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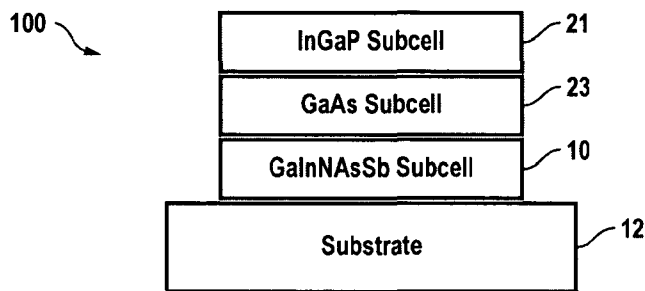


FIG. 1B

(57) Abstract: A high efficiency triple-junction solar cell and method of manufacture therefor is provided wherein junctions are formed between different types of III-V semiconductor alloy materials, one alloy of which contains a combination of an effective amount of antimony (Sb) with gallium (Ga), indium (In), nitrogen (N, the nitride component) and arsenic (As) to form the dilute nitride semiconductor layer GaInNAsSb which has particularly favorable characteristics in a solar cell. In particular, the bandgap and lattice matching promote efficient solar energy conversion.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/08495

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) - B05D 1/18; H01L 31/04 (2009.01)
 USPC - 136/252; 427/74
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B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 IPC(8) - B05D 1/18; H01L 31/04 (2009.01)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 USPC - 136/252, 255; 427/74

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 PubWEST, WIPO; Web: Google, Google Scholar
 Search Terms Used: solar cell, substrate, gallium arsenide, triple junction, dilute nitride, gallium, indium, nitrogen, arsenic, antimony, molecular beam epitaxy, phosphorous, aluminum, germanium

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Jackrel, D.B., Bank, S.R., Yuen, H.B., Wistey, M.A., Harris, J.S., Ptak, A.K., Johnston, S.W., Friedman, D.J., Kurtz, S.R., "Dilute nitride GaInNAs and GaInNAsSb solar cells by molecular beam epitaxy," 2007, Journal of Applied Physics, Vol. 101, Issue 11, 114916, p 1-8, 14 June 2007. (abstract) [online]. Retrieved from the Internet on [20 March 2009]. Retrieved from: <URL: http://scitation.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JAPIAU000101000011114916000001&idtype=cvips&prog=normal	1, 2, 4-10, 12-16
Y	Entire document, especially Fig 1; abstract; p 1-4	3, 11
Y	US 2004/0200523 A1 (King et al.) 14 October 2004 (14.10.2004) Entire document, especially: para [0006], [0021]	3, 11
A	Jackrel, D., Ptak, A., Bank, S., Yuen, H., Wistey, M., Friedman, D., Kurtz, S., Harris, J.S., "GaInNAsSb Solar Cells Grown by Molecular Beam Epitaxy," 2006, Photovoltaic Energy Conversion, Conference Record of the 2006 IEEE 4th World Conference on Volume 1, p. 783 ? 786, May 2006. (abstract) [online]. Retrieved from the Internet on [20 March 2009]. Retrieved from: <URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=04059746	1, 2, 4-10, 12-16
A	Harris Jr., J.S., Kudrawiec, R., Yuen, H.B., Bank, S.R., Bae, H.P., Wistey, M.A., Jackrel, D., Pickett, E.R., Sarmiento, T., Goddard, L.L., Lordi, V., Gugov, T., "Development of GaInNAsSb alloys: Growth, band structure, optical properties and applications," 2007, Physica Status Solidi (b), Vol. 244, Issue 8, p. 2707 ? 2729, 6 Jul 2007. (abstract) [online]. Retrieved from the Internet on [20 March 2009]. Retrieved from: <URL: http://www3.interscience.wiley.com/cgi-bin/fulltext/114287800/PDFSTART	1, 2, 4-10, 12-16

Further documents are listed in the continuation of Box C.

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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	

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