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Declarations under Rule 4.17:

- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))
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(54) Title: HIGH EFFICIENCY VERTICAL OPTICAL COUPLER USING SUB-WAVELENGTH HIGH CONTRAST GRATING

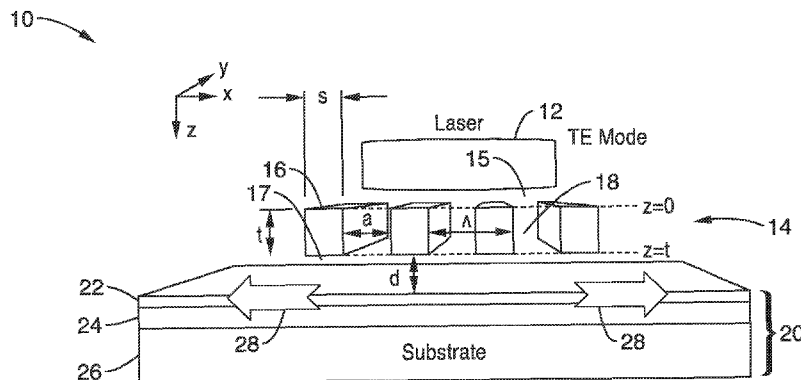
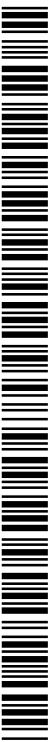


FIG. 1

(57) Abstract: A vertical optical coupler which redirects light transmission in response to the interaction between a sub-wavelength high contrast grating (HCG) having a plurality of spaced apart segments of grating material which is optically coupled to a waveguide. For a selected set of material, grating geometry, gaps and spacing, the light directed at a normal incidence into the optical coupler is angularly displaced in traveling in the optical waveguide, while light directed along the optical waveguide is angularly displaced in being output at normal incidence from the optical coupler. The coupler is integrated into a number of device embodiments, including: a coupler between angularly displaced waveguides, lasers, light emitting diodes (LEDs) and solar cells.



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/035615**A. CLASSIFICATION OF SUBJECT MATTER****G02B 6/293(2006.01)i**

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)

G02B 6/293; G02B 6/028; G02B 6/42; H01L 31/0232; H01S 3/08

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: high-contrast subwavelength grating, coupling, gap, waveguide, light-emitting diode, solar cell

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	MICHAEL C.Y. HUANG et al., "Nanoscale high-contrast subwavelength grating integrated tunable surface emitting laser", Optical MEMS and Their Applications Conference, 2006. IEEE/LEOS International Conference, pages 13 – 14, 21-24 August 2006	1-18, 20
X	See abstract, page 13 and figure 1.	19
Y	US 2008-0193080 A1 (CHEBEN PAVEL et al.) 14 August 2008 See abstract, paragraph [0021] and figure 1.	1-17
Y	US 6560259 B1 (HWANG WEN-YEN) 06 May 2003 See abstract, column 6 and claim 1.	18
Y	US 2002-0000244 A1 (SALEEM H. ZAIDI) 03 January 2002 See abstract, claim 1 and figure 1.	20

 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

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"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

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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
US 2008-0193080 A1	14.08.2008	CA 2619385 A1 US 2008-0193079 A1 US 7680371 B2	13.08.2008 14.08.2008 16.03.2010
US 6560259 B1	06.05.2003	None	
US 2002-0000244 A1	03.01.2002	US 6858462 B2	22.02.2005