US007259692B1

(12) **United States Patent**
Eichenberg

(10) **Patent No.: US 7,259,692 B1**
(45) **Date of Patent: Aug. 21, 2007**

(54) **HYBRID POWER MANAGEMENT SYSTEM AND METHOD**

(75) Inventor: **Dennis J. Eichenberg**, Parma Heights, OH (US)

(73) Assignee: **The United States of America as represented by the Administrator of NASA**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 218 days.

(21) Appl. No.: **10/931,205**

(22) Filed: **Sep. 1, 2004**

(51) **Int. Cl.**
G08G 1/095 (2006.01)

(52) **U.S. Cl.** **340/908**; 304/43; 320/167; 340/815.45

(58) **Field of Classification Search** 340/907, 340/908, 815.4, 815.45; 307/43, 157; 362/183, 362/800; 320/166, 167
See application file for complete search history.

(56) **References Cited**

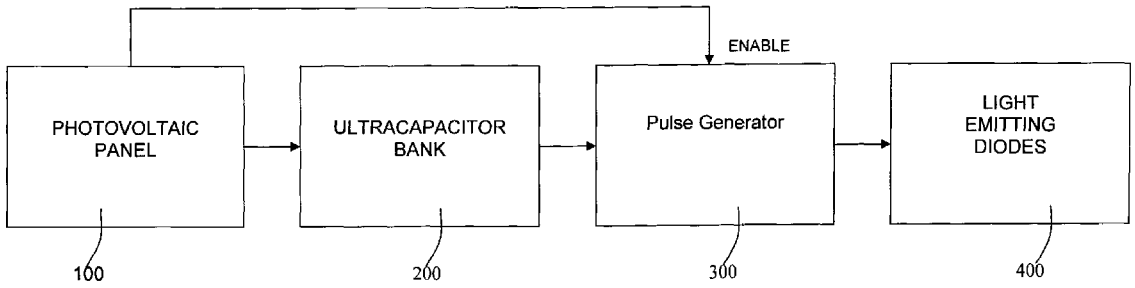
U.S. PATENT DOCUMENTS

4,634,953 A * 1/1987 Shoji et al. 368/205
5,345,154 A 9/1994 King
5,505,527 A 4/1996 Gray, Jr. et al.
5,589,743 A 12/1996 King
5,782,552 A * 7/1998 Green et al. 362/183
5,898,282 A 4/1999 Drozdz
5,939,848 A 8/1999 Yano et al.
5,948,006 A * 9/1999 Mann 607/61
6,044,922 A 4/2000 Field
6,068,078 A 5/2000 Rau et al.
6,135,913 A 10/2000 Lyon
6,138,784 A 10/2000 Oshima et al.
6,140,780 A 10/2000 Oshima et al.
6,217,398 B1 4/2001 Davis
6,230,496 B1 5/2001 Hofmann et al.
6,650,091 B1 * 11/2003 Shiue et al. 320/166
6,680,548 B2 * 1/2004 Shiue et al. 307/141
6,753,673 B2 * 6/2004 Shiue et al. 320/166
6,778,093 B2 * 8/2004 Harwood 340/815.45
2004/0036449 A1 * 2/2004 Bean et al. 320/166
2005/0052165 A1 * 3/2005 Willner et al. 323/266
2006/0194102 A1 * 8/2006 Keshishian et al. 429/160

* cited by examiner

Primary Examiner—Thomas Mullen
(74) *Attorney, Agent, or Firm*—Arlene P. Neal; Kent N. Stone

(57) **ABSTRACT**

A system and method for hybrid power management. The system includes photovoltaic cells, ultracapacitors, and pulse generators. In one embodiment, the hybrid power management system is used to provide power for a highway safety flasher.

13 Claims, 4 Drawing Sheets