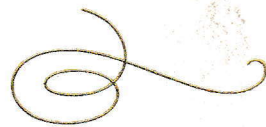
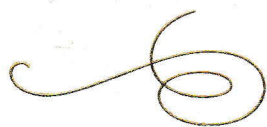


United
States
of
America



To Promote the Progress

of Science and Useful Arts

The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Anders Ivarsson

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

Maintenance Fee Notice

If the application for this patent was filed on or after December 12, 1980, maintenance fees are due three years and six months, seven years and six months, and eleven years and six months after the date of this grant, or within a grace period of six months thereafter upon payment of a surcharge as provided by law. The amount, number and timing of the maintenance fees required may be changed by law or regulation. Unless payment of the applicable maintenance fee is received in the United States Patent and Trademark Office on or before the date the fee is due or within a grace period of six months thereafter, the patent will expire as of the end of such grace period.

Patent Term Notice

If the application for this patent was filed on or after June 8, 1995, the term of this patent begins on the date on which this patent issues and ends twenty years from the filing date of the application or, if the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121, 365(c), or 386(c), twenty years from the filing date of the earliest such application ("the twenty-year term"), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b), and any extension as provided by 35 U.S.C. 154(b) or 156 or any disclaimer under 35 U.S.C. 253.

If this application was filed prior to June 8, 1995, the term of this patent begins on the date on which this patent issues and ends on the later of seventeen years from the date of the grant of this patent or the twenty-year term set forth above for patents resulting from applications filed on or after June 8, 1995, subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b) and any extension as provided by 35 U.S.C. 156 or any disclaimer under 35 U.S.C. 253.



US010183563B2

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

(10) **Patent No.:** **US 10,183,563 B2**
(45) **Date of Patent:** **Jan. 22, 2019**

(54) **APPARATUS AND SYSTEM FOR PROVIDING A SECONDARY POWER SOURCE FOR AN ELECTRIC VEHICLE**

(71) Applicant: **Dignan Herbert Rayner**, Eight Mile Plains, Queensland (AU)

(72) Inventors: **Dignan Herbert Rayner**, Eight Mile Plains (AU); **Ivan Herbert Godfrey Rayner**, Eight Mile Plains (AU)

(73) Assignee: **ITC IP HOLDINGS NO 1 PTY LTD**, Eight Mile Plains, Queensland (AU)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/532,622**

(22) PCT Filed: **Dec. 4, 2015**

(86) PCT No.: **PCT/AU2015/050767**
§ 371 (c)(1),
(2) Date: **Jun. 2, 2017**

(87) PCT Pub. No.: **WO2016/086274**
PCT Pub. Date: **Jun. 9, 2016**

(65) **Prior Publication Data**
US 2017/0349039 A1 Dec. 7, 2017

(30) **Foreign Application Priority Data**
Dec. 4, 2014 (AU) 2014904968

(51) **Int. Cl.**
B60K 1/04 (2006.01)
B60L 11/18 (2006.01)

(52) **U.S. Cl.**
CPC **B60K 1/04** (2013.01); **B60L 11/1801** (2013.01); **B60L 11/1877** (2013.01); **B60L 11/1879** (2013.01); **B60K 2001/0411** (2013.01); **B60K 2001/0416** (2013.01); **B60K 2001/0422** (2013.01); **B60K 2001/0444** (2013.01); **B60K 2001/0455** (2013.01); **B60K 2001/0466** (2013.01); **B60K 2001/0472** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC **B60K 1/04**; **B60K 2001/0466**; **B60K 2001/0444**; **B60K 2001/0411**; **B60L 11/1877**; **B60L 11/1801**; **B60L 11/1879**
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,562,504 B2 5/2003 Faris et al.
6,800,393 B2 10/2004 Faris
(Continued)

FOREIGN PATENT DOCUMENTS

CN 2199080 Y * 5/1995
JP 2010200393 A * 9/2010
(Continued)

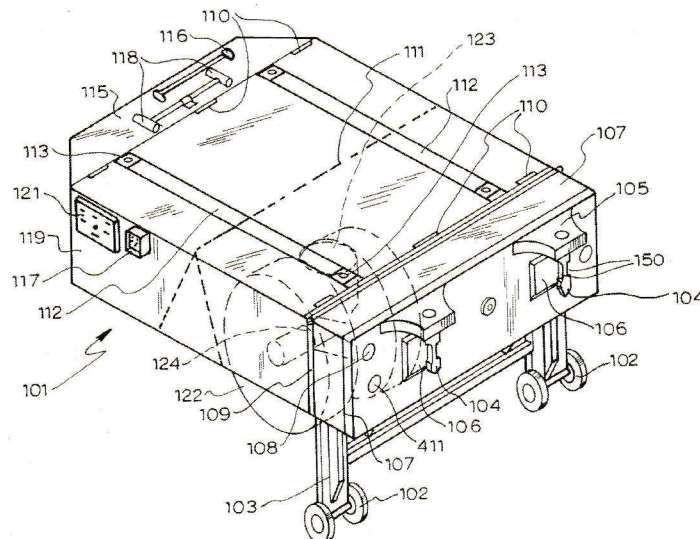
Primary Examiner — Jacob B Meyer

(74) *Attorney, Agent, or Firm* — Epstein Drangel LLP;
Robert L. Epstein

(57) **ABSTRACT**

An apparatus for providing a secondary power source for an electric vehicle and having at least one secondary electrical power storage unit for storing electrical energy for delivery to the electric vehicle as required to replace the primary power source, a power connection assembly to connect the at least one secondary power source to the electric vehicle and a control system to control supply to the electric vehicle.

28 Claims, 30 Drawing Sheets



- (52) **U.S. Cl.**
 CPC ... *B60K 2001/0477* (2013.01); *B60Y 2200/12*
 (2013.01); *Y02P 90/60* (2015.11); *Y02T*
10/7005 (2013.01); *Y02T 10/7088* (2013.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,314,587	B2 *	11/2012	White	.....	B60L 11/1816	320/103
8,941,463	B2 *	1/2015	Rovik	.....	B60L 3/12	320/127
2007/0229026	A1	10/2007	Morioka et al.			
2011/0084664	A1 *	4/2011	White	.....	B60L 11/1816	320/134
2011/0084665	A1 *	4/2011	White	.....	B60L 11/1822	320/134
2013/0249276	A1 *	9/2013	Rovik	.....	B60L 3/12	307/9.1
2014/0368156	A1	12/2014	Aloe			
2015/0249353	A1	9/2015	Hamilton, IV et al.			

FOREIGN PATENT DOCUMENTS

WO	2004051781	A2	6/2004
WO	2016086274	A1	6/2016

* cited by examiner