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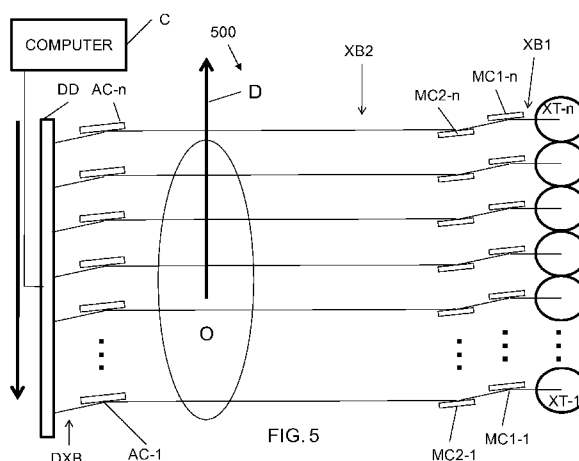
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(54) **Title:** STRAIN MATCHING OF CRYSTALS AND HORIZONTALLY-SPACED MONOCHROMATOR AND ANALYZER CRYSTAL ARRAYS IN DIFFRACTION ENHANCED IMAGING SYSTEMS AND RELATED METHODS



(57) **Abstract:** Strain matching of crystals and horizontally-spaced monochromator and analyzer crystal arrays in diffraction enhanced imaging systems and related methods are disclosed. A DEI system, including strain matched crystals can comprise an X-ray source configured to generate a first X-ray beam. A first monochromator crystal can be positioned to intercept the first X-ray beam for producing a second X-ray beam. A second monochromator crystal can be positioned to intercept the second X-ray beam to produce a third X-ray beam for transmission through an object. The second monochromator crystal has a thickness selected such that a mechanical strain on a side of the first monochromator crystal is the same as a mechanical strain on the second monochromator crystal. An analyzer crystal has a thickness selected such that a mechanical strain on a side of the first monochromator crystal is the same as a mechanical strain on the analyzer crystal.

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2010/037277

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B6/00 G21K1/06
ADD. A61B6/00

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)

G21K A61B

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KEYRILAINEN J ET AL: "Refraction contrast in X-ray imaging", NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A: ACCELERATORS, SPECTROMETERS, DETECTORS, AND ASSOCIATED EQUIPMENT, ELSEVIER BV * NORTH-HOLLAND, NETHERLANDS, vol. 488, no. 1-2, 1 August 2002 (2002-08-01), pages 419-427, XP004372221, ISSN: 0168-9002, DOI: 10.1016/S0168-9002(02)00442-4 section "3. Experimental Setup"; figure 1 -----	1-78



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

Date of the actual completion of the international search

6 August 2012

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04/12/2012

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/037277

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-78

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-78

Diffraction enhanced imaging system, with an analyzer crystal having thickness selected such that the mechanical strain is matched with the mechanical strain of the monochromator crystal

2. claims: 79-145

Diffraction enhanced imaging system, with a plurality of monochromator crystals and a plurality of analyzer crystals
