflaum *et al.* disclosed a translatable couch that is capable of movement in three planes plus angulation.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a translatable couch that is capable of movement in three planes plus angulation, since a person would be motivated to position a target at the isocenter of the apparatus for CT imaging.

21. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swerdloff *et al.* (U. S. Patent No. 5,661,773) and Roos *et al.* (U. S. Patent No. 6,041,097) as applied to claim 16 above, and further in view of Suzuki *et al.* (U. S. Patent No. 6,590,953 B2) and Stanton *et al.* (U. S. Patent No. 6,744,848 B2).

With regard to claim 42, Swerdloff *et al.* and Roos *et al.* disclosed the method of claim 16. However, Swerdloff *et al.* and Roos *et al.* failed to disclose continuously rotating the radiation source about the target volume while capturing image projection data, wherein one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

Suzuki *et al.* disclosed a method that comprises continuously rotating a radiation source about a target volume while capturing image projection data (column 1, lines 31-37).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to continuously rotate the radiation source about the target volume while capturing image projection data, since a person would be motivated to reduce the time required to perform a three-dimensional CT imaging of a large target volume.

Stanton *et al.* disclosed a CT system and a method that comprises the step of capturing radiation at non-uniformly spaced angles with respect to the rotation (column 2, line 59 - column

3, line 14). Stanton *et al.* taught that this method uses less radiation dose than a conventional screening methods (column 2, lines 5-16; column 3, lines 15-25).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to of capture radiation at non-uniformly spaced angles with respect to the rotation, since a person would be motivated to reduce a patient's exposure to radiation.

Response to Amendment

22. Applicants' amendments filed 23 July 2007 with respect to the drawings have been fully considered. The objection of the drawings has been withdrawn.

23. Applicants' amendments filed 23 July 2007 with respect to claims 9, 29, 50, 53, and 55 have been fully considered. The objections of claims 9, 29, 50, 53, and 55 have been withdrawn.

24. Applicants' amendments filed 23 July 2007 with respect to claims 1-13, 21-33, 39, 40, 43, 45-49, 50-53, 55, 59, 62, 63, and 64 have been fully considered and are persuasive. The rejection of claims 1-13, 21-33, 39, 40, 43, 45-49, 50-53, 55, 59, 62, 63, and 64 under 35 U.S.C. 112, second paragraph, has been withdrawn.

Response to Arguments

25. Applicant's arguments with respect to claims 1-58 and 61-78 have been considered but are moot in view of the new ground(s) of rejection.

26. Applicant's arguments filed 23 Jul have been fully considered but they are not persuasive.

With respect to the rejection of claims 1-3, 5-13, 43, 45-47, 49-51, 53, 62, and 65 under 35 U.S.C. 102(e) as being anticipated by Jaffray *et al.* (U. S. Patent No. 6,842,502 B2), the

applicants argue the rejection is overcame by the 37 CFR 1.131 declaration filed 14 November 2005. The examiner respectfully disagrees. The evidence submitted is incommensurate with the subject matter claimed in at least claims 1 and 45. Specifically, the evidence fails to show an apparatus that comprises a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation and a cone-beam radiation source coupled to the rotatable gantry to radiate the patient.

Conclusion

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 9:00 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Allen C. Ho/
Primary Examiner
Art Unit 2882

01 October 2007

Notice of References Cited	Application/Control No. 10/324,227	Applicant(s)/Patent Under Reexamination SHAPIRO ET AL.	
	Examiner Allen C. Ho	Art Unit 2882	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Ning et al., "Flat Panel Detector-Based Cone-Beam Volume CT Angiography Imaging: System Evaluation," IEEE Transactions on Medical Imaging, Vol. 19, No. 9, September 2000, 949-963.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Electronic Acknowledgement Receipt	
EFS ID:	3025991
Application Number:	10324227
International Application Number:	
Confirmation Number:	4627
Title of Invention:	Multi-mode cone beam CT radiotherapy simulator and treatment machine with a flat panel imager
First Named Inventor/Applicant Name:	Edward G. Shapiro
Customer Number:	45288
Filer:	Angelo Gaz/Robert Fiore
Filer Authorized By:	Angelo Gaz
Attorney Docket Number:	5513P009
Receipt Date:	19-MAR-2008
Filing Date:	18-DEC-2002
Time Stamp:	19:49:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1960
RAM confirmation Number	4128
Deposit Account	022666
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)

1		5513P009_RFOA_101007.pdf	1390936 d915980d7c5a513a000b0dbd05d8da0377426b2e	yes	27

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Request for Continued Examination (RCE)	1	1
Amendment After Final	2	4
Claims	5	16
Applicant Arguments/Remarks Made in an Amendment	17	25
Drawings-only black and white line drawings	26	27

Warnings:

Information:

2		5513P009_Attach_A_D.pdf	2213548 799a5b808cc3d149eab9828737cceb010b6c9982	yes	60

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Rule 130, 131 or 132 Affidavits	1	15
Rule 130, 131 or 132 Affidavits	16	30
Rule 130, 131 or 132 Affidavits	31	45
Rule 130, 131 or 132 Affidavits	46	60

Warnings:

Information:

3		5513P009_Attach_E_I.pdf	1998620 6eaa665e94ba9e2593ce7311bcce093c9e4fff88	yes	46

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Rule 130, 131 or 132 Affidavits	1	15
Rule 130, 131 or 132 Affidavits	16	30

	Applicant Arguments/Remarks Made in an Amendment		31	46	
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8488 4f9c586ec2hch37f90a9078a8e0a1fb159e0d83	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5611592		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. 1450
Alexandria, VA 22313-1450

Application No.	10/324,227
Filing Date	December 18, 2002
First Named Inventor	Edward G. Shapiro
Art Unit	2882
Examiner Name	Ho, Allen C.
Attorney Docket Number	5513P009

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR § 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application.

1. **Submission required under 37 CFR 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on ____

      ii. ☐ Other _____

   b. ☒ Enclosed

      i. ☒ Amendment/Reply

      ii. ☒ Affidavit(s)/Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☒ Other Attachments G – I

2. **Miscellaneous**

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. **Fees** The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☒ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 02-2666. I have enclosed a duplicate copy of this sheet.

      i. ☒ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other: ($.00)

   b. ☐ Check in the amount of $1,470.00 enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

   WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature		Date	March 19, 2008
Name *(Print/Type)*	Angelo J. Gaz, 45,907	*Registration No. (Attorney/Agent)*	45,907

CERTIFICATE OF MAILING OR TRANSMISSION

This Request for Continued Examination is being submitted electronically to the United States Patent and Trademark Office via EFS-Web on **March 19, 2008**

Name *(Print/Type)*	**Robert Fiore**		
Signature		Date	**March 19, 2008**

Based on PTO/SB/30 (04-05) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 06/15/2007.
SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

PATENT
Attorney Docket No. 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Edward G. Shapiro, et al. Application No.: 10/324,227 Filed: December 18, 2002 For: **A Multi-Mode Cone Beam CT Radiotherapy Simulator and Treatment Machine with a Flat Panel Imager**	Examiner: Allen C. Ho Art Unit: 2882 Confirmation No.: 4627

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION

Dear Sir:

In response to the Final Office Action mailed October 10, 2007, in connection with the above referenced patent application, Applicants respectfully request entry of the following amendments and request reconsideration in view of the following remarks.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Drawings begin on page 3 of this paper and include both an attached replacement sheet and an annotated sheet showing changes.

Amendments to the Claims are reflected in the Listing of Claims that begins on page 4 of this paper.

Remarks/Arguments begin on page 16 of this paper.

An **Appendix** including amended drawing figures is attached following page 24 of this paper.

AMENDMENT TO THE SPECIFICATION

Please amend paragraph [0039] on pages 15-16 as follows:

[0039] It should be appreciated that a separate kV cone-beam CT radiation source (~~not shown~~optional and shown as source 430) and another opposing flat panel imager (as described above on the simulator ~~but not shown here~~, optional and shown as imager 432) may also be coupled to the gantry 404 to perform a diagnostic cone-beam CT scan. For example, the kV cone-beam CT radiation source and opposing flat panel imager may be coupled to the treatment machine gantry 404 at an off axis of e.g. forty-five or ninety degrees from the MV cone-beam radiation source 404 and opposing imager 406. As before, software in the computers 420 and/or 421 may generate the three-dimensional representation of the patient anatomy and target volume from the cone-beam CT image data provided by the kV radiation source. The clinical treatment machine 400 may use the kV cone-beam CT image data to make any necessary adjustments to the treatment plan based on identified movement of the target volume or to determine the amount of patient repositioning required by the treatment couch 418 or collimator movements. In this way, the kV cone-beam CT radiation source and flat panel imager share a common axis of rotation with the MV cone-beam CT radiation source 404 and provide additional information for aligning the patient to the generated simulation treatment plan.

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AMENDMENTS TO THE DRAWINGS

The attached sheet of drawings includes changes to FIG. 3. This sheet, which includes FIG. 3, replaces the original sheet including Fig. 3. In Figure 3, previously omitted different cone beam source coupled to the same gantry as the high energy source has been added.

Attachments: Replacement Sheet
Annotated Sheet Showing Changes

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AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system ~~comprising;~~ comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

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a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the

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clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

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22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:

means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the

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translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Currently Amended) The machine-readable medium of claim 34,

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wherein instructing further comprises instructing the clinical ~~simulator~~ radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, wherein the high energy source comprises ~~further comprising~~ a megavoltage radiation source to radiate a target volume with radiation.

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44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry rotatably coupled to a frame of~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising~~:~~:

a frame;

a rotatable gantry coupled to the frame;

a high energy ~~MV~~ radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam ~~KV~~ radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the ~~KV~~ cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein

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the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment ~~machine~~ system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The method of claim 54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

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generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Previously Presented) The method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Previously Presented) The machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (Previously Presented) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager

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coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (Currently Amended) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (Previously Presented) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (Previously Presented) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (Previously Presented) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

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irradiating a patient with a radiation source; and

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (Previously Presented) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (Previously Presented) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (Previously Presented) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (Previously Presented) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

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76. (Previously Presented) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

77. (Previously Presented) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (Previously Presented) The method of claim 75, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

79. (New) The apparatus of claim 1, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

80. (New) The apparatus of claim 45, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

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REMARKS

Claims 1-58 and 61-78 were examined and rejected. The drawings are also objected to. Applicants amend claims 1, 14, 21, 34, 38, 43, 45, 54, 61, 66, 70 and 75. Applicants submit additional claims 79-80 for consideration. Applicants assert that no new matter is added herein as the amend claims are supported at least by the prior claims; Figures 2 and 4; and in paragraphs 28-32 and 39-40 of the Application as originally filed. Also, additional claims 79-80 are supported at least by replacement Figure 3 and paragraphs 39-40 of the Application as originally filed. Thus, Applicants respectfully request reconsideration of claims 1-58 and 61-78; and consideration of additional claims 79-80 in view of at least the following remarks.

I. Drawings

The Patent Office objects to the drawings under 37 CFR § 1.83(a) as the drawings do not show an embodiment having both the high energy radiation source and the different cone-beam radiation source coupled to the rotatable gantry (e.g., as claimed in added claims 79-80). Applicants comply with the Examiner's recommendation by providing replacement Figure 3 and amending paragraph 39 of the specification to identify those optional features in Figure 3. Thus, Applicants respectfully request that the Patent Office withdraw the objection above.

II. Claim Objections

The Patent Office objects to claims 14, 20, 56, 57, and 63 because the limitation "the clinical radiation treatment machine" has insufficient antecedent basis. Applicants amend claim 14 to provide sufficient antecedent basis.

The Patent Office objects to claims 34-35, 37, and 64 because the limitation "the clinical radiation treatment machine" has insufficient antecedent basis. Applicants amend claim 34 to provide sufficient antecedent basis.

The Patent Office objects to claim 38 because the limitation "the clinical simulator machine" has insufficient antecedent basis. Applicants amend claim 38 to provide sufficient antecedent basis.

The Patent Office objects to claim 54, line 6 because "machine" should be replaced with "system". Applicants amend claim 54 as suggested by the Patent Office. Hence, Applicants respectfully request the Patent Office withdraw the rejections above.

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III. Claim Rejections Under 35 U.S.C. §112

The Patent Office rejects claims 43 and 45-53 under 35 USC § 112 second paragraph. Claim 43 is rejected for reciting "a megavoltage radiation source". Applicants amend claim 43 and submit that claim 43 is now proper. Claim 45 is rejected for repeating recitation of a frame and rotatable gantry. Applicants amend claim 45 and submit that claim 45 is now proper. Claim 54 is rejected for reciting "a megavoltage radiation source". Applicants amend claim 45 and submit that claim 54 is now proper. Hence, Applicants respectfully request the Patent Office withdraw the rejections above.

The Patent Office rejects claims 14-20, 34-38, 41-42, 44, 54-58, 61, 63-64, and 70-78 under 35 USC § 112 second paragraph for omitting essential steps. Applicants disagree, but have amended independent claims 14, 34, 54, 61, 70, and 75 as recommended by the Examiner. Hence, Applicants respectfully request the Patent Office withdraw the rejections above.

IV. Claim Rejections Under 35 U.S.C. § 102

The Patent Office rejects claims 66-70, 72-75, and 77-78 under 35 USC § 102(b) as being anticipated by Ning, et al., IEEE Transactions on Medical Imaging, Vol. 19, No. 9, September 2000 (Ning '2000). It is axiomatic that to be anticipated, every limitation of a claim must be disclosed in a single reference.

Applicants disagree with the rejection for at least the reason that Applicants enclose herewith Rule 1.31 Declarations and supporting evidence which overcomes Ning '2000 by providing a date of invention for the claims at issue that predates the publication date of Ning '2000. Specifically, independent claims 66, 70, and 75 claim features which the declarations and supporting evidence show to enjoy an earlier date of invention than the priority date of Ning '2000.

Hence, Applicants respectfully request the Patent Office withdraw the rejections above.

The Patent Office rejects 1-3, 5-13, 43, 45-47, 49-51, 53, 62 and 65 under 35 U.S.C. § 102(e) as being anticipated by US Patent No. 6,842,502B2 to Jaffray et al. ("Jaffray").

Applicants disagree with the rejection for at least the reason that Applicants enclose herewith Rule 1.31 Declarations and supporting evidence which overcomes

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Jaffray by providing a date of invention for the claims at issue that predates the priority date of Jaffray. Specifically, independent claims 1 and 45 claim features which the declarations and supporting evidence show to enjoy an earlier date of invention than the priority date of Jaffray.

Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac® radiation treatment system, including actual reduction to practice of cone beam MV and a flat panel imager on the treatment system; and actual reduction to practice of kV cone beam and a flat panel imager. In addition, the text of paragraph 4 of Attachment I provides possession of an arrangement including imaging with keV and MeV radiation on the treatment system. Thus, given the Rule 1.31 Declarations and supporting evidence attachments G-I, the Applicant was in possession of the claimed invention of independent claim 1 and 45 with respect to the disclosure and teachings of Jaffray.

Moreover, Applicant asserts that the prior Rule 1.31 Declarations and supporting evidence which Applicants submitted have submitted and the Patent Office has accepted to overcome Jaffray and Suzuki with the Response to Office Action mailed by Applicants on November 9, 2005, are sufficient to overcome Jaffray, Suzuki, and Ning '2000 for current independent claims 1 and 45. Specifically, current independent claims 1 and 45 do not require that the cone beam source is necessarily different from the high energy source claimed.

Hence, for at least these two reasons Applicants respectfully request the Patent Office withdraw the rejections above.

V. Claims Rejected Under 35 U.S.C. § 103(a)

The Patent Office rejects claims 4 and 48 under 35 U.S.C. § 103(a) as being unpatentable over Jaffray as applied to 3 and 47 above, and further in view of US Patent No. 5,956,382 to Wiener-Avnear ("Weiner-Avnear"); claim 52 as being unpatentable over Jaffray as applied to claim 45 above and further in view of Suzuki. To render a claim obvious, all limitations of that claims must be taught or suggested by at least one properly combined reference.

Arguments above for independent claims 1 and 45, from which claims 4 and 48 depend, apply here, as well. Specifically, Applicants enclose herewith Rule 1.31 Declarations and supporting evidence which overcomes Jaffray for independent claims

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1 and 45. In addition, Wiener-Avnear does not cure the deficiencies of Jaffray for teaching the limitations of the independent base claims 1 and 45.

The Patent Office rejects 1-3, 5, 7-9, 13-16, 18, 20-23, 25, 27-29, 33-41, 44, 54, 56-58, 61-64 and 66-78 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,661,773 to Swerdloff et al. ("Swerdloff") in view of U.S. Patent no. 6,041,097 to Roos et al. ("Roos").

Applicants respectfully disagree for at least the reason that cited references do not teach or enable; and can not be properly combined to teach a radiation treatment system capable of implementing a treatment plan, the system comprising: a frame; a rotatable gantry coupled to the frame; a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient, as required by claim 1.

Swerdloff teaches fan beam CT imaging and fan beam treatment (see col. 5 lines 19-29 and col. 6 lines 27-34). However, Swerdloff does not teach a cone beam or a flat panel imager to generate volumetric image data.

Roos describes a cone beam pattern source (see Col. 4 lines 10-17) and an imaging system that can be characterized as a fluoroscopic imaging system that has the capability of performing volume data acquisition in the same system (see Col. 7 lines 15-19). Specifically, Roos describes large diameter track 10 stationarily mounted on the floor, and including outer race 12 stationarily supported by stationary support 15 with inner race 16 freely rotatable within the outer race (see column 3 lines 36-41 and Figs. 1 and 2). Although, Roos also inconsistently refers to feature 10 as "ring 10" and "gantry 10", it is clear from the descriptions above that none of track 10, race 12, or race 16 describe a rotatable gantry rotatably coupled to a frame, but instead describe a track or ring type gantry with an inner circular shaped "ring" or "donut" rotating within an outer circular shaped "ring" or "donut".

Consequently, the Patent Office has not identified and Applicant is unable to find any teaching or enablement in Roos of the concept of claim 1. Roos does not enable or teach a flat-panel imager, that while rotating on a rotatable gantry coupled to a frame, is operable to capture image projection data of the patient from the cone-beam

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radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient. Thus, for at least the reason that he references do not teach or enable the above noted limitation, Applicants respectfully request the Patent Office withdraw the rejection above for claim 1.

Moreover, the fan beam CT imaging and sinogram principle of operation of Swerdloff does not allow it to be properly combined with the cone beam imaging of either Roos. Specifically, Swerdloff is directed to sequential planar CT imaging and treatment (see claim 1 and col. 16 lines 24-28). The treatment planning method taught in Swerdloff uses individual planar tomographic images to define dose maps in each plane from which a treatment sinogram is computed (Id.). A sinogram is a construct that only has meaning in planar or helical slice geometry. Using the individual planar tomographic images to define dose maps in each plane is a principle of operation of Swerdloff because Swerdloff teaches benefits of using a one for one relationship for each planar tomographic image, dose map and treatment sonogram (see the preferred embodiment at col. 17 lines 8-15). One such benefit is reduced calculations by back projecting data from the image to calculate the dose map (see col. 11 line 55 – col. 12 line 65). Additionally, Swerdloff teaches comparing a post radiation tomographic image to the pre-radiation calculated dose map to compute a post-radiation dose error. It also teaches using a pre-treatment test tomogram as a precheck. The benefit here is that allowing an operator to easily alter the quantum of radiation directed toward each zone identified on a tomographic patient slice image (see col. 3 lines 17-34). Again, all of these concepts apply to individual planes and all have a one for one relationship.

Consequently, using CBCT based on Roos prohibits the above noted principle of operation of Swerdloff. To use CBCT to generate the pretreatment tomographic images would require additional means (e.g., hardware, software, design, and algorithms) to dimensionally transform the 2-dimensional CBCT imager data into the 1-dimensional fan based imager data of Swerdloff to provide the one for one relationship for each planar tomographic image, dose map and treatment sonogram. For example Figure 4 of Swerdloff shows both detectors 50 and 50' are connected to a common data acquisition system and reconstructor. Swapping out 50 with a flat panel detector of Roos(Previously Presented) would require separate means for both the data acquisition system and reconstructor of Swerdloff.

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Also, using CBCT of Roos, which is a volumetric reconstruction to create the slice by slice tomographic images of Swerdloff requires separate steps and means to calculate the needed slice by slice data and means to establish a one for one relationship to the treatment dose maps and sinograms. Specifically, additional means would be necessary to correlate a location of each transformed 1-dimensional fan based image from the 2-dimensional CBCT imager data. Compounding the problem, the need for such additional means would apply to both the tomographic images used for the original plan as well as the test pre-treatment tomographic images described in column 18 starting with line 30 of Swerdloff. Slice by slice acquisition is directly analogous to the slice by slice treatment as acknowledged in column 11 starting with line 55 of Swerdloff.

It can be appreciated that implementing such additional means would obviate the above noted advantages of Swerdloff. Moreover, such implementation would also obviate the advantage of using a CBCT in the first place. For instance, Ning teaches against a standard CT on a spiral CT by contrasting such a practice with a superior cone-shaped x-ray beam that has isotropic spatial resolution on three axes (see column 1, lines 45-56).

Thus, the suggested combination would require significant cost, hardware, software and computational overhead simply to reproduce the result Swerdloff already achieves without the suggested combination!

Hence, for at least the reasons above, a practitioner would not find obvious or be motivated to try to use a cone beam source and flat panel imager of Roos with the fan beam technology of Swerdloff. Thus, for at least the reasons above, Applicants submit the combination is improper and respectfully request the Patent Office withdraw the rejection above for claim 1.

As can be seen from the foregoing, the Office Action's purported motive for the combination is improper. As pointed out above, deconstructing the volumetric image data by dimensionally transforming and locating the slices for Swerdloff from the 2 dimensional imager data would require additional processing and time. However, this combination is against the cited motivation to "reduce patient scan time" for combining Swerdloff and Roos (see page 13 of the current office action). Similarly, this combination is against the motivations of Swerdloff (see col. 2 lines 24-44). Hence, Applicants can only conclude that this motivation is gleaned only from Applicant's claims.

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Hence, for at least the additional reasons above, Applicants submit that the combination is improper and respectfully request the Patent Office withdraw the rejection above for claim 1.

Next, Applicants also disagree with the rejection above for independent claims 14, 21, 34, 54, 61, 70, and 75. Each one of these claims at least requires a flat-panel imager, that while rotating on a rotatable gantry coupled to a frame, is to capture image projection data to generate cone-beam computed tomography (CT) volumetric image data. Thus, argument analogous to the ones above for claim 1 apply here as well. Hence, for at least those reasons, Applicants respectfully request the Patent Office withdraw the rejection above of independent claims 14, 21, 34, 54, 61, 70, and 75.

The Patent Office rejects claims 4 and 24 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,661,773 to Swerdloff et al. ("Swerdloff") in view of U.S. Patent no. 6,041,097 to Roos et al. ("Roos") as applied to 3 and 23 above, and further in view of US Patent No. 5,956,382 to Wiener-Avnear ("Weiner-Avnear"); claims 6, 17, and 26 as being unpatentable over Swerdloff in view of Roos as applied to 1, 14, and 21 above, and further in view of Ning '2000; claims 10, 19, 30, 43 and 55 as being unpatentable over Swerdloff in view of Roos as applied to 1, 16, 21 and 54 above, and further in view of US Patent. No. 5751781 to Brown et al. ("Brown"); claims 11, 12, 31-32 as being unpatentable over Swerdloff, Roos, as applied to claim 1 and 21 above, and further in view of U.S. Patent No. 6,416,219 to Pflaum et al. ("Pflaum"); and claim 42 as being unpatentable over Swerdloff, Roos as applied to claim 16 above and further in view of US Patent No. 6,590,935B2 to Suzuki et al. ("Suzuki") and US Patent No. 6,744,848B2 to Stanton et al. ("Stanton").

Arguments above for the independent claims from which these claims depend and Jaffray, Ning '2000, Roos and Swerdloff apply here, as well.

Also, Applicants disagree with the rejection for at least the reason that Applicants enclose herewith Rule 1.31 Declarations and supporting evidence which overcomes Suzuki by providing a date of invention for the claims at issue that predates the priority date of Suzuki. Specifically, the independent claims noted above claim features which the declarations and supporting evidence show to enjoy an earlier date of invention than the priority date of Suzuki.

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In addition, the Patent Office has not identified and Applicant is unable to find any teaching or enablement in Brown, Pflaum, or Stanton that cures the deficiencies of Jaffray, Suzuki, Ning '2000, Roos and Swerdloff for properly disclosing or teaching the limitations of the independent base claims from which these claims depend. Hence, Applicants respectfully request the Patent Office withdraw the rejection above for these dependent claims.

Any dependent claims not mentioned above are submitted as not being anticipated or obvious, for at least the reasons given above in support of their base claims, as well as additional limitations of those dependent claims.

VI. Additional Claims 79-80

Applicants respectfully request the Patent Office examine claims 79-80.

Applicants submit that claims 79-80 are allowable for at least the reasons given above in support of their base claims, as well as additional limitations of those dependent claims.

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CONCLUSION

In view of the foregoing, it is believed that all claims now are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 3/19/06

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CERTIFICATE OF TRANSMISSION:

I hereby certify that this correspondence is being submitted electronically via EFS Web on the date shown below to the United States Patent and Trademark Office.

Robert Fiore — 3/19/06 (Date)

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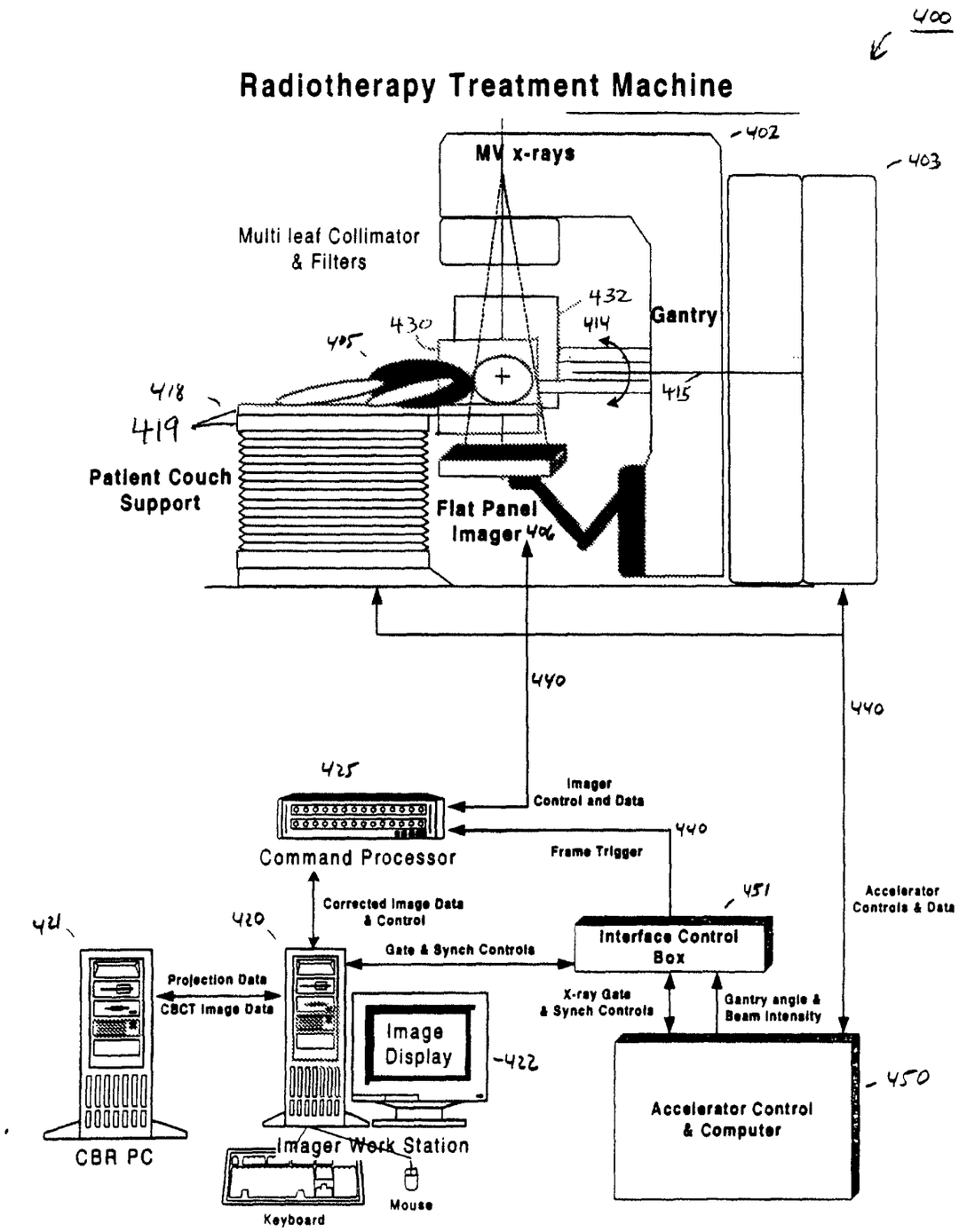


Figure 3- MV Cone Beam CT Diagram

Annotated Sheet Showing Changes

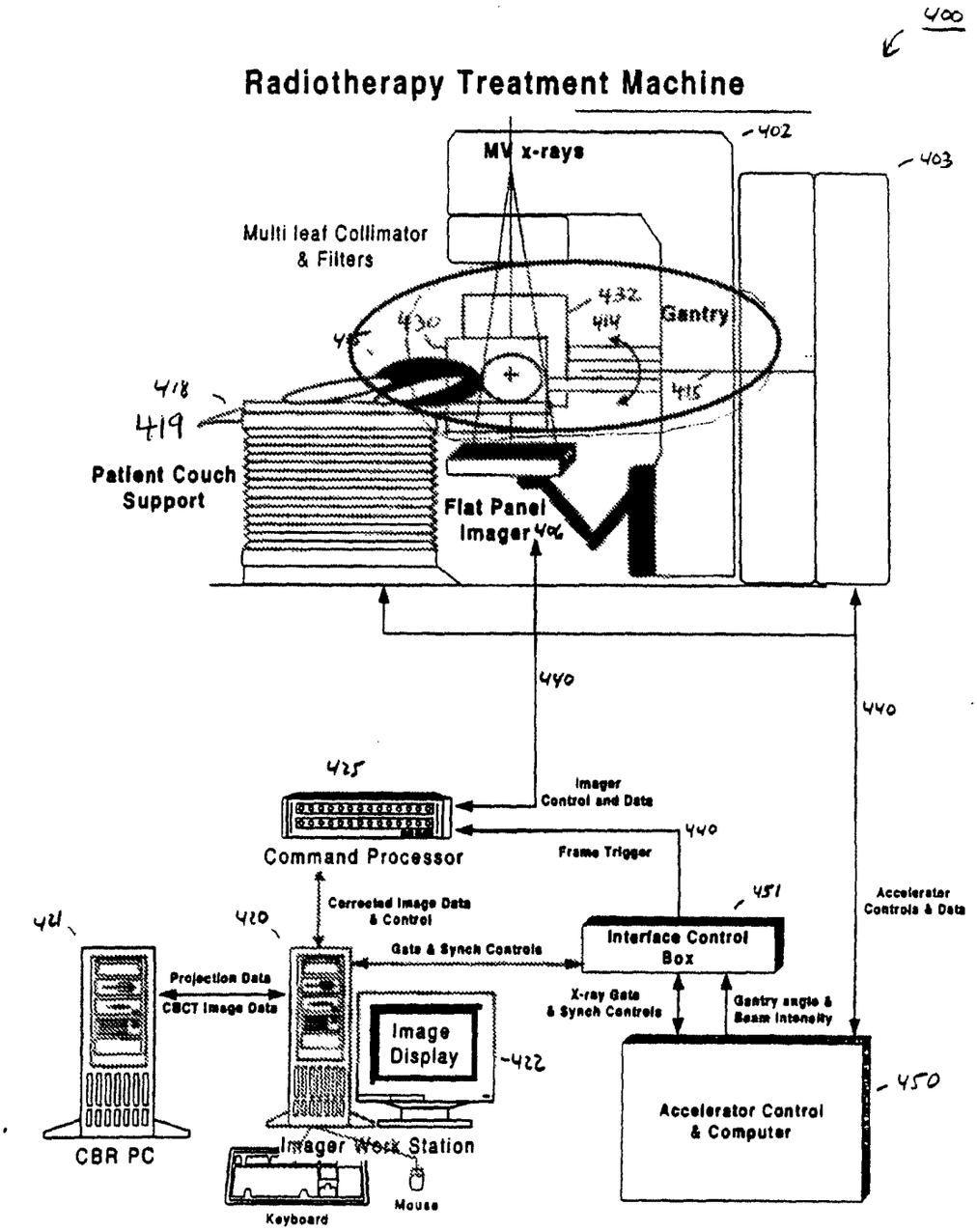


Figure 3- MV Cone Beam CT Diagram

Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:	Examiner: Allen C. Ho
Edward Shapiro	Art Unit: 2882
Serial No.: 10/324,227	
Filed: December 18, 2002	
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

ATTACHMENT A
DECLARATION OF EDWARD SHAPIRO
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Edward Shapiro, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 2107 Manzanita Avenue, Menlo Park, California 94025.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from at least February 12, 2000 through December 19, 2002.

5. My title is Senior Scientist.

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000; and Ning, et al. (herein "Ning"), IEEE Transactions on Medical Imaging, Vol. 19, No. 9, published September 2000 (Ning '2000) (the examiner has cited Jaffray, Suzuki, and Ning along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, Attachment H - Cone beam CT with a Si, and Attachment I – Varian Memo To Timothy Guertin From Edward Seppi of 8/29/99. The images and supporting documents of Attachments G-I were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-I demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-I pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac in 1998 with RNSH Hospital, Sydney, Australia, as well as Kilovoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Moreover, paragraph 4 of Attachment I

explicitly shows possession of "an arrangement where imaging with keV and MeV radiation on the accelerator leads to many scenarios for future oncology treatment possibilities." Thus, those images and document show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray, Suzuki, or Ning.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: March 6, 2008

Edward Shapiro

Full Name: Edward G. Shapiro
Citizenship: U.S.A.
Residence: 2107 Manzanita Avenue
Menlo Park, CA 94025

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam

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computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

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24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:
means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:
means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause

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a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Currently Amended) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical ~~simulator~~ radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

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means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, wherein the high energy source comprises ~~further comprising~~ a megavoltage radiation source to radiate a target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry rotatably coupled to a frame of~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising~~:~~:

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a frame;

a rotatable gantry coupled to the frame;

a high energy ~~MV~~ radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam ~~KV~~ radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the ~~KV~~ cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a

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translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment ~~machine~~ system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The method of claim 54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

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positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Previously Presented) The method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Previously Presented) The machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (Previously Presented) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (Currently Amended) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to

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radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (Previously Presented) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (Previously Presented) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (Previously Presented) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

irradiating a patient with a radiation source; and

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (Previously Presented) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the

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clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (Previously Presented) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (Previously Presented) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (Previously Presented) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

76. (Previously Presented) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

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77. (Previously Presented) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (Previously Presented) The method of claim 75, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

79. (New) The apparatus of claim 1, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

80. (New) The apparatus of claim 45, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:	Examiner: Allen C. Ho
Edward Shapiro	Art Unit: 2882
Serial No.: 10/324,227	
Filed: December 18, 2002	
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

ATTACHMENT B
DECLARATION OF EDWARD SEPPI
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Edward Seppi, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 320 Dadalera Drive, Portola Valley, California 94028.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from at least February 12, 2000 through December 19, 2002.

5. My title is Principal Scientist.

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000; and Ning, et al. (herein "Ning"), IEEE Transactions on Medical Imaging, Vol. 19, No. 9, published September 2000 (Ning '2000) (the examiner has cited Jaffray, Suzuki, and Ning along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, Attachment H - Cone beam CT with a Si, and Attachment I – Varian Memo To Timothy Guertin From Edward Seppi of 8/29/99. The images and supporting documents of Attachments G-I were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-I demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-I pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac in 1998 with RNSH Hospital, Sydney, Australia, as well as Kilovoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Moreover, paragraph 4 of Attachment I

explicitly shows possession of "an arrangement where imaging with keV and MeV radiation on the accelerator leads to many scenarios for future oncology treatment possibilities." Thus, those images and document show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray, Suzuki, or Ning.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: March 6, 2008

Edward Seppi

Full Name: Edward J. Seppi
Citizenship: U.S.A.
Residence: 320 Dedalera Drive
Portola Valley, CA 94028

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam

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computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

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24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:
means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:
means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause

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a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Currently Amended) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical ~~simulator~~ radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

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means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, wherein the high energy source comprises ~~further comprising~~ a megavoltage radiation source to radiate a target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry rotatably coupled to a frame of~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising:

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a frame;

a rotatable gantry coupled to the frame;

a high energy ~~MV~~ radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam ~~KV~~ radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the ~~KV~~ cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a

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translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment ~~machine~~ system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The method of claim 54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

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positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Previously Presented) The method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Previously Presented) The machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (Previously Presented) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (Currently Amended) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to

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radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (Previously Presented) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (Previously Presented) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (Previously Presented) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

irradiating a patient with a radiation source; and

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (Previously Presented) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the

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clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (Previously Presented) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (Previously Presented) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (Previously Presented) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

76. (Previously Presented) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

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77. (Previously Presented) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (Previously Presented) The method of claim 75, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

79. (New) The apparatus of claim 1, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

80. (New) The apparatus of claim 45, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for: Edward Shapiro Serial No.: 10/324,227 Filed: December 18, 2002 For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	Examiner: Allen C. Ho Art Unit: 2882

ATTACHMENT C
DECLARATION OF JOHN PAVKOVICH
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, John Pavkovich, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 2945 Alexis Drive, Palo Alto, California 94304.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.

4. I was employed by VMS, Inc. from at least February 12, 2000 through December 19, 2002.

5. My title is Senior Scientist.

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000; and Ning, et al. (herein "Ning"), IEEE Transactions on Medical Imaging, Vol. 19, No. 9, published September 2000 (Ning '2000) (the examiner has cited Jaffray, Suzuki, and Ning along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, Attachment H - Cone beam CT with a SI, and Attachment I – Varian Memo To Timothy Guertin From Edward Seppi of 8/29/99. The images and supporting documents of Attachments G-I were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-I demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-I pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac in 1998 with RNSH Hospital, Sydney, Australia, as well as Kilovoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Moreover, paragraph 4 of Attachment I

explicitly shows possession of "an arrangement where imaging with keV and MeV radiation on the accelerator leads to many scenarios for future oncology treatment possibilities." Thus, those images and document show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray, Suzuki, or Ning.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: Mar 6, 2008

John Pavkovich

Full Name: John M. Pavkovich
Citizenship: U.S.A.
Residence: 2945 Alexis Drive
Palo Alto, CA 94304

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam

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computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising~~:~~:

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

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24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:
means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:
means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause

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a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Currently Amended) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical ~~simulator~~ radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

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means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, wherein the high energy source comprises ~~further comprising~~ a megavoltage radiation source to radiate a target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry rotatably coupled to a frame of~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising:

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a frame;

a rotatable gantry coupled to the frame;

a high energy ~~MV~~ radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam ~~KV~~ radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the ~~KV~~ cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a

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translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment ~~machine~~ system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The method of claim 54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

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positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Previously Presented) The method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Previously Presented) The machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (Previously Presented) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (Currently Amended) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising~~:~~

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to

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radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (Previously Presented) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (Previously Presented) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (Previously Presented) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

irradiating a patient with a radiation source; and

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (Previously Presented) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the

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clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (Previously Presented) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (Previously Presented) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (Previously Presented) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

76. (Previously Presented) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

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77. (Previously Presented) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (Previously Presented) The method of claim 75, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

79. (New) The apparatus of claim 1, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

80. (New) The apparatus of claim 45, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:	Examiner: Allen C. Ho
Edward Shapiro	Art Unit: 2882
Serial No.: 10/324,227	
Filed: December 18, 2002	
For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	

ATTACHMENT D
DECLARATION OF PETER MUNRO
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Peter Munro, hereby declare that:

1. I am a citizen of Canada.
2. I currently reside at Pilgerstrasse 21, 5405 Baden-Dattwil, Switzerland.
3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Palo Alto, California.
4. I was employed by VMS, Inc. from May 7, 2001 through December 19, 2002.
5. My title is Product Manager.
6. I am a co-inventor of the above-identified patent application.
7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000; and Ning, et al. (herein "Ning"), IEEE Transactions on Medical Imaging, Vol. 19, No. 9, published September 2000 (Ning '2000) (the examiner has cited Jaffray, Suzuki, and Ning along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, Attachment H - Cone beam CT with a Si, and Attachment I – Varian Memo To Timothy Guertin From Edward Seppi of 8/29/99. The images and supporting documents of Attachments G-I were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-I demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-I pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac in 1998 with RNSH Hospital, Sydney, Australia, as well as Kilovoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Moreover, paragraph 4 of Attachment I explicitly shows possession of "an arrangement where imaging with keV and MeV

radiation on the accelerator leads to many scenarios for future oncology treatment possibilities." Thus, those images and document show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray, Suzuki, or Ning.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: 7 MAR, 2008

Peter Munro

Full Name: Peter Munro
Citizenship: Canada
Residence: Pilgerstrasse 21
5405 Baden-Dattwil
Switzerland

Attachment: Current Claims

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam

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computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

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24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:
means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:
means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause

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a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Currently Amended) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical ~~simulator~~ radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

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means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, wherein the high energy source comprises ~~further comprising~~ a megavoltage radiation source to radiate a target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry rotatably coupled to a frame of~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising~~:~~

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a frame;

a rotatable gantry coupled to the frame;

a high energy ~~MV~~ radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam ~~KV~~ radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the ~~KV~~ cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a

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translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment ~~machine~~ system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The method of claim 54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

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positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Previously Presented) The method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Previously Presented) The machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (Previously Presented) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (Currently Amended) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to

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radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (Previously Presented) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (Previously Presented) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (Previously Presented) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

irradiating a patient with a radiation source; and

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (Previously Presented) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the

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clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (Previously Presented) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (Previously Presented) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (Previously Presented) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

76. (Previously Presented) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

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77. (Previously Presented) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (Previously Presented) The method of claim 75, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

79. (New) The apparatus of claim 1, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

80. (New) The apparatus of claim 45, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for: Edward Shapiro Serial No.: 10/324,227 Filed: December 18, 2002 For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	Examiner: Allen C. Ho Art Unit: 2882

ATTACHMENT E
DECLARATION OF STANLEY JOHNSEN
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Stanley Johnsen, hereby declare that:

1. I am a citizen of the United States of America.

2. I currently reside at 3842 LaDonna Avenue, Palo Alto, California 94306.

3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Palo Alto, California.

4. I was employed by VMS, Inc. from at least February 12, 2000 through December 19, 2002.

5. My title is Senior Scientist.

6. I am a co-inventor of the above-identified patent application.

7. VMS, Inc. is the Assignee of the above-identified patent application.

8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000; and Ning, et al. (herein "Ning"), IEEE Transactions on Medical Imaging, Vol. 19, No. 9, published September 2000 (Ning '2000) (the examiner has cited Jaffray, Suzuki, and Ning along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, Attachment H - Cone beam CT with a Si, and Attachment I – Varian Memo To Timothy Guertin From Edward Seppi of 8/29/99. The images and supporting documents of Attachments G-I were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-I demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-I pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac in 1998 with RNSH Hospital, Sydney, Australia, as well as Kilovoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Moreover, paragraph 4 of Attachment I

explicitly shows possession of "an arrangement where imaging with keV and MeV radiation on the accelerator leads to many scenarios for future oncology treatment possibilities." Thus, those images and document show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray, Suzuki, or Ning.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: 12 March, 2008

Stanley Johnsen

Full Name: Stanley W. Johnsen
Citizenship: U.S.
Residence: 3842 LeDonna Avenue
Palo Alto, CA 94306

Attachment: Current Claims

CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam

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computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

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24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:
means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:
means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause

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a machine to perform a method to perform a clinical treatment, the method comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

instructing the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

35. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

36. (Original) The machine-readable medium of claim 34, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

37. (Previously Presented) The machine-readable medium of claim 34, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

38. (Currently Amended) The machine-readable medium of claim 34, wherein instructing further comprises instructing the clinical ~~simulator~~ radiation treatment machine to capture partial cone image data to reconstruct one of a head size and a body size.

39. (Previously Presented) The apparatus of claim 21, further comprising:

means for generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data; and

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means for treating a patient according to the treatment plan including providing synchronization and gate control between the imager and the radiation beam during treatment.

40. (Previously Presented) The apparatus of claim 39, wherein treating includes means for coordinating acquisition by the flat panel imager and pulsing by the radiation source.

41. (Previously Presented) The method of claim 16, further comprising:

deriving a master clock signal from a synchronization signal of the radiation source;

using the master clock signal to generate a first control pulse to gate the radiation source on and off and a second control pulse to trigger reading of an image from the imager;

selecting a timing of the first control pulse as compared to the second control pulse to read out the image while the radiation source is off.

42. (Previously Presented) The method of claim 16, further comprising:

continuously rotating the radiation source about the target volume while capturing image projection data; and

one of capturing radiation at non-uniformly spaced angles with respect to the rotation, and changing the speed of rotation of the gantry during a rotation.

43. (Currently Amended) The apparatus of claim 1, wherein the high energy source comprises ~~further comprising~~ a megavoltage radiation source to radiate a target volume with radiation.

44. (Previously Presented) The machine-readable medium of claim 34, further comprising instructing a megavoltage radiation source to radiate the target volume with radiation.

45. (Currently Amended) An apparatus, comprising:

~~a rotatable gantry rotatably coupled to a frame of~~ a clinical radiation treatment system capable of implementing a treatment plan, the system comprising~~:~~

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a frame;

a rotatable gantry coupled to the frame;

a high energy ~~MV~~ radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam ~~KV~~ radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager captures fluoroscopic or cone-beam CT imaging image projection data of the patient from the ~~KV~~ cone-beam radiation source to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data of the patient.

46. (Previously Presented) The apparatus of claim 45, wherein the flat-panel imager includes an amorphous silicon sensor array capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

47. (Previously Presented) The apparatus of claim 46, wherein the cone-beam CT radiation source is a kilovoltage radiation source, and the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

48. (Previously Presented) The apparatus of claim 47, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

49. (Previously Presented) The apparatus of claim 45, further comprising:

a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager, wherein the computing unit generates the treatment plan based on the image projection data.

50. (Previously Presented) The apparatus of claim 49, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

51. (Previously Presented) The apparatus of claim 45, further comprising a

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translatable treatment couch coupled to the rotatable gantry via a communications network, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

52. (Previously Presented) The apparatus of claim 45, wherein the rotatable gantry is capable of 360 degree rotation and the imager is capable of capturing image projection data while continuously rotating about a target volume.

53. (Previously Presented) The apparatus of claim 50, further comprising:

a megavoltage radiation source coupled to the rotatable gantry to radiate the volume with radiation, wherein the megavoltage radiation source comprises a source of between 4 and 25 mega-volts of radiation.

54. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment ~~machine~~ system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

55. (Previously Presented) The method of claim 54, further comprising:

radiating the target volume with a megavoltage radiation source,

wherein the volume may be modified by image projection data produced using the megavoltage radiation source.

56. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

57. (Previously Presented) The method of claim 14, further comprising:

modifying a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data.

58. (Previously Presented) The method of claim 14, further comprising:

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positioning a patient based on the cone-beam volumetric image data.

59. (Canceled)

60. (Canceled)

61. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation therapy system capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation therapy system to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

62. (Previously Presented) The apparatus of claim 1, wherein the frame comprises a drive stand pivotably coupled to the rotatable gantry.

63. (Previously Presented) The method of claim 14, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

64. (Previously Presented) The machine-readable medium of claim 34, wherein the clinical radiation treatment machine comprises a drive stand pivotably coupled to the rotatable gantry.

65. (Previously Presented) The apparatus of claim 1, wherein the a flat-panel imager is a flat-panel KV imager, and further comprising a flat-panel MV portal imager coupled to the rotatable gantry, wherein the MV imager is operable to capture image projection data of the patient produced by the high energy MV radiation source.

66. (Currently Amended) An apparatus, comprising:

a radiation treatment simulation system capable of determining a patient position, the system comprising:

a frame;

a rotatable gantry pivotably coupled to the frame;

a cone-beam imaging radiation source coupled to the rotatable gantry to

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radiate a patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient to generate cone-beam computed tomography (CT) volumetric image data of the patient.

67. (Previously Presented) The apparatus of claim 66, wherein the flat-panel imager includes an amorphous silicon sensor array and a cesium iodide scintillator, and wherein the imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

68. (Previously Presented) The apparatus of claim 67, wherein the imager captures fluoroscopic or cone-beam CT imaging kilovoltage image projection data to generate fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

69. (Previously Presented) The apparatus of claim 66, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager and to generate a three-dimensional image of a target volume based on the captured image projection data.

70. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical treatment simulator machine;

irradiating a patient with a radiation source; and

using the clinical simulator machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

71. (Previously Presented) The method of claim 70, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the

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clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

72. (Previously Presented) The method of claim 70, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam computed tomography radiation source passing through a target volume.

73. (Previously Presented) The method of claim 70, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

74. (Previously Presented) The method of claim 70, further comprising:

using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

75. (Currently Amended) A method to perform a clinical treatment simulation, comprising:

rotating a gantry pivotably coupled to a frame of a clinical simulator machine;

irradiating a patient with a radiation source; and

using the clinical treatment simulator machine to capture fluoroscopic or cone-beam CT imaging image projection data from a flat-panel imager for generating fluoroscopic or cone-beam computed tomography (CT) volumetric image data.

76. (Previously Presented) The method of claim 75, further comprising:

generating a treatment plan for a clinical treatment machine based on the cone-beam volumetric image data;

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

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77. (Previously Presented) The method of claim 75, wherein rotating further comprises pivoting the gantry using a drive stand pivotably coupled to the rotatable gantry.

78. (Previously Presented) The method of claim 75, further comprising:
using the flat-panel imager to capture fluoroscopic, radiographic, and cone-beam CT imaging image projection data to generate fluoroscopic, radiographic, and cone-beam computed tomography (CT) volumetric image data.

79. (New) The apparatus of claim 1, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

80. (New) The apparatus of claim 45, wherein the cone-beam source and high energy radiation source are different from one another, and the cone-beam source comprises a KV source and wherein the high energy radiation source comprises a MV source coupled to the rotatable gantry to radiate a patient with therapeutic radiation.

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Our Ref. No.: 005513.P009

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for: Edward Shapiro Serial No.: 10/324,227 Filed: December 18, 2002 For: **A MULTI-MODE CONE BEAM CT RADIOTHERAPY SIMULATOR AND TREATMENT MACHINE WITH A FLAT PANEL IMAGER**	Examiner: Allen C. Ho Art Unit: 2882

ATTACHMENT F
DECLARATION OF RICHARD COLBETH
PURSUANT TO 37 C.F.R. §1.131

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

I, Richard Colbeth, hereby declare that:

1. I am a citizen of the United States of America.
2. I currently reside at 1243 Richardson Avenue, Los Altos, California 94024.
3. I am currently an employee at Varian Medical Systems, Inc. (VMS, Inc.) in Mountain View, California.
4. I was employed by VMS, Inc. from at least February 12, 2000 through December 19, 2002.
5. My title is R&D Manager, X-Ray Products, Imaging Panels.
6. I am a co-inventor of the above-identified patent application.
7. VMS, Inc. is the Assignee of the above-identified patent application.

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8. I have reviewed U.S. Patent No. 6,842,502 B2 issued January 11, 2005 to Jaffray, et al. (herein "Jaffray"), published January 9, 2003, filed February 16, 2001, having a priority date of February 18, 2000; U.S. Patent No. 6,590,953 B2 issued July 8, 2003 to Suzuki, et al. (herein "Suzuki"), published March 14, 2002, filed September 12, 2001, having a priority date of September 12, 2000; and Ning, et al. (herein "Ning"), IEEE Transactions on Medical Imaging, Vol. 19, No. 9, published September 2000 (Ning '2000) (the examiner has cited Jaffray, Suzuki, and Ning along with other references, in anticipation and obviousness type rejections against the claims of the above-identified application.)

9. I have reviewed the invention disclosed and currently claimed (as shown by the attached Current Claims) of the above-identified patent application of which I am an inventor. The invention disclosed and currently claimed in the above-identified patent application was conceived in the United States of America at least as early as February 12, 2000, as evidenced by Attachment G – Varian Oncology Systems Memo, Attachment H - Cone beam CT with a Si, and Attachment I – Varian Memo To Timothy Guertin From Edward Seppi of 8/29/99. The images and supporting documents of Attachments G-I were created and reduced to writing internally within VMS, Inc., at least as early as February 12, 2000. The images and documents of Attachments G-I demonstrate conception and actual reduction to practice of the invention of the instant application and were prepared under the direction of the inventors of the instant application, including myself, on our original work. The images and documents of Attachments G-I pertain to conception and actual reduction to practice of Megavoltage Cone Beam Computed Tomography ("CBCT"). Specifically, the images of Attachment H are research scans and documents of Megavoltage CBCT on a Clinac in 1998 with RNSH Hospital, Sydney, Australia, as well as Kilovoltage CBCT with VMS, Inc. flat panel imagers in the laboratory of the location. Moreover, paragraph 4 of Attachment I explicitly shows possession of "an arrangement where imaging with keV and MeV

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radiation on the accelerator leads to many scenarios for future oncology treatment possibilities." Thus, those images and document show actual reduction to practice of the invention at least as early as February 12, 2000, as those images were obtained with a system according to apparatus and methods of the attached Current Claims. Therefore, the conception and actual reduction to practice of the invention disclosed and claimed in the above-identified patent application occurred prior to the priority date of Jaffray, Suzuki, or Ning.

10. The excerpts provided herewith are designated "Confidential" and/or are VMS, Inc. Confidential memos. It is VMS, Inc.'s practice to maintain in secrecy all VMS confidential internal memos or documents designated "Confidential." I believe that the images and documents from which these excerpts come have, at all times prior to the filing date of the above-captioned application, been maintained in a confidential manner.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon.

Respectfully submitted,

Dated: 3/7, 2008

Richard Colbeth

Full Name: Richard E. Colbeth
Citizenship: U.S.A.
Residence: 1243 Richardson Avenue
Los Altos, CA 94024

Attachment: Current Claims

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CURRENT CLAIMS

1. (Currently Amended) An apparatus, comprising:

a radiation treatment system capable of implementing a treatment plan, the system comprising:

a frame;

a rotatable gantry coupled to the frame;

a high energy radiation source coupled to the rotatable gantry to radiate a patient with therapeutic radiation;

a cone-beam radiation source coupled to the rotatable gantry to radiate the patient; and

a flat-panel imager coupled to the rotatable gantry, wherein the flat-panel imager is operable to capture image projection data of the patient from the cone-beam radiation source to generate cone-beam computed tomography (CT) volumetric image data of the patient.

2. (Original) The apparatus of claim 1, wherein the flat-panel imager includes an amorphous silicon sensor array.

3. (Previously Presented) The apparatus of claim 2, wherein the flat-panel imager includes a cesium iodide scintillator for kilovoltage imaging.

4. (Previously Presented) The apparatus of claim 3, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix for megavoltage imaging.

5. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

6. (Previously Presented) The apparatus of claim 1, wherein the flat-panel imager is capable of generating image projection data at 15 to 30 frames per second.

7. (Original) The apparatus of claim 1, further comprising:

a computing unit, coupled to the rotatable gantry via a communications network, to store the image projection data captured by the flat-panel imager.

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8. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a treatment plan based on the image projection data.

9. (Previously Presented) The apparatus of claim 7, wherein the computing unit generates a three-dimensional image of a target volume based on the captured image projection data.

10. (Previously Presented) The apparatus of claim 1, wherein the cone-beam CT radiation source is a kilovoltage radiation source and the high energy radiation source is a megavoltage radiation source.

11. (Original) The apparatus of claim 1, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

12. (Original) The apparatus of claim 11, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

13. (Original) The apparatus of claim 1, wherein the rotatable gantry is capable of 360 degree rotation.

14. (Currently Amended) A method to perform a clinical treatment, comprising:

rotating a gantry pivotably coupled to a frame of a clinical radiation treatment ~~system~~ machine capable of implementing a treatment plan;

irradiating a patient with a radiation source; and

using the clinical radiation treatment machine to capture image projection data from a flat-panel imager for generating cone-beam computed tomography (CT) volumetric image data.

15. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

transferring the treatment plan to the clinical treatment machine, wherein the clinical treatment machine implements the treatment plan.

16. (Previously Presented) The method of claim 14, wherein the image projection data is generated from the flat-panel imager capturing radiation from a cone-beam

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computed tomography radiation source passing through a target volume.

17. (Original) The method of claim 14, wherein capturing comprises capturing the image projection data at a frame rate in the range of 15-30 frames per second.

18. (Original) The method of claim 14, wherein the image projection data is fluoroscopic image projection data.

19. (Previously Presented) The method of claim 16, wherein the radiation source is a kilovoltage radiation source.

20. (Previously Presented) The method of claim 14, further comprising:

generating a treatment plan for the clinical treatment machine based on the cone-beam volumetric image data; and

using the treatment plan to instruct the clinical treatment machine to at least adjust a therapeutic radiation source into position to align the treatment volume with the therapeutic radiation.

21. (Currently Amended) An apparatus, comprising:

one of a radiation simulation system capable of determining a patient position and a radiation treatment system capable of implementing a treatment plan, the system comprising::

a frame;

a rotatable gantry pivotably coupled to the frame;

means for applying a cone-beam computed tomography (CT) radiation beam coupled to the rotatable gantry; and

means for capturing image projection data with a flat-panel imager, coupled to the rotatable gantry, to generate cone-beam computed tomography (CT) volumetric image data of a patient's anatomy.

22. (Original) The apparatus of claim 21, wherein the means for capturing includes an amorphous silicon sensor array.

23. (Previously Presented) The apparatus of claim 22, wherein the means for capturing includes a cesium iodide scintillator for kilovoltage imaging.

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24. (Previously Presented) The apparatus of claim 23, wherein the scintillator includes cesium iodide crystals coated with a reflective powder and epoxy mixture in a large matrix.

25. (Previously Presented) The apparatus of claim 21, wherein the means for capturing is capable of fluoroscopic imaging, radiographic imaging, and cone-beam CT imaging.

26. (Previously Presented) The apparatus of claim 21, wherein the means for capturing captures the image data at 15 to 30 frames per second.

27. (Original) The apparatus of claim 21, further comprising:
means for storing the captured image projection data is coupled to the rotatable gantry via a communications network.

28. (Previously Presented) The apparatus of claim 21, further comprising:
means for generating a treatment plan based on the image projection data coupled to the means for capturing via a communications network.

29. (Previously Presented) The apparatus of claim 28, wherein the means for generating generates a three-dimensional image of a target volume based on the captured image projection data.

30. (Previously Presented) The apparatus of claim 21, wherein the means for applying includes a kilovoltage radiation source.

31. (Original) The apparatus of claim 21, further comprising a translatable treatment couch coupled to the rotatable gantry via a communications network.

32. (Previously Presented) The apparatus of claim 31, wherein the translatable treatment couch is capable of movement in three planes plus angulation.

33. (Original) The apparatus of claim 21, wherein the rotatable gantry is capable of 360-degree rotation.

34. (Currently Amended) A machine-readable medium having instructions to cause

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