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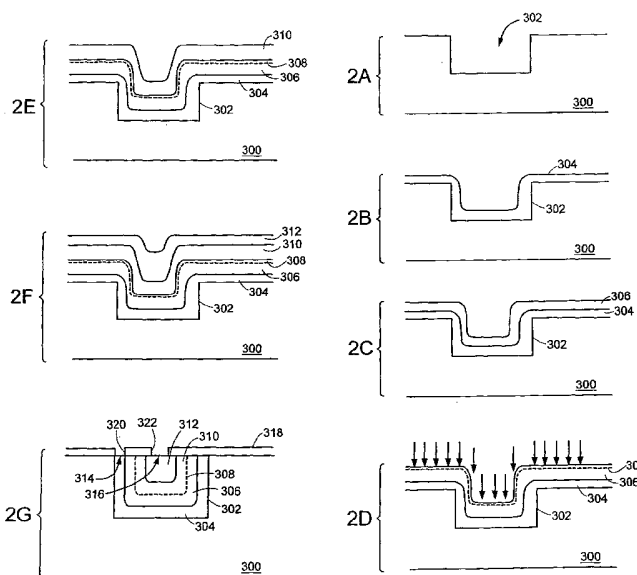
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- Published:**
— with international search report

[Continued on next page]

(54) Title: IMPURITY-BASED WAVEGUIDE DETECTORS



(57) Abstract: An optical circuit including a semiconductor substrate (300); an optical waveguide formed in or on the substrate (300); and an optical detector (302) formed in or on the semiconductor substrate (300), wherein the optical detector (302) is aligned with the optical waveguide so as to receive an optical signal from the optical waveguide during operation, and wherein the optical detector (302) has: a first electrode (304); a second electrode (312); and an intermediate layer (306) between the first and second electrodes, the intermediate layer (306) being made of a semiconductor material characterized by a conduction band, a valence band, and deep level energy states introduced between the conduction and valence bands.

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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*

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.

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24 February 2005

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/17186

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01S 5/00
 US CL : 372/43, 46

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. : 372/43, 46; 369/44.12, 44.11

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 5,481,515 A (KANDO et al.) 02 January 1996 (02.01.1996), see the entire document	1-4, 7-23, and 17
Y	US 5,793,913 A (KOVACIC) 11 August 1998 (11.08.1998), see Figure 2	5-6 and 14-15
Y	US 6,426,522 B1 (KEAN et al) 30 June 2002 (30.06.2002), see the entire document	16 and 18-19

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	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"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

27 October 2004 (27.10.2004)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/17186

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:
Please See Continuation 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.: 1-19
- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

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

Group I, claim(s) 1-19 are drawn to an optical circuit comprising a semiconductor substrate, an optical waveguide, and an optical detector.

Group II, claim(s) 20-31 are drawn to an optical detector.

Group III, claim(s) 32-33 are drawn to a method of fabricating an optical circuit.

Group IV, claim 34 is drawn to method of fabricating an optical detector.

The inventions listed as Groups I, II, III, and IV do not relate to a single general 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: Group I is classified to class 372/43, Group II is classified to class 455/313, and Group III is classified to class 438/1+.