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(54) **Title**: BACKSCATTER SYSTEM WITH VARIABLE SIZE OF DETECTOR ARRAY

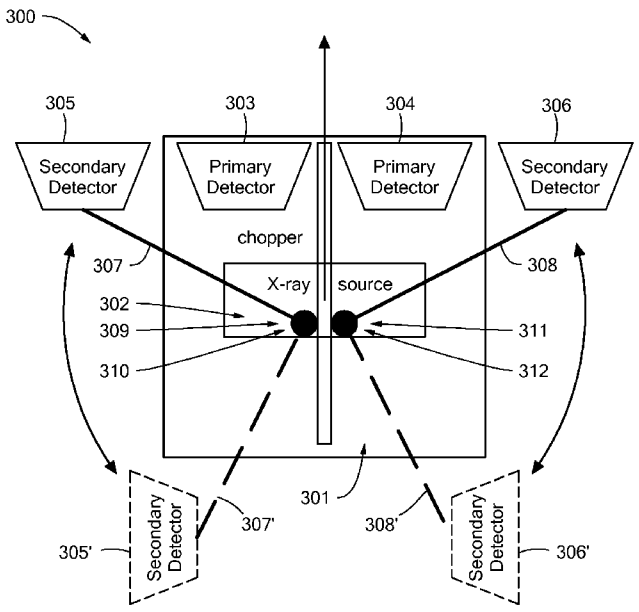

FIG. 3

(57) **Abstract**: A variable-geometry backscatter inspection system has a radiation detector array including one or more backscatter radiation detectors. The position of a second backscatter radiation detector is variable with respect to the position of a first backscatter radiation detector, so that the size of the detector array may be varied by moving the second radiation detector into or out of a predefined alignment with the first radiation detector. The system may include a movable base, and at least one of the detectors is movable with respect to the base. Methods of inspecting an object include forming a detector array by moving a second radiation detector into a predefined alignment with a first radiation detector, illuminating the object with a pencil beam of penetrating radiation, and detecting backscattered radiation with the detector array.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01N 23/203; G01N 23/201; G01N 23/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: variable, geometry, backscatter, inspection, conveyance, array, detector, angle.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 6292533 B1 (SWIFT; RODERICK et al.) 18 September 2001 See column 3, line 37 - column 9, line 67; claim 1 and figures 2A, 5A and 5B.	1-3,9 4-8,10-20
A	US 7508910 B2 (SAFAI MORTEZA et al.) 24 March 2009 See column 3, line 55 - column 8, line 5; claim 1 and figures 1-5.	1-20
A	US 2007-0098142 A1 (PETER ROTHSCHILD et al.) 03 May 2007 See page 3, paragraph [0050] - page 8, paragraph [0120]; claim 1 and figure 1.	1-20
A	US 6424695 B1 (GRODZINS; LEE et al.) 23 July 2002 See column 2, line 24 - column 4, line 45; claim 1 and figure 2.	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6292533 B1	18.09.2001	US 05764683A A	09.06.1998
		US 05903623A A	11.05.1999
		US 2001-0021241 A1	13.09.2001
		US 5764683 B1	21.11.2000
		US 6252929 B1	26.06.2001
		US E039396 E1	14.11.2006
		US RE39396 E1	14.11.2006
US 7508910 B2	24.03.2009	US 2007-0269006 A1	22.11.2007
		US 2009-0168964 A1	02.07.2009
		US 7623626 B2	24.11.2009
		WO 2007-130545 A2	15.11.2007
		WO 2007-130545 A3	13.03.2008
		WO 2007-130545 A3	15.11.2007
US 2007-0098142 A1	03.05.2007	AU 2003-291288 A1	03.06.2004
		AU 2003-291288 A2	03.06.2004
		AU 2003-291288 B2	03.12.2009
		CA 2504500 A1	27.05.2004
		CA 2504500 C	10.01.2012
		CN 101379415 A	04.03.2009
		CN 1318841 C0	30.05.2007
		CN 1441914 A	10.09.2003
		CN 1441914 C0	09.08.2006
		CN 1556921 A	22.12.2004
		CN 1556921 C0	30.05.2007
		EP 1254384 A1	06.11.2002
		EP 1254384 B1	23.01.2008
		EP 1558947 A2	03.08.2005
		EP 1558947 B1	11.01.2012
		EP 1949139 A2	30.07.2008
		EP 2275839 A2	19.01.2011
		EP 2275839 A3	02.11.2011
		JP 2006-505805 A	16.02.2006
		JP 2011-017709 A	27.01.2011
		JP 2011-085593 A	28.04.2011
		KR 10-1171598 B1	10.08.2012
		KR 10-2005-0071663 A	07.07.2005
		US 2002-0094059 A1	18.07.2002
		US 2003-0016790 A1	23.01.2003
		US 2003-0165211 A1	04.09.2003
		US 2004-0086078 A1	06.05.2004
		US 2004-0256565 A1	23.12.2004
		US 2005-0105665 A1	19.05.2005
		US 2005-0117683 A1	02.06.2005
		US 2006-0251211 A1	09.11.2006
		US 2007-0269005 A1	22.11.2007
		US 2008-0111080 A1	15.05.2008
		US 2008-0211431 A1	04.09.2008

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/033585

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2009-0175412 A1	09.07.2009
		US 2009-0257555 A1	15.10.2009
		US 2011-0075808 A1	31.03.2011
		US 6459761 B1	01.10.2002
		US 7010094 B2	07.03.2006
		US 7099434 B2	29.08.2006
		US 7218704 B1	15.05.2007
		US 7505556 B2	17.03.2009
		US 7538325 B2	26.05.2009
		US 7551715 B2	23.06.2009
		US 8194822 B2	05.06.2012
		WO 01-59485 A1	16.08.2001
		WO 01-73415 A2	04.10.2001
		WO 01-73415 A3	04.10.2001
		WO 03-012414 A1	13.02.2003
		WO 03-075037 A1	12.09.2003
		WO 2004-043740 A2	27.05.2004
		WO 2004-043740 A3	27.05.2004
		WO 2007-051092 A2	03.05.2007
		WO 2007-051092 A3	03.05.2007
US 6424695 B1	23.07.2002	None	