US008614395B1

(12) **United States Patent**
Nielson et al.

(10) **Patent No.: US 8,614,395 B1**
(45) **Date of Patent: Dec. 24, 2013**

(54) **SOLAR CELL WITH BACK SIDE CONTACTS**

(75) Inventors: **Gregory N. Nielson**, Albuquerque, NM (US); **Murat Okandan**, Edgewood, NM (US); **Jose Luis Cruz-Campa**, Albuquerque, NM (US); **Paul J. Resnick**, Albuquerque, NM (US); **Mark Woodbury Wanlass**, Golden, CO (US); **Peggy J. Clews**, Tijeras, NM (US)

(73) Assignee: **Sandia Corporation**, Albuquerque, NM (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 113 days.

(21) Appl. No.: **13/164,017**

(22) Filed: **Jun. 20, 2011**

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/914,441, filed on Oct. 28, 2010, which is a continuation-in-part of application No. 11/933,458, filed on Nov. 1, 2007, application No. 13/164,017, which is a continuation-in-part of application No. 12/957,082, filed on Nov. 30, 2010, now Pat. No. 8,329,503, which is a continuation-in-part of application No. 11/933,458, filed on Nov. 1, 2007.

(51) **Int. Cl.**
H01L 31/00 (2006.01)
H01L 21/00 (2006.01)

(52) **U.S. Cl.**
USPC **136/256**; 438/57

(58) **Field of Classification Search**
USPC 136/256; 438/57
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,482,568	A	1/1996	Hockaday	
5,501,893	A	3/1996	Laermer et al.	
5,998,729	A *	12/1999	Shiomi et al.	136/251
6,359,210	B2 *	3/2002	Ho et al.	136/256
6,612,705	B1	9/2003	Davidson et al.	
6,624,548	B1	9/2003	Miller et al.	
6,805,998	B2 *	10/2004	Jenson et al.	429/162
6,957,894	B2	10/2005	Rabinowitz et al.	
6,964,486	B2	11/2005	Rabinowitz	
6,987,604	B2	1/2006	Rabinowitz et al.	
6,988,809	B2	1/2006	Rabinowitz	
7,077,361	B1	7/2006	Rabinowitz	

(Continued)

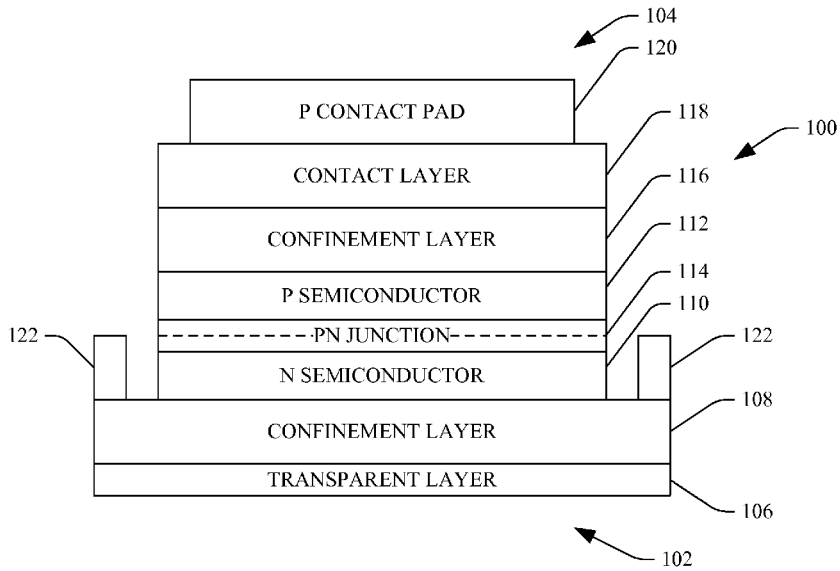
OTHER PUBLICATIONS

Li, W. et al., "GaInP/AlInP tunnel junction for GaInP/GaAs tandem solar cells", Electronic Letters, Feb. 19, 1998, vol. 34, No. 4, pp. 406-407.*

(Continued)

Primary Examiner — Tamir Ayad
(74) *Attorney, Agent, or Firm* — Medley Behrens & Lewis LLC; Michael J. Medley; Olivia J. Tsai

(57) **ABSTRACT**

A III-V solar cell is described herein that includes all back side contacts. Additionally, the positive and negative electrical contacts contact compound semiconductor layers of the solar cell other than the absorbing layer of the solar cell. That is, the positive and negative electrical contacts contact passivating layers of the solar cell.

5 Claims, 5 Drawing Sheets