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(54) Title: PHASE CONTRAST IMAGING METHOD

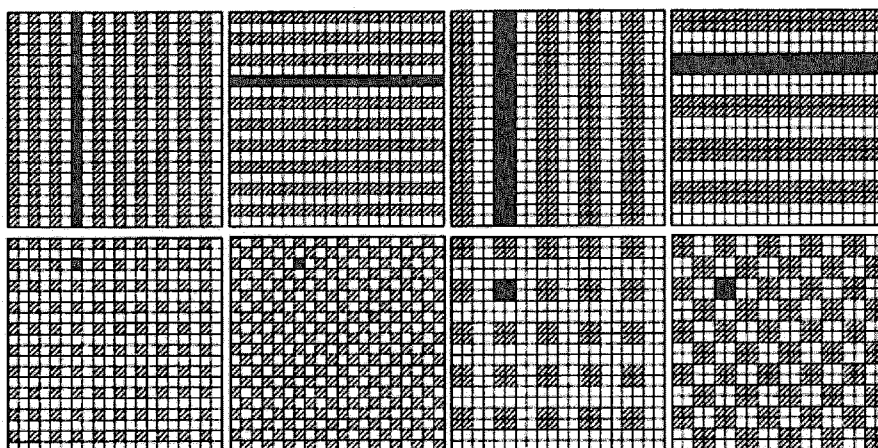


FIG. 3

(57) Abstract: A phase contrast imaging (PCI) method in which instead of using an analyzer grid detector pixels are grouped and only a part of the total pixels are used to calculate a phase contrast image. In a second, third... step the pixels which were not used in the previous recalculation are used additionally to recalculate a second, third.... phase contrast image. Finally the different phase contrast images are fused to result in a full image.



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**A. CLASSIFICATION OF SUBJECT MATTER**  
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**B. FIELDS SEARCHED**  
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KREJCI F ET AL: "Single grating method for low dose 1-D and 2-D phase contrast X-ray imaging", JOURNAL OF INSTRUMENTATION, INSTITUTE OF PHYSICS PUBLISHING, BRISTOL, GB, vol. 6, no. 1, 11 January 2011 (2011-01-11), page C01073, XP020203529, ISSN: 1748-0221, DOI: 10.1088/1748-0221/6/01/C01073 equations 2.3 and 2.4 and fig. 2 ----- -/--	1-13

Further documents are listed in the continuation of Box C.  See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
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Date of the actual completion of the international search <b>16 October 2018</b>	Date of mailing of the international search report <b>17/01/2019</b>
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <b>Anscombe, Marcel</b>
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2018/067786

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KREJCI FRANTISEK ET AL: "Hard x-ray phase contrast imaging using single absorption grating and hybrid semiconductor pixel detector", REVIEW OF SCIENTIFIC INSTRUMENTS, AIP, MELVILLE, NY, US, vol. 81, no. 11, 5 November 2010 (2010-11-05), pages 113702-113702, XP012145818, ISSN: 0034-6748, DOI: 10.1063/1.3499372 section B -----	1-13
A	WO 2014/154188 A1 (INST OF EX AND APPLIED PHYSICS [CZ]) 2 October 2014 (2014-10-02) page 15, 2nd paragraph -----	1-13
A	KREJCI F ET AL: "Semiconductor pixel detector with absorption grid as a tool for charge sharing studies and energy resolution improvement", JOURNAL OF INSTRUMENTATION, INSTITUTE OF PHYSICS PUBLISHING, BRISTOL, GB, vol. 6, no. 12, 13 December 2011 (2011-12-13), page C12034, XP020215982, ISSN: 1748-0221, DOI: 10.1088/1748-0221/6/12/C12034 section 2.2 -----	1-13
A	WO 2004/102958 A1 (ZALEVSKY ZEEV [IL]; SOLOMON JONATHAN [IL]) 25 November 2004 (2004-11-25) page 21, line 13-14 -----	1-13
A	US 2016/146744 A1 (ENDREZZI MARCO [GB] ET AL) 26 May 2016 (2016-05-26) paragraph [0048] -----	1-13

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014154188 A1	02-10-2014	EP 2978377 A1 WO 2014154188 A1	03-02-2016 02-10-2014
-----			
WO 2004102958 A1	25-11-2004	CN 1802847 A EP 1627526 A1 JP 2007515842 A KR 20060115961 A US 2007040828 A1 WO 2004102958 A1	12-07-2006 22-02-2006 14-06-2007 13-11-2006 22-02-2007 25-11-2004
-----			
US 2016146744 A1	26-05-2016	EP 3011321 A1 JP 2016527490 A US 2016146744 A1 WO 2014202949 A1	27-04-2016 08-09-2016 26-05-2016 24-12-2014
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