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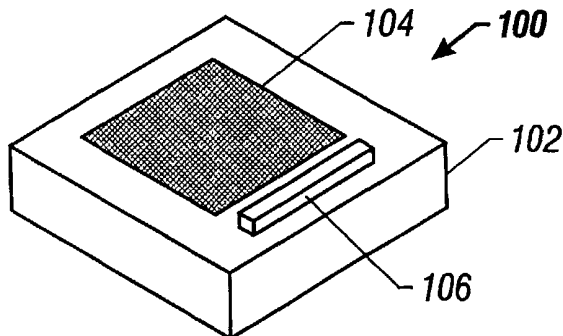
PCT

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 - (71) Applicant (for all designated States except US): CALIFORNIA INSTITUTE OF TECHNOLOGY [US/US]; 1200 East California Boulevard, Mail Code 201-85, Pasadena, CA 91125 (US).
 - (72) Inventors; and
 - (75) Inventors/Applicants (for US only): WADSWORTH, Mark [US/US]; 520 Manzanita Avenue, Serra Madre, CA 91024 (US). ATLAS, Gene [US/US]; 2188 Camino Robledo, Carlsbad, CA 92009 (US).
 - (74) Agent: HARRIS, Scott, C.; Fish & Richardson, P.C., Suite 500, 4350 La Jolla Village Drive, San Diego, CA 92112 (US).
 - (81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



(54) Title: FABRICATING A HYBRID IMAGING DEVICE

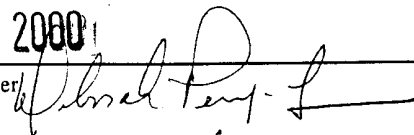
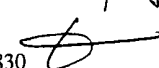


(57) Abstract: A hybrid detector (100) or imager includes two substrates (102, 106) fabricated under incompatible processes. An array of detectors (104), such as charged-coupled devices, are formed on the first substrate using a CCD fabrication process, such as a buried channel or peristaltic process. One or more charge-converting amplifiers (114) are formed on a second substrate using a CMOS fabrication process. The two substrates are then bonded together to form a hybrid detector.

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INTERNATIONAL SEARCH REPORT

International application No.
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| A. CLASSIFICATION OF SUBJECT MATTER IPC(7) :H01J 40/14 US CL :250/214LA 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) U.S. : 250/214LA, 214.1, 208.1, 370.08, 338.4, 332; 257/226, 228, 241, 249; 348/294, 300, 301, 302 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) | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | US 5,449,908 A (WADSWORTH et al) 12 September 1995 (12/9/95) see entire document. | 1-25 |
| A | US 5,149,956 A (NORTON) 22 September 1992 (22/9/92) see entire document. | 1-15 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex. | | |
| * Special categories of cited documents: | "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 |
| "A" document defining the general state of the art which is not considered to be of particular relevance | "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 |
| "E" earlier document published on or after the international filing date | "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 |
| "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) | "&" | document member of the same patent family |
| "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 | | |
| Date of the actual completion of the international search | Date of mailing of the international search report | |
| 06 SEPTEMBER 2000 | 17 OCT 2000 | |
| Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 | Authorized officer:  QUE T. LE | |
| Facsimile No. (703) 305-3230 | Telephone No. (703) 308-4830  | |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29653

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international 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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

Please See Extra 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 fee, this Authority did not invite payment of any additional fee.
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.:
1-25

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
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BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1-25, drawn to a method and a radiation detecting device.

Group II, claim(s) 26, drawn to a radiation imaging device.

Group III, claim(s) 27, drawn to a radiation imaging device.

Group IV, claims 28-34, drawn to a method.

The inventions listed as Groups I, II, III, IV do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The method and/or device of the invention Group I, claims 1-25 requires incompatible first and second fabrication processes for the respective first and second substrates while the invention Groups II, III and IV do not. The invention Group II, claim 26 requires CMOS processing circuitry to change some aspect of the voltage-mode signal received from a charge converting amplifier while the invention Groups I, III and IV do not. The invention Group III, claim 27 requires an averaging circuit to average an amount of charge collected by each of the CCDs at multiple sampling instants and for each of the parallel lines of the CCDs array, a CMOS amplifier coupled to the averaging circuit to convert the charge collected by the CCD over the multiple sampling instants into a voltage mode signal while the invention Groups I, II and IV do not. The invention Group IV requires method steps of delivering a charge mode signal generated by a detector array in response to the radiation from the first substrate to a second substrate, and converting the charge mode signal into a voltage mode signal while the invention Groups I, II and III do not.