



US009461479B2

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

(10) **Patent No.:** **US 9,461,479 B2**
(45) **Date of Patent:** **Oct. 4, 2016**

(54) **WIRELESS POWER TRANSMITTER AND WIRELESS POWER TRANSFER METHOD THEREOF**

(2013.01); **H02J 7/0093** (2013.01); **H02J 7/025** (2013.01); **H02J 17/00** (2013.01); **H02J 2007/0096** (2013.01)

(71) Applicant: **LG ELECTRONICS INC.**, Seoul (KR)

(58) **Field of Classification Search**
CPC H02J 5/005; H02J 7/025
USPC 320/108
See application file for complete search history.

(72) Inventors: **Beomseok Chae**, Seoul (KR);
Byungsang Jung, Seoul (KR);
Jeongkyo Seo, Seoul (KR); **Kwangmin Yoo**, Yongin-si (KR); **Junyoung Lee**, Yongin-si (KR)

(56) **References Cited**

U.S. PATENT DOCUMENTS

(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

2007/0059957 A1 3/2007 Choi
2014/0203774 A1* 7/2014 Sawayanagi H02J 7/0004
320/108
2015/0236539 A1 8/2015 Park et al.

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 167 days.

FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **14/286,672**

CN 1941547 A 4/2007
CN 102593883 A 7/2012
WO WO 2011/156768 A2 12/2011
WO WO 2013/046391 A1 4/2013
WO WO 2013046391 A1 * 4/2013 H02J 7/0004

(22) Filed: **May 23, 2014**

* cited by examiner

(65) **Prior Publication Data**

Primary Examiner — Richard Isla Rodas
Assistant Examiner — Tikisha Slan

US 2014/0347008 A1 Nov. 27, 2014

(74) *Attorney, Agent, or Firm* — Birch, Stewart, Kolasch & Birch, LLP

(30) **Foreign Application Priority Data**

(57) **ABSTRACT**

May 27, 2013 (KR) 10-2013-0059894

A wireless power transmitter including a power supply unit configured to supply an input voltage; a power conversion unit configured to generate wireless power based on a driving signal, generated by the supplied input voltage and a first pulse width modulation (PWM) signal, and transfer the wireless power to a wireless power receiver; and a power transmission control unit configured to receive a voltage value of a battery charged with the wireless power through a wireless network, and generate the first PWM signal based on the voltage value of the battery.

(51) **Int. Cl.**

H01M 10/44 (2006.01)
H01M 10/46 (2006.01)
H02J 5/00 (2016.01)
H02J 7/02 (2016.01)
H02J 17/00 (2006.01)
H02J 7/00 (2006.01)

18 Claims, 24 Drawing Sheets

(52) **U.S. Cl.**

CPC **H02J 5/005** (2013.01); **H02J 7/0081**

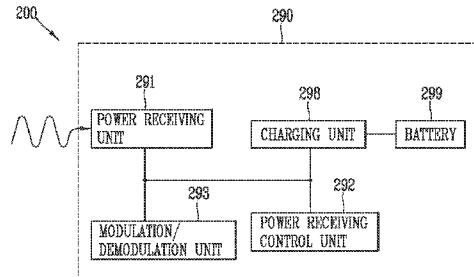
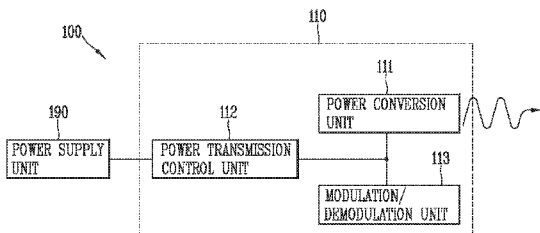


FIG. 1



FIG. 2A

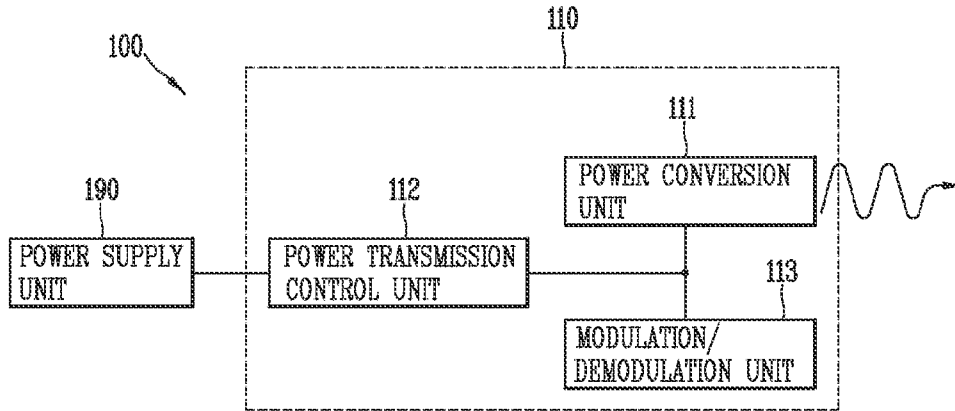


FIG. 2B

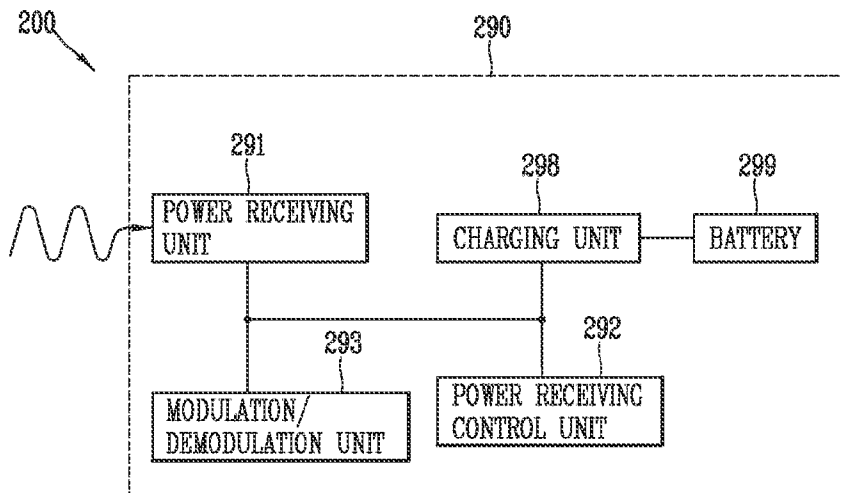


FIG. 3

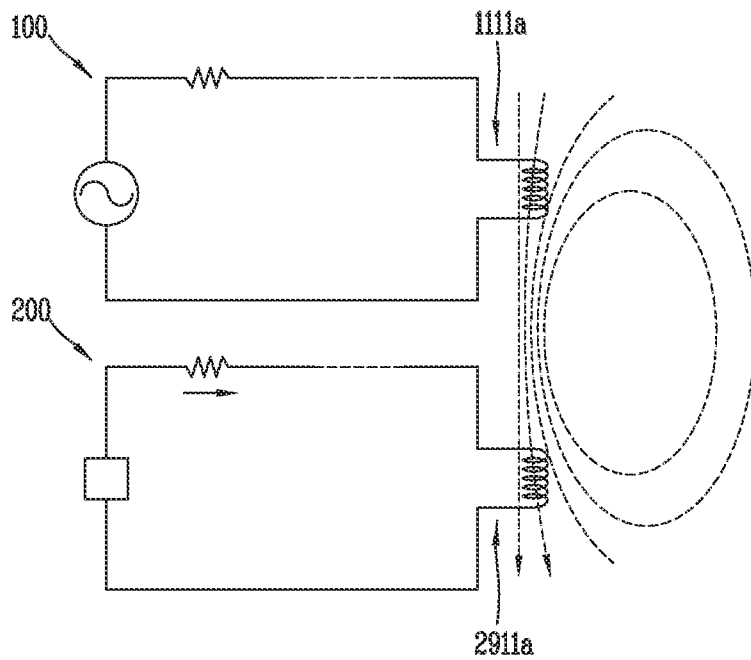


FIG. 4A

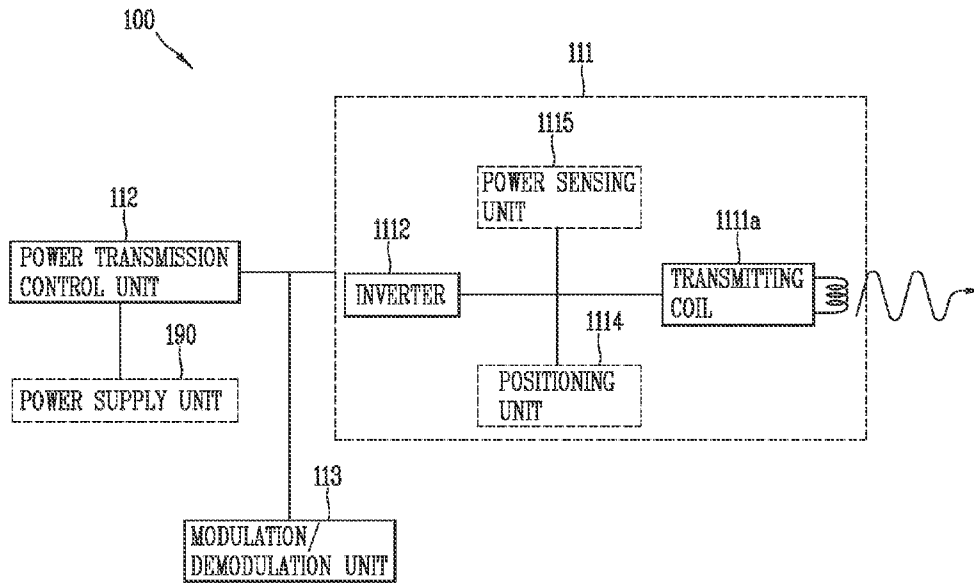


FIG. 4B

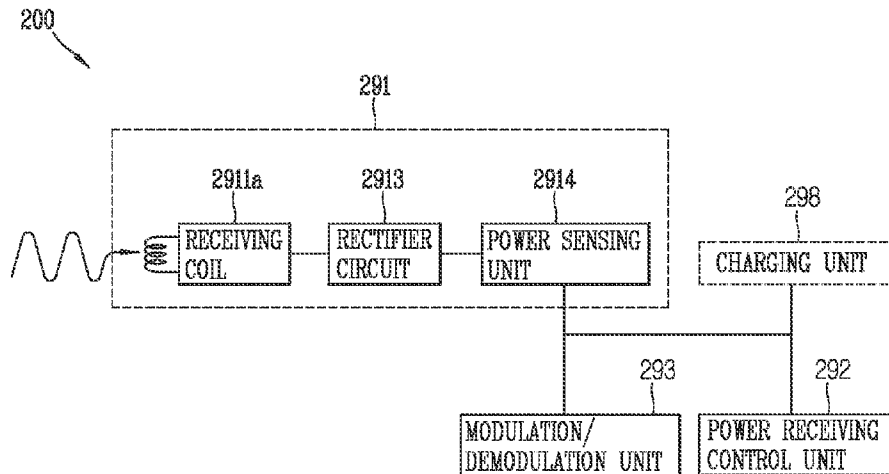


FIG. 5

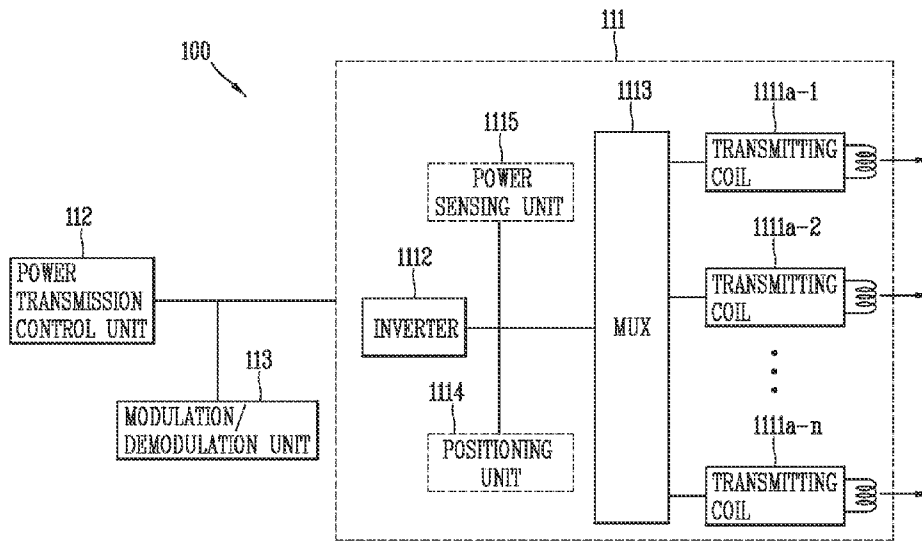
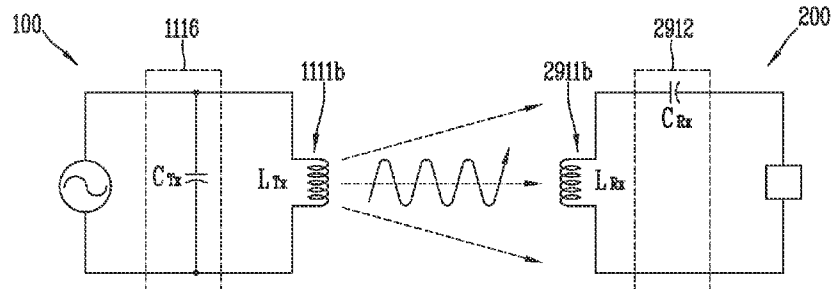


FIG. 6



Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.