

(51) International Patent Classification:
H02J 17/00 (2006.01)(21) International Application Number:
PCT/KR2012/003153(22) International Filing Date:
24 April 2012 (24.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10-2011-0055291 8 June 2011 (08.06.2011) KR(71) Applicant (for all designated States except US): **LG IN-
NOTEK CO., LTD.** [KR/KR]; Seoul Square, 541, Nam-
daemunno 5-ga, Jung-gu, Seoul 100-714 (KR).

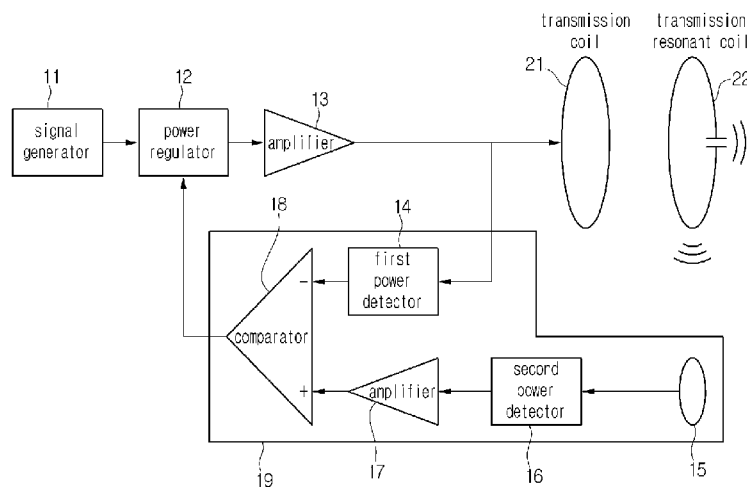
(72) Inventor; and

(75) Inventor/Applicant (for US only): **BAE, Su Ho** [KR/KR];
Seoul Square, 541, Namdaemunno 5-ga, Jung-gu, Seoul
100-714 (KR).(74) Agent: **SEO, Kyo Jun**; 9th Fl. Hyun Juk Bldg., 832-
41, Yeoksam-dong, Gangnam-gu, Seoul 135-080 (KR).(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ,
LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE,
SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT,
TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).**Published:**

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))

(54) Title: WIRELESS POWER TRANSMITTER, WIRELESS POWER RECEIVER AND WIRELESS POWER TRANSMISSION METHOD

[Fig. 5]



(57) Abstract: Disclosed is a wireless power transmitter. A wireless power transmitter includes a transmission coil for generating a magnetic field by receiving power from a power source, a transmission resonant coil for transmitting power to a receiving coil by using the magnetic field generated from the transmission coil by using resonance, a detection unit for detecting an approach of the receiving coil and a power regulator for adjusting an output of the power source, which supplies the power, based on the approach of the receiving coil detected by the detection unit.

Description

Title of Invention: WIRELESS POWER TRANSMITTER, WIRELESS POWER RECEIVER AND WIRELESS POWER TRANSMISSION METHOD

Technical Field

- [1] The embodiment relates to a wireless power transmission. More particularly, the embodiment relates to a wireless power transmission using resonance, in which a detection coil capable of detecting energy stored in a transmission resonant coil of a wireless power transmitter is provided to detect whether a receiver is located far away. If it is determined that the receiver is located far away or does not exist, intensity of transmission power is reduced to prevent the power loss.

Background Art

- [2] A wireless power transmission or a wireless energy transfer refers to a technology for wirelessly transferring electric energy to desired devices. In the 1800's, an electric motor or a transformer employing the principle of electromagnetic induction has been extensively used and then a method for transmitting electric energy by irradiating electromagnetic waves, such as radio waves or lasers, has been suggested. Actually, electric toothbrushes or electric razors, which are frequently used in daily life, are charged based on the principle of electromagnetic induction. Until now, the long-distance transmission using the magnetic induction, the resonance and the short-wavelength radio frequency has been used as the wireless energy transfer scheme.
- [3] In the case of a short-distance wireless power transmission, which has been spotlighted in these days, a wireless power transmitter is installed in a building in such a manner that a mobile device, such as a cellular phone or a notebook computer, can be continuously charged when a user uses the mobile device in the building even if the mobile device is not connected to an additional power cable.
- [4] However, according to the wireless power transmission of the related art, power must be constantly transmitted regardless of the existence of a receiver that receives the power, causing the waste of the power.

[5]

Disclosure of Invention

Technical Problem

- [6] The embodiment provides a method for preventing the waste of power by adjusting transmission power based on the existence or the location of a receiver.
- [7]

Solution to Problem

- [8] A wireless power transmitter according to one embodiment includes a transmission coil for generating a magnetic field by receiving power from a power source, a transmission resonant coil for transmitting power to a receiving coil by using the magnetic field generated from the transmission coil by using resonance, a detection unit for detecting an approach of the receiving coil and a power regulator for adjusting an output of the power source, which supplies the power, based on the approach of the receiving coil detected by the detection unit.
- [9] A wireless power receiver for wirelessly receiving power from a wireless power transmitter equipped with a detection unit according to one embodiment includes a receiving resonant coil for receiving AC power from the wireless power transmitter by using resonance and a receiving coil for receiving the received AC power by using electromagnetic induction, wherein an approach of the receiving resonant coil to the wireless power transmitter is detected by the detection unit.
- [10] A wireless power transmission method according to one embodiment includes transmitting a magnetic field generated by power supplied from a power source, checking a status of the transmitted magnetic field, detecting an approach of a receiving coil that receives the magnetic field based on the status of the magnetic field and adjusting transmission power based on the approach of the receiving coil.

[11]

Advantageous Effects of Invention

- [12] According to the embodiment, the waste of power can be prevented by adjusting transmission power based on the existence or the location of a receiver.

[13]

Brief Description of Drawings

- [14] FIG. 1 is a view showing the structure of a wireless power transmission system according to one embodiment;
- [15] FIG. 2 is a view showing an equivalent circuit of a transmission coil 21 according to one embodiment;
- [16] FIG. 3 is a view showing an equivalent circuit of a power source 10 and a transmitter 20 according to one embodiment;
- [17] FIG. 4 is a view showing an equivalent circuit of a receiving resonant coil 31, a receiving coil 32, a smoothing circuit 40 and a load 50; and
- [18] FIG. 5 is a view showing the structure of a wireless power transmitter according to one embodiment.

[19]

Best Mode for Carrying out the Invention

- [20] Hereinafter, embodiments will be described in more detail with reference to accompanying drawings.
- [21] FIG. 1 is a view showing the structure of a wireless power transmission system according to one embodiment.
- [22] Power generated from a power source 10 is transmitted to a transmitter 20 and then transmitted to a receiver 30 that makes resonance with the transmitter 20 using resonance, that is, has a resonant frequency value equal to that of the transmitter 20. The power transmitted to the receiver 30 is transmitted to a load 50 through a rectifier circuit 40. The load 50 may be a battery or a device requiring the power.
- [23] In detail, the power source 10 is an AC power source to provide AC power having a predetermined frequency.
- [24] The transmitter 20 includes a transmission coil 21 and a transmission resonant coil 22. The transmission coil 21 is connected to the power source 10 and AC current is applied to the transmission coil 21. As the AC current is applied to the transmission coil 21, the AC current is induced to the transmission resonant coil 22, which is physically spaced apart from the transmission coil 21, by using the electromagnetic induction. The power transmitted to the transmission resonant coil 22 is transmitted to the power receiver 30, which forms a resonant circuit together with the power transmitter 10 using resonance.
- [25] According to the power transmission using the magnetic resonance, the power can be transmitted between two LC circuits which are impedance-matched. The power transmission using the magnetic resonance can transmit the power farther than the power transmission using the electromagnetic induction with the high power transmission efficiency.
- [26] The power receiver 30 includes a receiving resonant coil 31 and a receiving coil 32. The power transmitted through the transmission resonant coil 22 is received in the receiving resonant coil 31 so that the AC current is applied to the receiving resonant coil 31. The power transmitted to the receiving resonant coil 31 is transmitted to the receiving coil 32 by using the electromagnetic induction. The power transmitted to the receiving coil 32 is rectified through the rectifier circuit 40 and then transmitted to the load 50.
- [27] The transmitting resonant coil of the power transmitter 20 transmits power to the receiving resonant coil of the power receiver 30 by using magnetic field. The transmitting resonant coil and the receiving resonant coil are magnetically coupled and each of them can operate at resonant frequency. Resonant coupling of the transmitting resonant coil and the receiving resonant coil significantly improves power transmission efficiency between the power transmitter 20 and the power receiver 30.
- [28] FIG. 2 shows the equivalent circuit of the transmission coil 21 according to one em-

bodiment. As shown in FIG. 2, the transmission coil 21 may include an inductor L1 and a capacitor C1 and a circuit having predetermined inductance and capacitance values can be formed by using the inductor L1 and the capacitor C1. The capacitor C1 may be a variable capacitor and the impedance matching can be performed by controlling the variable capacitor. The equivalent circuit of the transmission resonant coil 22, the receiving resonant coil 31 and the receiving coil 22 may be equal to the equivalent circuit shown in FIG. 2.

- [29] FIG. 3 is a view showing an equivalent circuit of the power source 10 and the transmitter 20 according to one embodiment. As shown in FIG. 3, the transmission coil 21 and the transmission resonant coil 22 may consist of inductors L1 and L2 having predetermined inductance values and capacitors C1 and C2 having predetermined capacitance values, respectively.
- [30] FIG. 4 is a view showing an equivalent circuit of the receiving resonant coil 31, the receiving coil 32, the smoothing circuit 40 and the load 50.
- [31] As shown in FIG. 4, the receiving resonant coil 31 and the receiving coil 32 may consist of inductors L3 and L4 having predetermined inductance values and capacitors C3 and C4 having predetermined capacitance values, respectively. The smoothing circuit 40 may consist of a diode D1 and a smoothing capacitor C5 and can output DC power by converting AC power to the DC power. Although the load 50 is shown as a DC power source of 1.3V, the load 50 may be a battery or a device requiring the DC power.
- [32] Meanwhile, according to the embodiment, a detection unit for detecting the location of the receiver is installed at a side of the wireless power transmitter to adjust intensity of the transmission power according to the location of the receiver.
- [33] FIG. 5 is a view showing the structure of the wireless power transmitter according to one embodiment.
- [34] In FIG. 5, elements except for the transmission coil 21 and the transmission resonant coil 22 may be included in the power source 10 shown in FIG. 1.
- [35] As shown in FIG. 5, the wireless power transmitter according to one embodiment includes a signal generator 11, a transmission coil 21 connected to the signal generator 11 to form a magnetic field, a transmission resonant coil 22 coupled with the transmission coil 21 to transmit the power, a detection unit 19 for detecting the location of a coil of a receiving side, and a power regulator 12 for controlling the output of the power source based on the location of the coil of the receiving side.
- [36] In addition, the wireless power transmitter according to one embodiment may further include an amplifier 13 which transmits the output of the signal generator 11 by amplifying the output of the signal generator 11.
- [37] The detection unit 19 includes a first power detector 14 that detects an output of the

signal generator 11 to convert the output into DC current, a detection coil 15 for detecting intensity of a magnetic field transmitted from the transmission resonant coil 22, a second power detector 16 that converts the power, which is generated by the magnetic field detected from the detection coil 15, into DC current, and a comparator that compares the output of the first power detector 14 with the output of the second power detector 16 and transmits the comparison result to the power regulator 12.

[38] In addition, the detection unit 19 may further include an amplifier 17 for amplifying the DC current converted by the second power detector 16.

[39] The detection unit 19 measures the intensity of the magnetic field generated by the transmission coil. If the intensity of the magnetic field exceeds a reference value, the power regulator 12 determines that the coil of the receiving side may not approach the transmitter, so the power regulator 12 reduces the transmission power.

[40] When the receiver rarely receives the power because the receiver is located far away from the transmitter or when it is not necessary for the transmitter to generate the power because there is no receiver, the wireless power transmitter according to the embodiment automatically shuts off the power transmission by detecting the above situation.

[41] When the wireless power transmitter is installed in the room and a wireless power receiver is installed in a cellular phone or a notebook computer, if the cellular phone or the notebook computer does not exist in the room or is located far away from the wireless power transmitter, the transmission power of the wireless power transmitter is automatically reduced to prevent the power loss.

[42] The principle of the wireless power transmitter according to the embodiment is as follows. Referring to FIG. 5, the transmission resonant coil 22 stores power using resonance. The amount of energy stored in the transmission resonant coil 22 can be expressed as: input power $\times$ Q (quality factor). The Q value of the transmission resonant coil 22 may become lowered as the power received in the receiver is increased because the receiver approaches the transmitter.

[43] In addition, since the amount of the magnetic field generated from the transmission resonant coil 22 is proportional to the energy stored in the transmission resonant coil 22, the amount of the energy stored in the transmission resonant coil 22 may be reduced as the receiver approaches the transmitter, so the intensity of the magnetic field generated from the transmission resonant coil 22 is weakened. Thus, the amount of power detected by the detection coil 15 is also reduced.

[44] The detection coil 15 is coupled with the magnetic field generated from the transmission resonant coil 22 and the second power detector 16 converts the coupled magnetic field into a DC voltage signal. Since the DC voltage signal converted by the second power detector 16 is very low, the amplifier 17 amplifies the DC voltage signal.

- [45] The first power detector 14 may output a constant DC voltage.
- [46] Since the DC voltage output from the first power detector 14 is constant, the DC voltage can be used as a reference value. If the DC voltage output from the amplifier 17 or the second power detector 16 is constant, the output of the comparator 18 may have the constant value of high or low.
- [47] If the receiver moves far from the transmitter, the amount of the energy stored in the transmission resonant coil 22 is increased and the intensity of the magnetic field generated from the transmission resonant coil 22 is increased. That is, if the output of the comparator becomes high (or low) because the DC voltage output from the amplifier 17 exceeds a predetermined voltage level, the power regulator 12 outputs a power reduction signal based on the output of the comparator. The power reduction signal refers to a signal for reducing the transmission power and the power regulator 12 can reduce the power transmitted from the transmission coil 21 and the transmission resonant coil 22 or can make the power as zero by using the power reduction signal.
- [48] In contrast, if the output of the comparator becomes low (or high) because the DC voltage output from the amplifier 17 is less than the predetermined voltage level, the power regulator 12 outputs a power increase signal based on the output of the comparator. The power regulator 12 can increase the power transmitted from the transmission coil 21 and the transmission resonant coil 22 by using the power increase signal.
- [49] In other words, the output of the first power detector 14 is always kept in a constant level, so the output value of the first power detector 14 can be used as the reference value for detecting the approach of the receiving coil.
- [50] In addition, the output of the second power detector 16 may vary depending on the location of the coil of the receiving side. Preferably, the output of the second power detector 16 becomes reduced as the coil of the receiving side approaches the transmitter or becomes increased as the coil of the receiving side moves far away from the transmitter.
- [51] The comparator 18 compares the output value of the first power detector 14 with the output value of the second power detector 16 and outputs the high or low signal according to the comparison result. Preferably, the comparator 18 outputs the low (or high) signal when the output value of the first power detector 14 is equal to or higher than the output value of the second power detector 16. At this time, if the output value of the second power detector 16 becomes higher than the output value of the first power detector 14 because the coil of the receiving side moves far away from the transmitter, the comparator 18 outputs the high (or low) signal. That is, the high (or low) signal output from the comparator 18 signifies that the coil of the receiving side moves far away from the transmitter.

- [52] Upon receiving the high (or low) signal from the comparator 18, the power regulator 12 reduces the power transmitted from the transmission resonant coil 22 or makes the power as zero, thereby minimizing the power loss.
- [53] Therefore, the power loss can be reduced when there is no receiver or the receiver is located far away from the transmitter.
- [54] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.
- [55]
- [56]

Claims

- [Claim 1] A wireless power transmitter comprising:
a transmission coil for generating a magnetic field by receiving power from a power source;
a transmission resonant coil for transmitting power to a receiving coil by using the magnetic field generated from the transmission coil by using resonance;
a detection unit for detecting an approach of the receiving coil; and
a power regulator for adjusting an output of the power source, which supplies the power, based on the approach of the receiving coil detected by the detection unit.
- [Claim 2] The wireless power transmitter of claim 1, wherein the detection unit detects an intensity of the magnetic field transmitted from the transmission resonant coil and detects the approach of the receiving coil based on the detected intensity of the magnetic field.
- [Claim 3] The wireless power transmitter of claim 2, wherein the power regulator compares the detected intensity of the magnetic field with a predetermined reference value and reduces transmission power if the detected intensity of the magnetic field is equal to or higher than the reference value.
- [Claim 4] The wireless power transmitter of claim 2, wherein the power regulator compares the detected intensity of the magnetic field with a predetermined reference value and increases transmission power if the detected intensity of the magnetic field is less than the reference value.
- [Claim 5] The wireless power transmitter of claim 1, wherein the detection unit comprises:
a first power detector for converting the power of the power source into DC current;
a detection coil for detecting an intensity of the magnetic field transmitted from the transmission resonant coil;
a second power detector for converting the power generated by the magnetic field detected from the detection coil into DC current; and
a comparator for comparing an output of the first power detector with an output of the second power detector and transmitting a comparison result to the power regulator.
- [Claim 6] The wireless power transmitter of claim 5, further comprising an amplifier for amplifying the DC current converted by the second power

detector.

- [Claim 7] The wireless power transmitter of claim 1, further comprising an amplifier for amplifying the power supplied from the power source to transmit the power to the transmission coil.
- [Claim 8] The wireless power transmitter of claim 1, wherein each of the transmission coil and the transmission resonant coil comprises an inductor and a capacitor.
- [Claim 9] A wireless power receiver for wirelessly receiving power from a wireless power transmitter equipped with a detection unit, the wireless power receiver comprising:
a receiving resonant coil for receiving AC power from the wireless power transmitter by using resonance; and
a receiving coil for receiving the received AC power by using electro-magnetic induction,
wherein an approach of the receiving resonant coil to the wireless power transmitter is detected by the detection unit.
- [Claim 10] The wireless power receiver of claim 9, wherein the approach of the receiving resonant coil to the wireless power transmitter is detected based on an intensity of a magnetic field transmitted from a transmission resonant coil of the wireless power transmitter coupled with the receiving resonant coil.
- [Claim 11] The wireless power receiver of claim 10, wherein the power transmitted from the wireless power transmitter is adjusted based on the approach of the receiving resonant coil to the wireless power transmitter.
- [Claim 12] The wireless power receiver of claim 9, further comprising a rectifier circuit that receives the AC power from the receiving coil and rectifies the received AC power into DC power.
- [Claim 13] A wireless power transmission method comprising:
transmitting a magnetic field generated by power supplied from a power source;
checking a status of the transmitted magnetic field;
detecting an approach of a receiving coil that receives the magnetic field based on the status of the magnetic field; and
adjusting transmission power based on the approach of the receiving coil.
- [Claim 14] The wireless power transmission method of claim 13, wherein the checking of the status of the transmitted magnetic field comprises detecting an intensity of the transmitted magnetic field, and the

approach of the receiving coil is determined based on the detected intensity of the magnetic field.

[Claim 15]

The wireless power transmission method of claim 14, wherein the adjusting of the transmission power based on the approach of the receiving coil comprises:

comparing the detected intensity of the magnetic field with a predetermined reference value; and

reducing the transmission power if the detected intensity of the magnetic field is equal to or higher than the predetermined reference value

[Claim 16]

The wireless power transmission method of claim 15, wherein the comparing of the detected intensity of the magnetic field with the predetermined reference

value comprises:

converting a first power supplied from the power source into DC current;

generating the magnetic field by using the converted DC current;

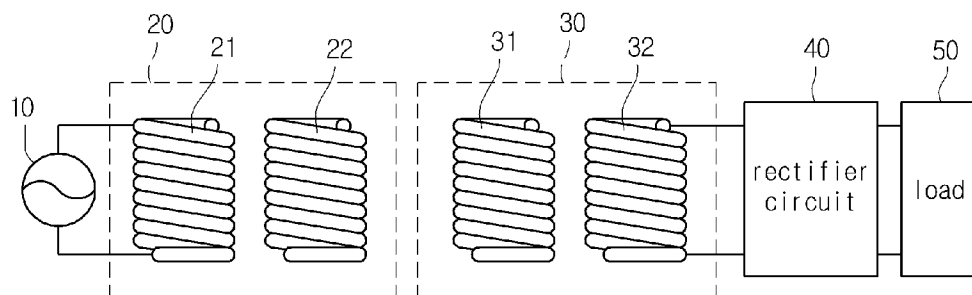
transmitting the magnetic field to the receiving coil;

detecting the intensity of the magnetic field transmitted to the receiving coil;

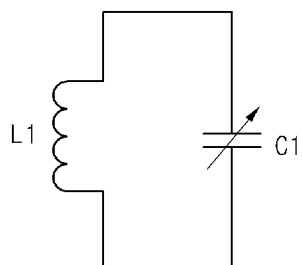
converting a second power, which is generated based on the intensity of the detected magnetic field, into the DC current; and

comparing a value of the first power converted into the DC current with a value of the second power converted into the DC current.

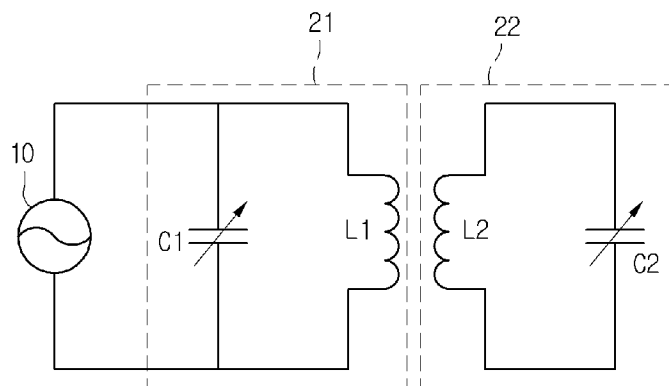
[Fig. 1]



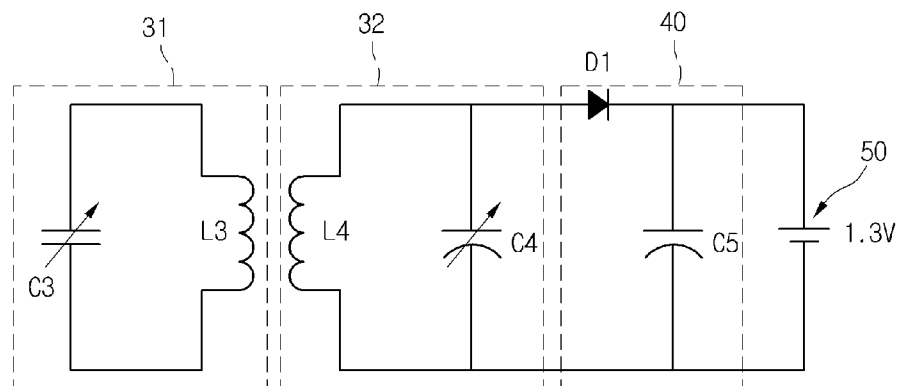
[Fig. 2]



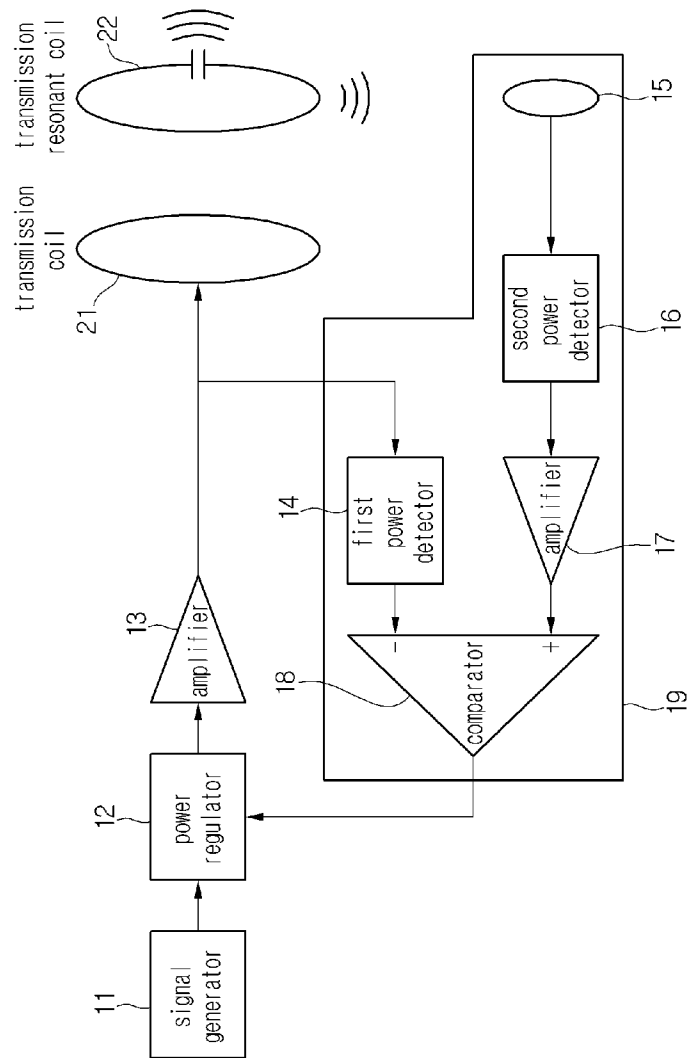
[Fig. 3]



[Fig. 4]



[Fig. 5]



A. CLASSIFICATION OF SUBJECT MATTER***H02J 17/00(2006.01)i***

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H02J 17/00; B60L 11/18; H02J 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: wireless power, magnetic field, detect, approach, regulate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2010-0244582 A1 (YOSHIKAWA HIROYASU) 30 September 2010 See the abstract; paragraphs [0033],[0044],[0051]; figure 1.	1-4,7-15 5-6,16
A	WO 2010-040015 A2 (ACCESS BUSINESS GROUP INTERNATIONAL LLC et al.) 08 April 2010 See the abstract; claims 1,2,9,25,38,40; figures 1,2,7.	1-16
A	JP 2006-288034 A (MATSUSHITA ELECTRIC IND CO., LTD.) 19 October 2006 See the abstract; claims 1-2.	1-16
A	KR 10-0874837 B1 (HANRIM POSTECH CO., LTD.) 18 December 2008 See the abstract; claim 1.	1-16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

11 OCTOBER 2012 (11.10.2012)

Date of mailing of the international search report

12 OCTOBER 2012 (12.10.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

WEE Jae Woo

Telephone No. 82-42-481-8540



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2012/003153

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0244582 A1	30.09.2010	None	
WO 2010-040015 A2	08.04.2010	AU 2009-298384 A1 AU 2009-298384 A2 CA 2739071 A1 CN 102239619 A EP 2347494 A2 JP 2012-504931 A KR 10-2011-0065552 A TW 201034334 A US 2010-0084918 A1 WO 2010-040015 A3	08.04.2010 30.06.2011 08.04.2010 09.11.2011 27.07.2011 23.02.2012 15.06.2011 16.09.2010 08.04.2010 27.05.2010
JP 2006-288034 A	19.10.2006	None	
KR 10-0874837 B1	18.12.2008	None	