US009190546B1

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

(10) **Patent No.: US 9,190,546 B1**
(45) **Date of Patent: Nov. 17, 2015**

(54) **SOLAR PHOTOVOLTAIC REFLECTIVE TROUGH COLLECTION STRUCTURE**

(75) Inventors: **Benjamin J. Anderson**, Albuquerque, NM (US); **William C. Sweatt**, Albuquerque, NM (US); **Murat Okandan**, Edgewood, NM (US); **Gregory N. Nielson**, Albuquerque, 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 927 days.

(21) Appl. No.: **12/894,772**

(22) Filed: **Sep. 30, 2010**

(51) **Int. Cl.**

H01L 31/00	(2006.01)
H01L 31/052	(2014.01)
H01L 31/042	(2014.01)
H02S 40/22	(2014.01)

(52) **U.S. Cl.**
CPC ***H01L 31/052*** (2013.01); ***H02S 20/00*** (2013.01); ***H02S 40/22*** (2014.12); *H01L 31/0422* (2013.01); *H01L 31/0522* (2013.01); *H01L 31/0524* (2013.01); *Y02E 10/52* (2013.01)

(58) **Field of Classification Search**
CPC H01L 31/0422; H01L 31/052; H01L 31/0522; H01L 31/0524; H01L 31/0525; Y02E 10/52
USPC 136/243–246, 251
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,191,593	A *	3/1980	Cacheux	136/259
4,964,713	A *	10/1990	Goetzberger	359/867
6,440,769	B2	8/2002	Peumans et al.	
7,501,752	B2	3/2009	Ohba et al.	
7,569,764	B2	8/2009	Shan et al.	
7,737,356	B2	6/2010	Goldstein	
2003/0070368	A1 *	4/2003	Shingleton	52/173.3
2005/0081909	A1 *	4/2005	Paull	136/246
2007/0012311	A1 *	1/2007	Yi et al.	126/573
2007/0251569	A1 *	11/2007	Shan et al.	136/246
2008/0066801	A1 *	3/2008	Schwarze	136/251
2009/0056789	A1 *	3/2009	Draganov	136/246
2009/0199890	A1 *	8/2009	Hering et al.	136/246

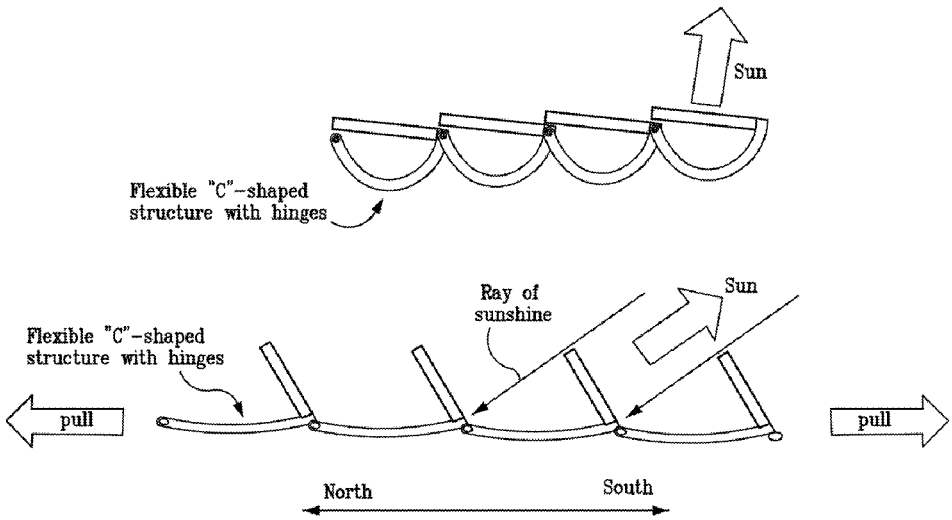
OTHER PUBLICATIONS

Kasarova et al., "Analysis of the dispersion of optical plastic materials", Optical Materials, 2007.*

* cited by examiner

Primary Examiner — Matthew Martin
(74) *Attorney, Agent, or Firm* — Elmer A. Klavetter

(57) **ABSTRACT**

A photovoltaic (PV) solar concentration structure having at least two troughs encapsulated in a rectangular parallelepiped optical plastic structure, with the troughs filled with an optical plastic material, the troughs each having a reflective internal surface and approximately parabolic geometry, and the troughs each including photovoltaic cells situated so that light impinging on the optical plastic material will be concentrated onto the photovoltaic cells. Multiple structures can be connected to provide a solar photovoltaic collection system that provides portable, efficient, low-cost electrical power.

16 Claims, 6 Drawing Sheets