US009409489B2

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

(10) **Patent No.: US 9,409,489 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **AUTOMOTIVE INDUCTIVE CHARGER WITH INSERTABLE MAGNETIC CORE**

(71) Applicant: **Hyundai Motor Company**, Seoul (KR)

(72) Inventors: **Woo Young Lee**, Chungcheongbuk-do (KR); **Byeong Seob Song**, Gyeonggi-do (KR); **Dae Woo Lee**, Gyeonggi-do (KR); **Jin Young Yang**, Gyeonggi-do (KR); **Jong Pil Kim**, Gyeonggi-do (KR)

(73) Assignee: **Hyundai Motor Company**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 221 days.

(21) Appl. No.: **13/930,646**

(22) Filed: **Jun. 28, 2013**

(65) **Prior Publication Data**

US 2014/0176059 A1 Jun. 26, 2014

(30) **Foreign Application Priority Data**

Dec. 26, 2012 (KR) 10-2012-0153679

(51) **Int. Cl.**
B60L 11/18 (2006.01)
H01F 38/14 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B60L 11/182*** (2013.01); ***B60L 3/0023*** (2013.01); ***B60L 11/14*** (2013.01); ***B60L 11/1805*** (2013.01); ***B60L 11/1812*** (2013.01); ***B60L 11/1829*** (2013.01); ***B60L 11/1831*** (2013.01); ***B60L 11/1881*** (2013.01); ***H01F 38/14*** (2013.01); ***H02J 7/025*** (2013.01); ***H02J 17/00*** (2013.01); ***H02J 50/10*** (2016.02); ***H04B 5/0037*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H02J 7/025; H02J 50/00; H02J 50/10; H02J 50/12; H02J 17/00; H01F 38/14; Y02T 90/122; B60L 11/182; B60L 11/1831; H04B 5/00; H04B 5/0075; H04B 5/0093; H04B 5/0037
USPC 320/108, 103, 104; 439/38, 39
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,637,986 A * 1/1972 Laing 219/519
3,686,599 A * 8/1972 Lee 336/96
(Continued)

FOREIGN PATENT DOCUMENTS

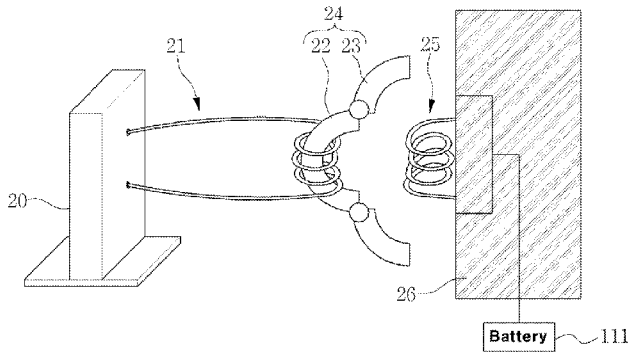
JP 10-106866 4/1998
JP 10112354 4/1998
(Continued)

OTHER PUBLICATIONS

"Synonyms for inlet," interglot.com, published Apr. 25, 2012, accessed Mar. 26, 2015, http://web.archive.org/web/20120425054215/http://www.interglot.com/dictionary/en/en/translate/inlet.*
(Continued)

Primary Examiner — Robert Grant
Assistant Examiner — John Trischler
(74) *Attorney, Agent, or Firm* — Mintz Levin Cohn Ferris Glovsky and Popeo, P.C.; Peter F. Corless

(57) **ABSTRACT**

A magnetic connector apparatus that charges an electric vehicle through contactless magnetic coupling. The magnetic connector apparatus includes an external charger, an inlet, and a magnetic connector. The inlet is connected to a rechargeable battery of the vehicle. The magnetic connector is connected to a power source of the external charger and is transferred to the vehicle to be inserted into the inlet.

10 Claims, 10 Drawing Sheets