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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2

CONFIRMATION NO. 7725

POWER OF ATTORNEY NOTICE

23557
SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
P.O. BOX 142950
GAINESVILLE, FL 32614

OC000000124758430

Date Mailed: 04/12/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/06/2021.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sstephanos/

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/673,763	08/10/2017	Ki Min Lee	0106.001POA1

CONFIRMATION NO. 7725

151145
Shami Messinger PLLC
1000 Wisconsin Ave. NW
Suite 200
Washington, DC 20007

POA ACCEPTANCE LETTER

OC000000124758455

Date Mailed: 04/12/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/06/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sstephanos/

PTO/AIA/123 (08-12)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

CHANGE OF CORRESPONDENCE ADDRESS
Patent

Address to:
Mail Stop Post Issue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Patent Number	10,153,666
Issue Date	12-11-2018
Application Number	15/673,763
Filing Date	08-10-2017
First Named Inventor	Ki Min Lee
Attorney Docket Number	0106.001POA1

Please change the Correspondence Address for the above-identified patent to:

☑ The address associated with Customer Number: 151145

OR

☐ **Firm *or* Individual Name**

Address

City | **State** | **ZIP**

Country

Telephone | **Email**

This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

This form will not affect any "fee address" provided for the above-identified patent. To change a "fee address" use the "Fee Address Indication Form" (PTO/SB/47).

I am the:

☐ Patentee.

☐ If the Patentee was not the applicant for patent (37 CFR 1.42), then a Statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is enclosed or was filed on _____. See 37 CFR 3.71.

☑ Attorney or agent of record. Registration Number 38,745.

☐ Patent practitioner acting in a representative capacity whose correspondence address is the correspondence address of record. Notice has been given to the patentee or owner. Registration Number 38,745.

Signature /Khaled Shami/

Typed or Printed Name KHALED SHAMI

Date April 6, 2021 | Telephone 202-516-6901

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	42375226
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Khaled Shami/Susanh Perez
Filer Authorized By:	Khaled Shami
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	06-APR-2021
Filing Date:	10-AUG-2017
Time Stamp:	15:31:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	01060000000_POASigned.pdf	1055768 a163da1e2fda2ffb59b2385b929b44750ed33a63	no	1

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	Pat_10153666_373_aia0096.pdf	137281 ac7bcdb00f348c841d6964a93782fa126e687819	no	3
Warnings:					
Information:					
3	Transmittal Letter	Pat_10153666_POA_Transmittal.pdf	212329 63619f979f904689804724ca766947ebc3cc3a39	no	1
Warnings:					
Information:					
4	Change of Address	Pat_10153666_aia0123.pdf	245957 eb798fe470838ec55f9a2a50c987d5fdaf5a0398	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1651335		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/83B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 151145

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Scramoge Technology Limited

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	FEB 19 2021
Name	Carlos Olona		
Title	Director		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: SCRAMOGE TECHNOLOGY LIMITED

Application No./Patent No.: 10,153,666 Filed/Issue Date: 12-11-2018

Titled: Wireless Power Receiver and Control Method Thereof

SCRAMOGE TECHNOLOGY LIMITED, a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: LEE, KI MIN, LEE, JUNG OH To: LG INNOTEK CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at

   Reel 029174, Frame 0295, or for which a copy thereof is attached.

2. From: LG INNOTEK CO., LTD. To: SCRAMOGE TECHNOLOGY LIMITED

   The document was recorded in the United States Patent and Trademark Office at

   Reel 055335, Frame 0652, or for which a copy thereof is attached.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Khaled Shami/	April 6, 2021
Signature	Date
Khaled Shami	38,745
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/673,763
Filing Date	08-10-2017
First Named Inventor	Ki Min Lee
Title	Wireless Power Receiver and Control Method Thereof
Art Unit	2836
Examiner Name	FLEMING, FRITZ M
Attorney Docket Number	0106.001POA1

SIGNATURE of Applicant or Patent Practitioner

Signature	/Khaled Shami/	Date (Optional)	
Name	Khaled Shami	Registration Number	38,745
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	12/11/2018	10153666	SUN.LGI.417D2	7725

23557 7590 11/20/2018

SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Ki Min Lee, Seoul, KOREA, REPUBLIC OF;
LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF;
Jung Oh Lee, Seoul, KOREA, REPUBLIC OF;

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23557 7590 08/16/2018
SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614
UNITED STATES OF AMERICA
Phone: (352) 375-8100 Fax:(352) 372-5800

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2	7725

TITLE OF INVENTION: Wireless Power Receiver and Control Method Thereof

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0	$0	$1000	11/16/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
FLEMING, FRITZ M	2836	307-104000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Saliwanchik, Lloyd & Eisenschenk
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: LG INNOTEK CO., LTD.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): SEOUL, KOREA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 190065 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date November 6, 2018
Typed or printed name Jeff Lloyd Registration No. 35,589

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	15673763
Filing Date:	10-Aug-2017
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Filer:	Jeff Lloyd/Megan Kuchenthal
Attorney Docket Number:	SUN.LGI.417D2

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt

EFS ID:	34229795
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Jeff Lloyd/Megan Kuchenthal
Filer Authorized By:	Jeff Lloyd
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	06-NOV-2018
Filing Date:	10-AUG-2017
Time Stamp:	17:37:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1000
RAM confirmation Number	110718INTEFSW00004451190065
Deposit Account	190065
Authorized User	Megan Kuchenthal
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	IFP-AF.pdf	141838 ece9595226b151fbb393382064 8d691dfe0c4811	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30220 3669e07d34d7effe214040683e52dca5dd23ccfd	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	172058		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

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SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614
UNITED STATES OF AMERICA

Courtesy Reminder for
Application Serial No: 15/673,763

Attorney Docket No: SUN.LGI.417D2
Customer Number: 23557
Date of Electronic Notification: 08/21/2018

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:
euspto@slepatents.com

To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

23557 7590 08/16/2018

SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614
UNITED STATES OF AMERICA

EXAMINER
FLEMING, FRITZ M

ART UNIT	PAPER NUMBER
2836	

DATE MAILED: 08/16/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2	7725

TITLE OF INVENTION: Wireless Power Receiver and Control Method Thereof

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0	$0	$1000	11/16/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23557 7590 08/16/2018
SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614
UNITED STATES OF AMERICA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2	7725

TITLE OF INVENTION: Wireless Power Receiver and Control Method Thereof

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0	$0	$1000	11/16/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
FLEMING, FRITZ M	2836	307-104000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2	7725

23557 7590 08/16/2018

SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614
UNITED STATES OF AMERICA

EXAMINER	
FLEMING, FRITZ M	
ART UNIT	PAPER NUMBER
2836	

DATE MAILED: 08/16/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/673,763	Applicant(s) LEE ET AL.	
	Examiner FRITZ M. FLEMING	Art Unit 2836	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment filed 4/30/18*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-29*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 4/20/18, 2/12/18
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/FRITZ M FLEMING/
Primary Examiner, Art Unit 2836

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-29 are allowed.

2. The following is an examiner's statement of reasons for allowance: The amendment and response has clarified the claimed subject matter and shown that there is no new matter. Hence the status of CON is correct. The added description clarifies the layers, and the separation distance is merely descriptive of, for example, paragraphs 56 and 64, in that layers are inherently spaced apart by a separation distance.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRITZ M. FLEMING whose telephone number is (571)272-4145. The examiner can normally be reached on M-F, 0900-1730.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford N. Barnie can be reached on 571-272-7492. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FRITZ M FLEMING
Primary Examiner
Art Unit 2836

/FRITZ M FLEMING/
Primary Examiner, Art Unit 2836

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	15/673,763
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	2836
Examiner Name	Fritz M. Fleming
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Foreign Patent Document Country Code [3] - Number [4] - Kind Code [5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	F1	EP-0790667-A1 (with English Abstract)	08-20-1997	SCHLUMBERGER IND SA	ALL	

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. [1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	R1	Communication dated February 6, 2018 in European Application No. 12189931.4.	

Examiner Signature	/FRITZ M FLEMING/	Date Considered	08/05/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.
This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

J:\SUN\LGI\417D2\IDS-Refs\4-20-2018\PTO-SB-08(4).doc/mrk

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.M.F/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	15/673,763
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	2836
Examiner Name	Fritz M. Fleming
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code [2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U1	9,461,364-B2	10-04-2016	Lee *et al.*	ALL

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Foreign Patent Document Country Code [3] - Number [4] - Kind Code [5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T [6]
	F1	KR-10-2010-0067748-A (with English Abstract)	06-22-2010	HANRIM POSTECH CO., LTD	ALL	
	F2	JP-2009-247124-A (with English Abstract)	10-22-2009	PANASONIC CORP	ALL	
	F3	CN-101983466-A (with English Abstract)	03-02-2011	PANASONIC CORP	ALL	
	F4	CN-101517666-A (with English Abstract)	08-26-2009	PHILIPS INTELLECTUAL PROPERTY; KONINKLIJKE PHILIPS ELECTRONICS N.V	ALL	
	F5	CN-101286411-A (with English Abstract)	10-15-2008	SEIKO EPSON CORP	ALL	

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. [1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T [2]
	R1	Office Action dated November 28, 2017 in Korean Application No. 10-2014-0081260.	
	R2	Office Action dated January 5, 2018 in Chinese Application No. 201610451640.3.	
	R3	Office Action dated January 11, 2018 in U.S. Application No. 15/195,390.	

Examiner Signature	/FRITZ M FLEMING/	Date Considered	08/05/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.
This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

J:\SUN\LGI\417D2\IDS-Refs\2-12-2018\PTO-SB-08(3).doc/mrk

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.M.F/

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	Art Unit
	FRITZ M FLEMING	2836

CPC- SEARCHED		
Symbol	Date	Examiner
H02J50/5,10,12,70,80	12/28/2017	FMF
H04B5/0037,0087	12/28/2017	FMF

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST, PLUS, reviwed parent applications/patent.	12/28/2017	FMF
Updated search.	8/6/2018	FMF

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	See interference search printout.	8/6/2018	FMF

	/FRITZ M FLEMING/ Primary Examiner.Art Unit 2836

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	Art Unit
	FRITZ M FLEMING	2836

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/28/2017	08/06/2018							
1	1	✓	=							
2	2	✓	=							
3	3	✓	=							
4	4	✓	=							
5	5	✓	=							
6	6	✓	=							
7	7	✓	=							
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29	25	✓	=							
21	26	✓	=							
22	27	✓	=							
24	28	✓	=							
25	29	✓	=							

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	**Art Unit**
	FRITZ M FLEMING	2836

CPC							
Symbol						**Type**	**Version**
H02J		50	/	12		F	2016-02-01
H02J		50	/	10		A	2016-02-01
H01Q		1	/	526		I	2013-01-01
H01Q		7	/	00		I	2013-01-01
G06K		19	/	0708		I	2013-01-01
G06K		19	/	0715		I	2013-01-01
G06K		19	/	07783		I	2013-01-01
H01Q		1	/	2225		I	2013-01-01
H04B		5	/	0031		I	2013-01-01
H04B		5	/	0037		I	2013-01-01
H04B		5	/	0087		I	2013-01-01
H02J		50	/	80		I	2016-02-01
H02J		7	/	025		I	2013-01-01
H02J		7	/	045		I	2013-01-01
H02J		50	/	70		I	2016-02-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	29	
/FRITZ M FLEMING/ Primary Examiner.Art Unit 2836	08/06/2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	**Art Unit**
	FRITZ M FLEMING	2836

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		H	0	2	J	50 / 12 (2016.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 29	
/FRITZ M FLEMING/ Primary Examiner.Art Unit 2836 (Primary Examiner)	08/06/2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 10

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	**Art Unit**
	FRITZ M FLEMING	2836

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	17	17												
2	2	18	18												
3	3	19	19												
4	4	20	20												
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11	11	22	27												
12	12	24	28												
13	13	25	29												
14	14														
15	15														
16	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 29	
/FRITZ M FLEMING/ Primary Examiner.Art Unit 2836 (Primary Examiner)	08/06/2018 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 10

I hereby certify that this correspondence is being electronically transmitted via EFS to the United States Patent and Trademark Office on the date shown below:

30 APRIL 2018

Jeff Lloyd, Patent Attorney, Reg. No. 35,589

AMENDMENT UNDER 37 C.F.R. §1.111
Examining Group 2836
Patent Application
Docket No. SUN.LGI.417D2
Serial No. 15/673,763

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner	:	Fritz M. Fleming
Art Unit	:	2836
Applicants	:	Ki Min Lee, Jung Oh Lee
Serial No.	:	15/673,763
Filed	:	August 10, 2017
Confirm. No.	:	7725
For	:	Wireless Power Receiver and Control Method Thereof

Mail Stop **Amendment**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. §1.111

Sir:

Applicants request that the period for response be extended one month through and including May 10, 2018, the fee for which was paid at the time this Amendment was filed.

In response to the Office Action dated January 10, 2018, please amend the application identified above as follows:

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In the Specification

Please amend paragraph [0083] as follows:

First, referring to FIG. 9, after the short-range communication antenna 340 has been disposed ~~on~~ in the printed circuit board 301, the shielding unit 380 may be attached to one side of the printed circuit board 301 with an adhesive. The printed circuit board 301 comprises a plurality of layers wherein each layer of the plurality of layers is spaced apart from adjacent layers. The shielding unit 380 is disposed under the short-range communication antenna 340 or the receiving coil 310 (not shown in the Fig. 9).

Please amend paragraph [0084] as follows:

Referring to FIG. 10, the printed circuit board 301 comprises a plurality of layers wherein each layer of the plurality of layers is spaced apart from adjacent layers, the short-range communication antenna 340 or the receiving coil 310 (not shown in the Fig. 10) is disposed in the printed circuit board 301. Moreover, the shielding unit 380 is disposed in the printed circuit board 301. The shielding unit 380 is disposed under the receiving coil 310 or the short-range communication antenna 340. The receiving coil 310 (not shown in the Fig. 10), the short-range communication antenna 340, and the shielding unit 380 are disposed between the plurality of layers of the printed circuit board 301. ~~while~~ While the procedure of disposing the short-range communication antenna 340 or receiving coil(310)(not shown in the Fig. 10) in the printed circuit board 301 is being performed, the shielding unit 380 may be inserted into the printed circuit board 301. That is, unlike FIG. 9, since the shielding unit 380 is disposed in the printed circuit board 301, the procedure of disposing the shielding unit 380 may be included in the procedure of disposing the short-range communication antenna 340 without performing the procedure of disposing the shielding unit 380 at one side of the printed circuit board 301. That is, as described above, according to the embodiment shown in FIG. 8, when the shielding unit 380 is inserted into the printed circuit board 301, the entire thickness of

the wireless power receiver 300 may be reduced corresponding to the thickness of the adhesive 303. Thus, a separate procedure of attaching the shielding unit 380 is not necessary, so the manufacturing process may be simplified.

Remarks

Claims 1-29 are pending in the subject application. The specification has been amended. The amendments to the specification have been made in an effort to lend greater clarity to the claimed subject matter without introducing any new matter, thereby maintaining the subject application as a continuation application, not a continuation-in-part application, of the U.S. Patent Application No. 13/658,116 (now U.S. Patent No. 9,461,364). Upon entry of these amendments, claims 1-29 will be before the Examiner. Favorable consideration of the pending claims is respectfully requested.

Telephonic Interview of March 28, 2018

Applicants wish to thank Examiner Fleming for the courtesy extended to Applicants' representative, Justin Y. Gao, during the telephonic conference of March 28, 2018. During the interview, proposed amendments to the specification were discussed. The Examiner agreed that the amendments to the specification as presented herein would overcome the rejections and the objections set forth in the outstanding Office Action, would not constitute new matter, and are supported by the parent applications (U.S. Serial Nos. 13/658,116 and 15/195,390). The remarks and amendments set forth herein are consistent with the substance of the interview, and this paragraph constitutes a summary thereof.

Objection to the drawings

The drawings have been objected to. Applicants respectfully submit that the amendments to the specification obviate this objection. Moreover, Figures 9 and 10 of the subject application are also found in the parent application U.S. Patent Application Serial No. 13/658,116 (now as U.S. Patent No. 9,461,364), to which the subject application claims priority. Accordingly, Applicants respectfully request reconsideration and withdrawal of this objection.

Objection to the specification

The specification has been objected to. In view of the amendments to the specification presented herein, Applicants respectfully request reconsideration and withdrawal of this objection.

Rejection of claims 1-29 under 35 U.S.C. §112, first paragraph

Claims 1-29 have been rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Applicants respectfully request reconsideration.

The specification has been amended as indicated above. MPEP 2163.07(a) provides that "by disclosing in a patent application a device that inherently performs a function or has a property, operates according to a theory or has an advantage, a patent application necessarily discloses that function, theory or advantage, even though it says nothing explicit concerning it. The application may later be amended to recite the function, theory or advantage without introducing prohibited new matter" (*In re Reynolds*, 443 F.2d 384, 170 USPQ 94 (CCPA 1971); *In re Smythe*, 480 F. 2d 1376, 178 USPQ 279 (CCPA 1973); *Yeda Research and Dev. Co. v. Abbott GMBH & Co.*, 837 F.3d 1341, 120 USPQ2d 1299 (Fed. Cir. 2016) ('Under the doctrine of inherent disclosure, when a specification describes an invention that has certain undisclosed yet inherent properties, that specification serves as adequate written description to support a subsequent patent application that explicitly recites the invention's inherent properties.' (citing *Kennecott Corp. v. Kyocera Int'l, Inc.*, 835 F.2d 1419, 1423 (Fed. Cir. 1987))).

In the subject application, a person of ordinary skill in the art would understand and recognize from the original disclosure of the subject application, and of the parent applications (U.S. Serial Nos. 13/658,116 and 15/195,390), that the sentences added to paragraphs [0083] and [0084] by this Amendment are only to clarify and describe features that were already shown in Figures 9 and 10 and/or inherent based on the full disclosure of the subject application, which is the same as that of the parent applications. That is, the subject application is a continuation application, not a continuation-in-part application, of U.S. Serial No. 15/195,390, which is a continuation of U.S. Serial No. 13/658,116. Also, as discussed above, the amendments to the specification presented herein introduce no new matter.

Applicants submit that the claims as currently presented satisfy the requirements of 35 U.S.C. §112, first paragraph. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 1-29 under 35 U.S.C. §112, first paragraph.

Rejection of claims 1-29 under 35 U.S.C. §112, second paragraph

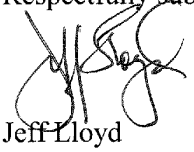
Claims 1-29 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In view of the discussion above with respect to the rejection under 35 U.S.C. §112, first paragraph, and with respect to the objections to the drawings and specification, Applicants respectfully request reconsideration and withdrawal of this rejection.

In view of the foregoing remarks and amendments to the claims, Applicants believe that the claims as currently pending are in condition for allowance, and such action is respectfully requested.

Applicants invite the Examiner to call the undersigned if clarification is needed on any of this response, or if the Examiner believes a telephonic interview would expedite the prosecution of the subject application to completion.

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 or 1.17 as required by this paper to Deposit Account 19-0065.

Respectfully submitted,



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A Professional Association
P.O. Box 142950
Gainesville, FL 32614-2950

JL/mrk/jyg/lcf

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Electronic Patent Application Fee Transmittal

Application Number:	15673763
Filing Date:	10-Aug-2017
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Filer:	Jeff Lloyd/Megan Kuchenthal
Attorney Docket Number:	SUN.LGI.417D2

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
		Total in USD ($)		**200**

Electronic Acknowledgement Receipt

EFS ID:	32488403
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Jeff Lloyd/Megan Kuchenthal
Filer Authorized By:	Jeff Lloyd
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	30-APR-2018
Filing Date:	10-AUG-2017
Time Stamp:	16:14:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$200
RAM confirmation Number	050118INTEFSW00023519190065
Deposit Account	190065
Authorized User	Megan Kuchenthal
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Response1.pdf	379507 c6ff22b5ccbde1650eea2a72a13c66cd074c8eb5	yes	6

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Specification	2	3
Applicant Arguments/Remarks Made in an Amendment	4	6

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30706 3a9aa49f898fddcea7e1ca123236f9d43edd9ee6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	410213		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/673,763	Filing Date 08/10/2017	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $80 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $420 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/30/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 29	Minus	** 29	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
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	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
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	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
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** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	monique benjamin
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 1 of 1

Complete if Known	
Application Number	15/673,763
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	2836
Examiner Name	Fritz M. Fleming
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Foreign Patent Document Country Code [3] - Number [4] - Kind Code [5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	F1	EP-0790667-A1 (with English Abstract)	08-20-1997	SCHLUMBERGER IND SA	ALL	

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. [1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	R1	Communication dated February 6, 2018 in European Application No. 12189931.4.	

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Espacenet

Bibliographic data: EP0790667 (A1) — 1997-08-20

Method for realisation of a portable object with a coil antenna

Inventor(s): CATTE ETIENNE [FR] ± (CATTE, ETIENNE)

Applicant(s): SCHLUMBERGER IND SA [FR] ± (SCHLUMBERGER INDUSTRIES, ; SCHLUMBERGER SYSTEMES)

Classification: **- international:** ***B42D15/10; G06K19/07; G06K19/077; H01Q1/22; H01Q7/00; H04B5/02;*** (IPC1-7): G06K19/077; H01Q1/22; H01Q7/00

- cooperative: **G06K19/07749; G06K19/0775; G06K19/07779; G06K19/07781; H01Q1/22; H01Q1/2225; H01Q7/00**

Application number: EP19970400251 19970205 Global Dossier

Priority number(s): FR19960001760 19960213

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Abstract of EP0790667 (A1)

A portable card (10) with wound antenna is made in lower and upper halves (10a,10b). The two halves are moulded and the lower half (10a) has a central raised platform (11) which serves as a mandrel for a coil to be wound (20) by rotation. The central raised platform (11) has a space (12) which houses a printed circuit (13) whose contacts (14a,14b) are soldered to the ends of the wound antenna. The upper half (10b) of the portable card is located by lugs and holes (16a,16b) and secured ultrasonically or by glueing or clipping.

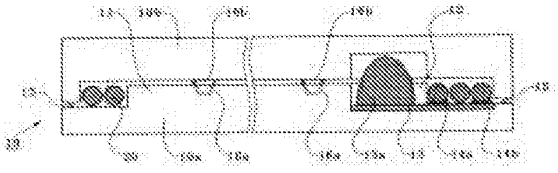

FIG. 4

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(54) Procédé de réalisation d'un objet portatif à antenne bobinée

(57) Selon l'invention, le procédé de réalisation d'un objet portatif en forme de carte comporte au moins une antenne bobinée et comprend les étapes suivantes :

- réalisation d'un premier et d'un deuxième demi-corps de carte, le premier demi-corps de carte présentant un noyau au gabarit de l'antenne,
- bobinage direct de l'antenne autour du noyau du premier demi-corps de carte,
- assemblage des deux demi-corps de carte.

Application à la fabrication d'objets portatifs à antenne comme par exemple les cartes sans contact, notamment les cartes sans contact au format ISO 7816.

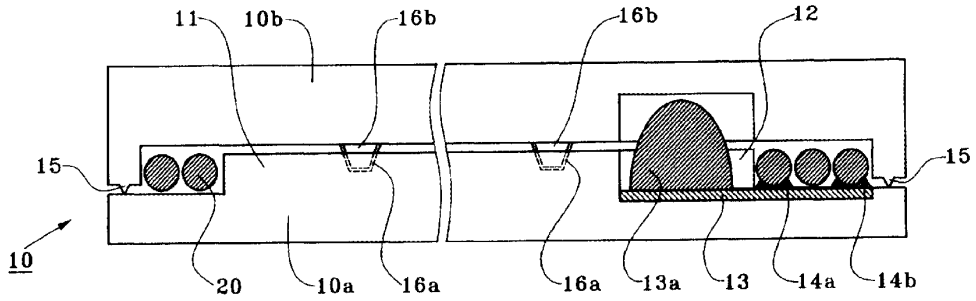

FIG. 4

EP 0 790 667 A1

Printed by Jouve, 75001 PARIS (FR)

Description

La présente invention concerne un procédé de réalisation d'un objet portatif en forme de carte et comportant au moins une antenne bobinée.

L'invention trouve une application particulièrement avantageuse dans le domaine de la fabrication d'objets portatifs à antenne comme par exemple les cartes sans contact, notamment les cartes sans contact au format ISO 7816.

Actuellement, la plupart des procédés utilisé pour réaliser des cartes à antenne bobinée consistent d'abord, à l'aide d'un outillage spécifique, à bobiner une antenne et à la préformer, puis à l'insérer dans un corps de carte dans lequel on aura préalablement aménagé une gorge apte à recevoir l'antenne ainsi bobinée. Ladite gorge peut, par exemple, être obtenue par laminage d'une feuille formant le fond de la gorge et sur laquelle sont disposés un cadre et un noyau formant les parois latérales de la gorge.

Toutefois, ces procédés connus présentent l'inconvénient d'exiger la mise en oeuvre de trois opérations successives coûteuses en temps et en main d'oeuvre. D'autre part, on peut remarquer que chaque gabarit d'antenne nécessite un outillage particulier.

Aussi, le problème technique à résoudre par l'objet de la présente invention est de proposer un procédé de fabrication d'un objet portatif en forme de carte et comportant au moins une antenne bobinée, procédé qui permettrait, par rapport aux procédés de l'état de la technique, de limiter le nombre d'opérations à effectuer et de simplifier les outillages.

La solution au problème technique posé consiste, selon la présente invention, en ce que ledit procédé comprend les étapes suivantes :

- réalisation d'un premier et d'un deuxième demi-corps de carte, ledit premier demi-corps de carte présentant un noyau au gabarit de ladite antenne.
- bobinage direct de l'antenne autour du noyau du premier demi-corps de carte,
- assemblage des deux demi-corps de carte.

Ainsi, le procédé de l'invention permet de réaliser l'antenne de l'objet portatif en une seule opération de bobinage sans qu'il soit nécessaire de la préformer ni de l'insérer dans une gorge. Il en résulte une réduction sensible de temps et de main-d'oeuvre. D'autre part, un avantage supplémentaire de l'invention réside dans le fait que le seul outillage à prévoir est une bobineuse universelle, utilisable quelque soit le gabarit de l'antenne, et sur laquelle le premier demi-corps de carte est monté directement en guise de mandrin.

D'une manière générale, l'antenne réalisée conformément au procédé de l'invention sera destinée à être couplée à un circuit imprimé portant les différents sous-ensembles nécessaires au fonctionnement de l'objet portatif, tels que composants électroniques, piles, etc.

C'est pourquoi l'invention prévoit que ledit procédé comprend également une étape de montage d'un circuit imprimé à l'intérieur d'une cavité aménagée dans le premier demi-corps de carte, chaque extrémité de l'antenne étant reliée à une plage de connexion dudit circuit imprimé.

Selon un premier mode de réalisation, le circuit imprimé est monté à l'intérieur de ladite cavité après bobinage, les extrémités de l'antenne étant reliées simultanément auxdites plages de connexion.

Selon un deuxième mode de réalisation, le circuit imprimé est monté à l'intérieur de ladite cavité avant bobinage, une première extrémité de l'antenne étant reliée à une première plage de connexion avant bobinage et une deuxième extrémité de l'antenne étant reliée à une deuxième plage de connexion après bobinage.

La description qui va suivre en regard des dessins annexés, donnés à titre d'exemples non limitatifs, fera bien comprendre en quoi consiste l'invention et comment elle peut être réalisée.

La figure 1 est une vue en perspective de deux demi-corps d'une carte destinée à recevoir une antenne réalisée conformément au procédé de l'invention.

La figure 2 est une vue de côté du premier demi-corps de la carte de la figure 1 montée sur une bobineuse.

La figure 3a est une vue de côté du premier demi-corps de carte de la figure 2 dans lequel est monté un circuit imprimé après bobinage de l'antenne.

La figure 3b est une vue de côté du premier demi-corps de carte de la figure 2 dans lequel est monté un circuit imprimé avant bobinage de l'antenne.

La figure 4 est une vue de côté d'une carte sans contact réalisée conformément à l'invention.

Les figures 5a et 5b sont respectivement une vue de dessus et une vue de côté d'une carte avec contact extérieur, réalisée conformément à l'invention.

La figure 6 est une vue de côté d'une carte à deux antennes réalisée conformément au procédé de l'invention.

La figure 1 montre en perspective un objet portatif 10 en forme de carte destiné à recevoir une antenne bobinée. Cet objet portatif, que l'on appellera "carte" dans la suite de ce mémoire, est fabriqué selon un procédé qui consiste, dans une première étape, à réaliser, par moulage par exemple, un premier 10a et un deuxième 10b demi-corps de carte qui, lorsqu'ils sont assemblés, constituent une carte complète de forme sensiblement parallélipipédique.

Comme on peut le voir sur la figure 1, le premier demi-corps 10a de carte présente un noyau 11 faisant saillie par rapport au plan général P du demi-corps 10a. Ce noyau 11 est prévu au gabarit de l'antenne à réaliser, laquelle est obtenue par bobinage direct de l'antenne autour du noyau 11.

Plus précisément, ainsi que l'indique la figure 2, le premier demi-corps 10a de carte est monté directement sur une bobineuse, non représentée, et sert alors de

mandrin. Un fil 20 est bobiné par entraînement autour du noyau 11 suite au mouvement de rotation autour de l'axe A du demi-corps 10a de carte. Le fil 20 peut être freiné lors du bobinage, d'une part pour obtenir une bonne tenue mécanique, et, d'autre part, pour compenser le fait que la vitesse linéaire de bobinage n'est pas constante car le noyau n'est généralement pas cylindrique. Enfin, un guide 30 peut être amené en contact avec le demi-corps 10a pour s'assurer que le fil 20 reste en contact avec le plan P pendant le bobinage.

Les objets portatifs concernés par l'invention seront le plus souvent des cartes dans lesquelles l'antenne doit être reliée à un circuit imprimé portant les divers sous-ensembles nécessaires au fonctionnement des cartes, à savoir les composants électroniques de traitement des signaux reçus via l'antenne ou l'élaboration des signaux à émettre également via ladite antenne et, éventuellement des piles d'alimentation.

A cet effet, une cavité 12, visible sur les figures 1 et 2, destinée à recevoir ledit circuit imprimé est aménagée dans le premier demi-corps 10a de carte d'une manière telle à permettre la liaison électrique entre chaque extrémité de l'antenne et une plage de connexion du circuit imprimé.

Le circuit imprimé peut être monté dans le premier demi-corps 10a après ou avant le bobinage de l'antenne.

La figure 3a illustre le cas où le circuit imprimé 13 est monté après bobinage de l'antenne. Les extrémités du fil 20 sont soudées sur les plages 14a, 14b de connexion du circuit imprimé en dehors du demi-corps 10a de carte, puis le circuit 13 est replié dans la cavité 12, les composants 13a étant en-dessous et la boucle de fil 20 ainsi créée venant se loger dans la cavité 12.

Si, comme le montre la figure 3b, le circuit imprimé est monté dans la cavité 12 avant bobinage de l'antenne, une première extrémité du fil 20 est d'abord soudée sur une première plage 14a de connexion du circuit imprimé 13. Puis, on bobine l'antenne autour du noyau 11, conformément au procédé de l'invention. La deuxième extrémité du fil 20 est alors soudée sur la deuxième plage 14b de connexion du circuit imprimé 13. Le fil 20 peut être choisi de type auto-dénudant de façon à faciliter la liaison avec le circuit imprimé 13 accueillant les autres composants 13a de la carte. Contrairement à l'exemple de la figure 3a, le circuit imprimé 13 est alors au fond de la cavité 12. On a intérêt dans ce cas à utiliser un circuit imprimé à pistes argentées afin de pouvoir souder sans difficulté sur le même circuit les extrémités du fil 20 d'antenne et les connexions des composants électroniques.

Le fil 20 peut de plus être classiquement de type thermo-adhérent. Une courte mise sous tension de l'antenne ou un passage en étuve permet alors de solidariser l'antenne avec le deuxième demi-corps 10a de carte. Le choc électrique est effectué avant la soudure de la deuxième extrémité du fil 20 pour ne pas détériorer les composants 13a montés sur le circuit imprimé 13.

Pour les diamètres de fil importants, supérieurs à 0,25mm, il peut être délicat, voire même impossible, de ramener le brin de la spire extérieure sur la spire intérieure tant en respectant l'épaisseur de 0,76 mm de la carte.

Il y aura alors avantage à utiliser la configuration illustrée sur la figure 4 qui consiste à faire déboucher la cavité 12 de manière à ce que le circuit imprimé 13 de faible épaisseur, 0,1 mm par exemple, passe sous les spires du bobinage. On soude donc les extrémités du fil 20 sur les plages 14a, 14b de connexion à l'extérieur de la cavité 12. Une piste du circuit 13 se charge de faire la liaison avec les autres composants électroniques 13a. Cette piste est courte et peut être large, ce qui permet malgré sa faible épaisseur de ne pas faire chuter le facteur de qualité de bobinage.

Après bobinage de l'antenne, montage du circuit imprimé et soudage de l'antenne sur le circuit, le deuxième demi-corps 10b de carte peut alors être rapporté pour former la carte 10. L'assemblage des premier et deuxième demi-corps de carte est réalisé par collage ou par ultra-sons. Dans ce dernier cas, on aura pris soin d'inclure un concentrateur 15 d'énergie à la périphérie du deuxième demi-corps 10b de carte, par exemple.

Pour assurer un bon positionnement des deux demi-corps 10a, 10b l'un par rapport à l'autre, des pions 16b de centrage et des trous borgnes 16a aptes à recevoir lesdits pions de centrage seront prévus lors du moulage des demi-corps de carte. Ces pions 16b peuvent éventuellement être conçus pour permettre un assemblage des demi-corps 10a, 10b par clipsage des pions dans les trous borgnes 16a.

On a représenté sur la figure 4 et les suivantes des bobinages avec des fils de fort diamètre sur un seul plan, ceci afin de bien montrer que, même dans ce cas, il était possible d'obtenir des épaisseurs de carte respectant la norme ISO 7816. Bien entendu, les principes du procédé décrit restent valables pour des bobinages réalisés avec des fils de faible diamètre sur plusieurs couches. La mise en oeuvre est alors plus aisée car on peut ramener le brin de la spire extérieure vers l'intérieur sans précaution particulière.

La carte 10 de la figure 4 est une carte à antenne sans contact en ce sens qu'elle n'est pas destinée à être introduite dans un lecteur quelconque. Les figures 5a et 5b illustrent au contraire le cas d'une carte à antenne avec contact extérieur. Dans cet exemple de réalisation, la cavité 12 débouche à l'extérieur du premier demi-corps 10a de carte. Le circuit 13 portant les composants 13a est muni de plages de contact extérieures selon des techniques bien connues dans le domaine des cartes à mémoire électronique. Après montage du circuit 13 ainsi équipé à l'intérieur de la cavité 12, le bobinage du fil 20 d'antenne est effectué puis le deuxième demi-corps 10b de carte est assemblé avec le premier demi-corps 10a de la même manière que pour la carte sans contact de la figure 4.

On peut être amené également à vouloir réaliser

deux antennes superposées dont une partie des surfaces intérieures sont en regard l'une de l'autre, par exemple pour assurer le couplage mutuel entre les deux antennes. La figure 6 montre comment l'invention s'applique à ce mode de réalisation particulier.

Le circuit 13 fonctionne à deux fréquences différentes. L'antenne dédiée à la fréquence haute est réalisée en premier par bobinage du fil 20a autour du noyau 1la. Puis, la même opération est effectuée pour l'antenne basse fréquence à l'aide du fil 20b de diamètre plus faible, bobiné autour du noyau IIb sur un nombre de tours plus grand. Cette antenne basse fréquence est connectée au circuit intégré 13 à travers un passage 17 reliant la cavité 12 à la périphérie du noyau 11b. Le circuit 13 est monté en premier, mais pourrait être monté à la fin, dans le sens contraire.

Revendications

1. Procédé de réalisation d'un objet portatif (10) en forme de carte et comportant au moins une antenne bobinée, caractérisé en ce que ledit procédé comprend les étapes suivantes :

   - réalisation d'un premier (10a) et d'un deuxième (10b) demi-corps de carte, ledit premier demi-corps (10a) de carte présentant un noyau (11) au gabarit de ladite antenne,
   - bobinage direct de l'antenne autour du noyau (11) du premier demi-corps (10a) de carte,
   - assemblage des deux demi-corps (10a, 10b) de carte.

2. Procédé selon la revendication 1, caractérisé en ce que lesdits premier (10a) et deuxième (10b) demi-corps de carte sont réalisés par moulage.

3. Procédé selon la revendication 2, caractérisé en ce que lesdits premier (10a) et deuxième (10b) demi-corps de carte comportent des pions (16b) de centrage et des trous borgnes (16a) aptes à recevoir lesdits pions (16b) de centrage.

4. Procédé selon la revendication 3, caractérisé en ce que les premier (10a) et deuxième (lOb) demi-corps de carte sont assemblés par clipsage des pions (16b) de centrage dans lesdits trous borgnes (16a).

5. Procédé selon l'une quelconque des revendications 1 à 3, caractérisé en ce que les premier (10a) et deuxième (10b) demi-corps de carte sont assemblés par collage.

6. Procédé selon l'une quelconque des revendications 1 à 3, caractérisé en ce que les premier (10a) et deuxième (10b) demi-corps de carte sont assemblés par ultrasons.

7. Procédé selon l'une quelconque des revendications 1 à 6, caractérisé en ce que ledit procédé comprend également une étape de montage d'un circuit imprimé (13) à l'intérieur d'une cavité (12) aménagée dans le premier (10a) demi-corps de carte, chaque extrémité de l'antenne étant reliée à une plage (14a, 14b) de connexion dudit circuit imprimé.

8. Procédé selon la revendication 7, caractérisé en ce que le circuit imprimé (13) est monté à l'intérieur de ladite cavité (12) après bobinage, les extrémités de l'antenne étant reliées simultanément auxdites plages (14a, 14b) de connexion.

9. Procédé selon la revendication 7, caractérisé en ce que le circuit imprimé (13) est monté à l'intérieur de ladite cavité (12) avant bobinage, une première extrémité de l'antenne étant reliée à une première plage (14a) de connexion avant bobinage et une deuxième extrémité de l'antenne étant reliée à une deuxième plage (14b) de connexion après bobinage.

10. Procédé selon l'une quelconque des revendications 1 à 9, caractérisé en ce que ladite antenne est réalisée en fil (20) thermo-adhérent.

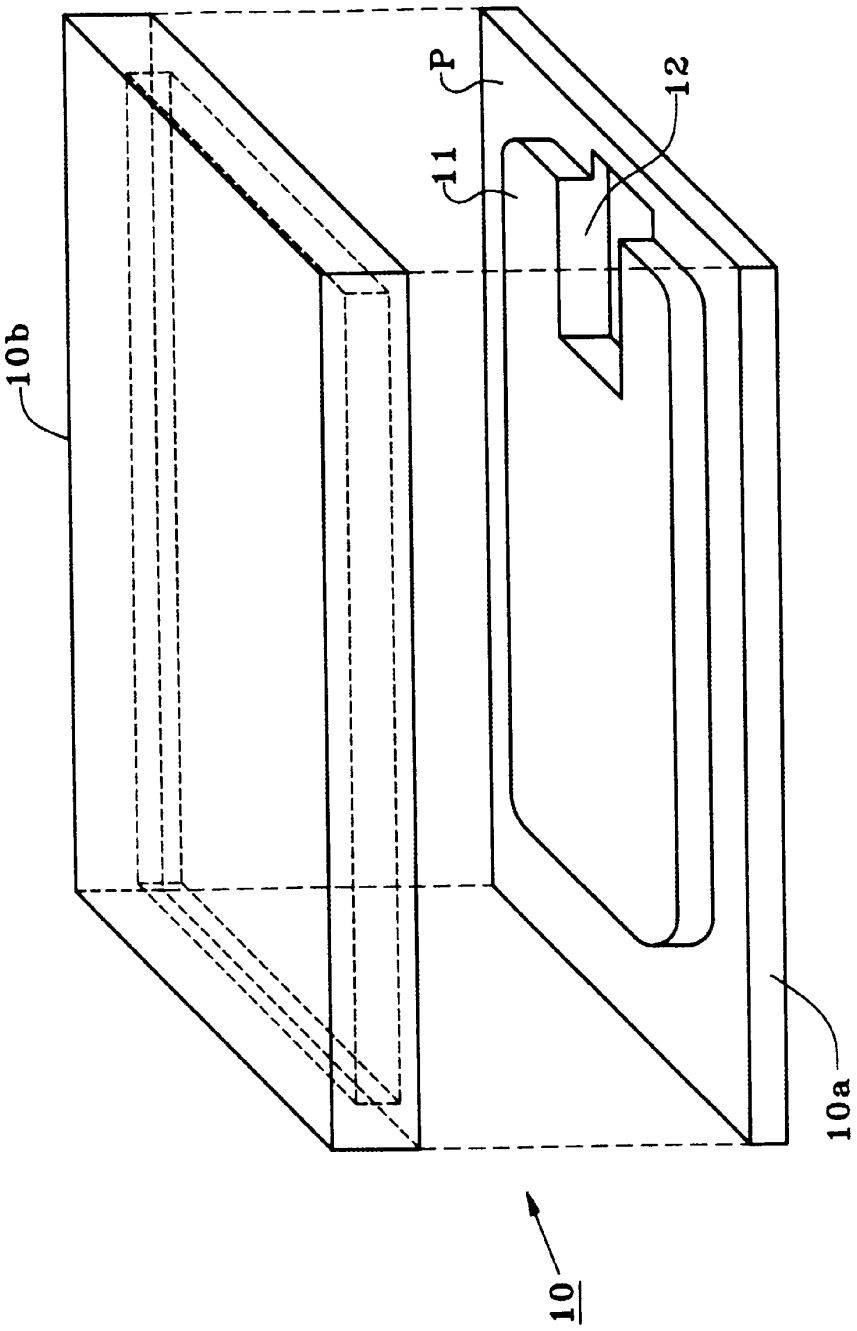

FIG. 1

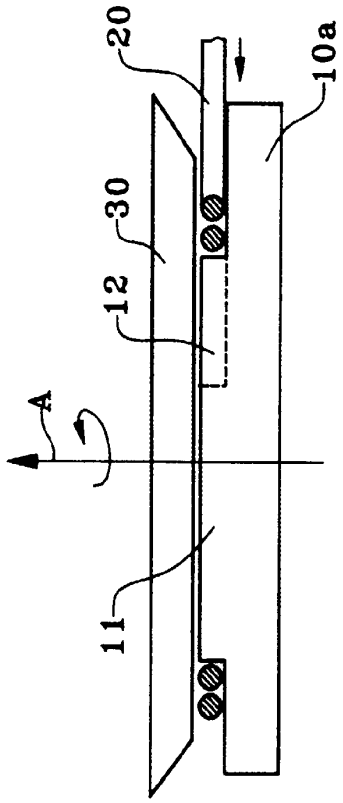

FIG. 2

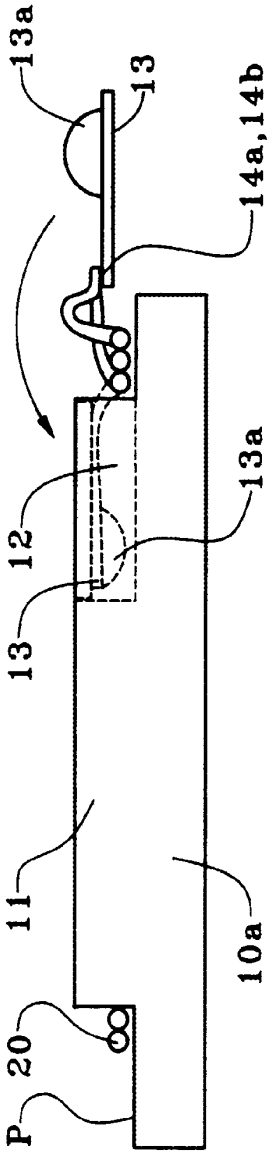

FIG. 3a

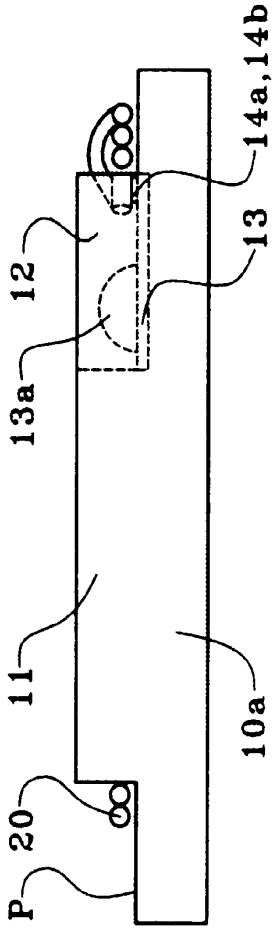

FIG. 3b

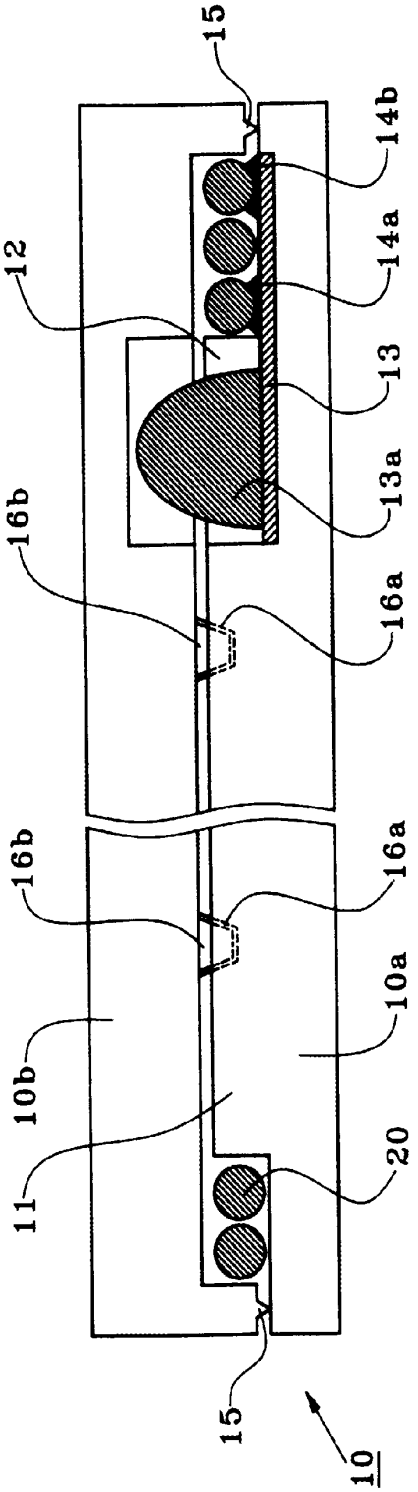

FIG. 4

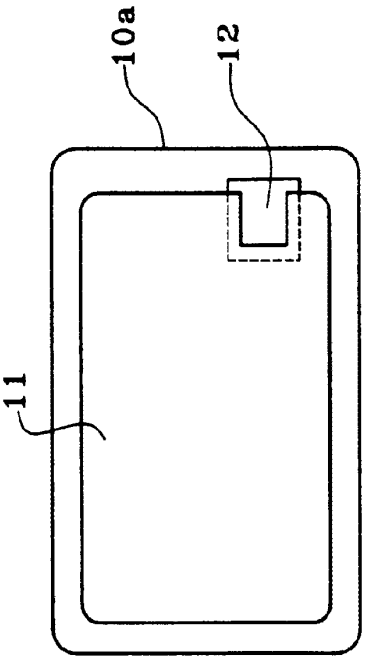

FIG. 5a

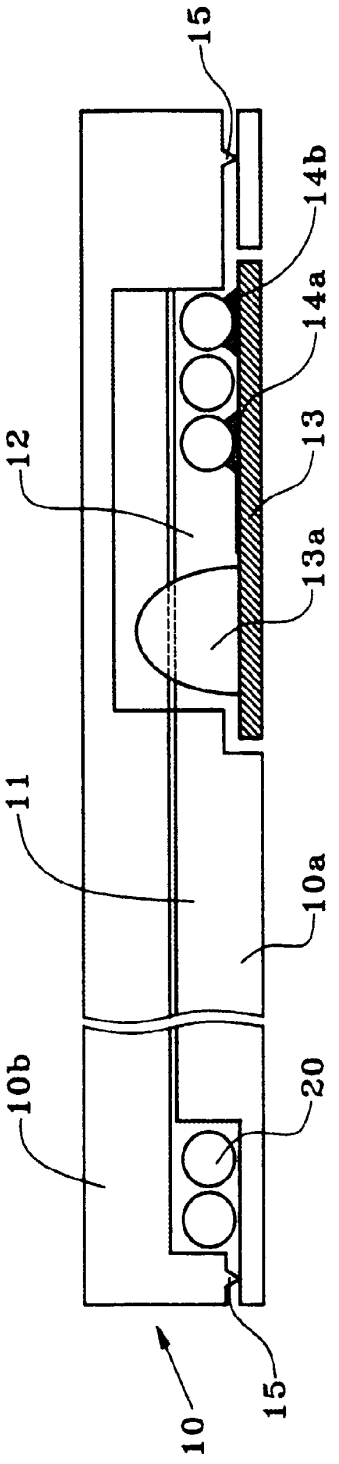

FIG. 5b

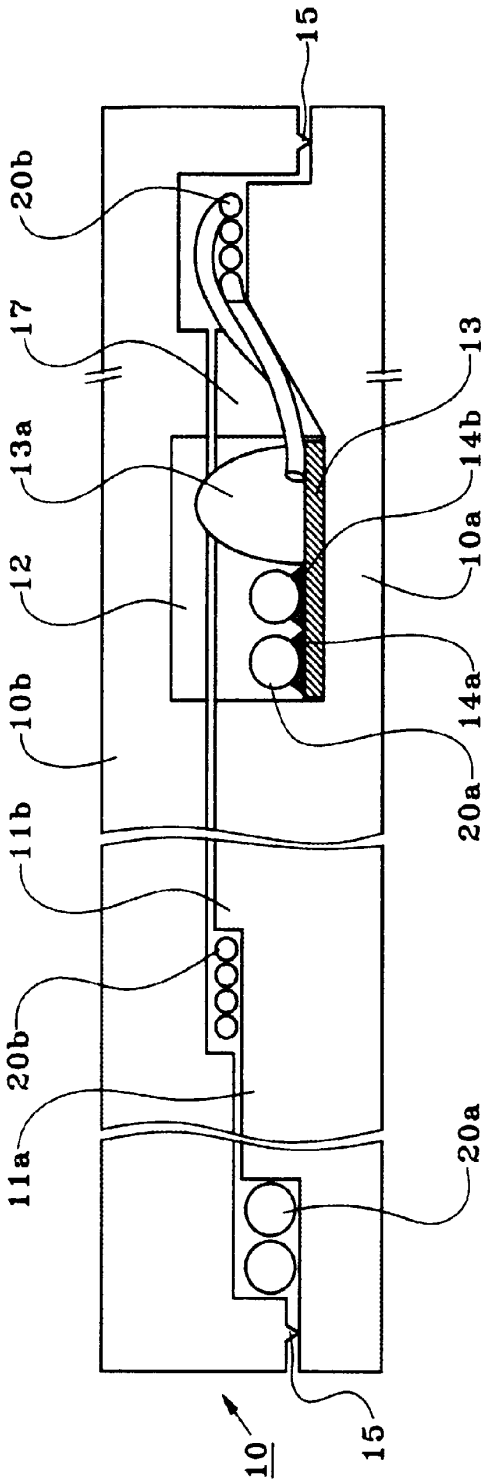

FIG. 6

Office européen des brevets

RAPPORT DE RECHERCHE EUROPEENNE

Numero de la demande
EP 97 40 0251

DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE (Int.Cl.6)
Y A	DE 44 41 122 C (WENDISCH) 21 Décembre 1995 * revendications 1-12; figures 1,2 * ---	1,7 2-6,8-10	H01Q7/00 H01Q1/22 G06K19/077
Y	EP 0 586 083 A (HUGHES MICROELECTRONICS EUROPA) 9 Mars 1994 * revendication 9; figures 2,3,5,6 * ---	1,7	
A	GB 2 284 324 A (MITSUBISHI) 31 Mai 1995 * page 9, dernier alinéa - page 12; figures 1-3,6 * ---	1-10	
A	EP 0 549 832 A (TEXAS INSTRUMENTS) 7 Juillet 1993 * abrégé; figures 1A-6 * -----	1-6	

DOMAINES TECHNIQUES RECHERCHES (Int.Cl.6)

H01Q
G06K
H04B

Le présent rapport a été établi pour toutes les revendications

Lieu de la recherche	Date d'achèvement de la recherche	Examinateur
LA HAYE	24 Avril 1997	Angrabeit, F

CATEGORIE DES DOCUMENTS CITES

X : particulièrement pertinent à lui seul
Y : particulièrement pertinent en combinaison avec un autre document de la même catégorie
A : arrière-plan technologique
O : divulgation non-écrite
P : document intercalaire

T : théorie ou principe à la base de l'invention
E : document de brevet antérieur, mais publié à la date de dépôt ou après cette date
D : cité dans la demande
L : cité pour d'autres raisons

& : membre de la même famille, document correspondant

EPO FORM 1503 03.82 (P04C02)

Electronic Acknowledgement Receipt

EFS ID:	32399159
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Jeff Lloyd/Megan Kuchenthal
Filer Authorized By:	Jeff Lloyd
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	20-APR-2018
Filing Date:	10-AUG-2017
Time Stamp:	14:31:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SIDS3.pdf	194315 2309acf321fea3586aa70f5cc0f0a0172a2c003b	yes	3

	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	3	
Warnings:					
Information:					
2	Foreign Reference	F1.pdf	1533168 8c42e90c777d0533188feda9504986cf023fe903	no	12
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	R1.pdf	4354252 46cc2e6072d08fa9ba54b195e473a27cef29d5a9	no	7
Warnings:					
Information:					
		Total Files Size (in bytes):	6081735		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

I hereby certify that this correspondence is being electronically filed in the United States Patent and Trademark Office on April 20, 2018.

/MEGAN KUCHENTHAL/

Megan Kuchenthal

SUPPLEMENTAL INFORMATION
DISCLOSURE STATEMENT
UNDER 37 C.F.R §§ 1.97 AND 1.98
Examining Group 2836
Patent Application
Docket No. SUN.LGI.417D2
Serial No. 15/673,763

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner	:	Fritz M. Fleming
Art Unit	:	2836
Applicants	:	Ki Min Lee, Jung Oh Lee
Serial No.	:	15/673,763
Filed	:	August 10, 2017
Conf. No.	:	7725
For	:	WIRELESS POWER RECEIVER AND CONTROL METHOD THEREOF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 AND 1.98

Sir:

In accordance with 37 C.F.R. § 1.56, the references listed on the attached form PTO/SB/08 are being brought to the attention of the Examiner for consideration in connection with the examination of the patent application identified above. Copies of the cited references are attached.

The undersigned hereby certifies that each item of information contained in this Supplemental Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Supplemental Information Disclosure Statement. Applicants are attaching a copy of the Communication from the European Patent Office.

J:\SUN\LGI\417D2\IDS-Refs\4-20-2018\SIDS3.doc/mrk

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the attached form PTO/SB/08 with initials or other appropriate marks.

Applicants respectfully assert that the substantive provisions of 37 C.F.R. §§ 1.56, 1.97, and 1.98 are met by the foregoing statements.

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 or 1.17 as required by this paper to Deposit Account 19-0065.

Respectfully submitted,

/JEFF LLOYD/

Jeff Lloyd
Patent Attorney
Registration No. 35,589
Phone No.: 352-375-8100
Fax No.: 352-372-5800
Address: Saliwanchik, Lloyd & Eisenschenk
A Professional Association
P.O. Box 142950
Gainesville, FL 32614-2950

JL/mrk

Attachments: Form PTO/SB/08; copies of references cited.

J:\SUN\LGI\417D2\IDS-Refs\4-20-2018\SIDS3.doc/mrk

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2	7725

23557 7590 04/04/2018

SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614

EXAMINER	
FLEMING, FRITZ M	

ART UNIT	PAPER NUMBER
2836	

NOTIFICATION DATE	DELIVERY MODE
04/04/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

euspto@slepatents.com

Applicant-Initiated Interview Summary	**Application No.** 15/673,763	**Applicant(s)** LEE ET AL.	
	Examiner FRITZ M. FLEMING	**Art Unit** 2836	

All participants (applicant, applicant's representative, PTO personnel):

(1) *FRITZ M. FLEMING*. (3)_____.

(2) *Mr. Justin Gao*. (4)_____.

Date of Interview: *29 March 2018*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☒112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *none*.

Identification of prior art discussed: *none*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

We discussed the proposed amendment and verified that the same Figures 9 and 10 were filed in the grandparent application 13/658,116. We discussed MPEP 2163.07(a) and how this applies to this application, namely that the proposed amendment would find support as an "inherent property" and how the application may be amended to recite the property without introducing prohibited new matter. The examiner requested that applicants address this in the response, as the proposed amendment would overcome all outstanding issues. .

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/FRITZ M FLEMING/ Primary Examiner, Art Unit 2836	Attached: proposed amendment.

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

———

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner	:	Fritz M. Fleming
Art Unit	:	2836
Applicants	:	Ki Min Lee, Jung Oh Lee
Serial No.	:	15/673,763
Filed	:	August 10, 2017
Confirm. No.	:	7725
For	:	Wireless Power Receiver and Control Method Thereof

PROPOSED AGENDA FOR INTERVIEW

Examiner Fleming:

The applicants thank you for agreeing to participate in a telephonic interview to discuss this application. During the interview, the undersigned would like to discuss the outstanding objections/rejections and potential amendments to the specification.

The applicants are considering amending the specification as follows:

Amend paragraph [0083] as follows:

First, referring to FIG. 9, after the short-range communication antenna 340 has been disposed ~~on~~ in the printed circuit board 301, the shielding unit 380 may be attached to one side of the printed circuit board 301 with an adhesive. The printed circuit board 301 comprises a plurality of layers wherein each layer of the plurality of layers is spaced apart from adjacent layers. The shielding unit 380 is disposed under the short-range communication antenna 340 or the receiving coil 310 (not shown in the Fig. 9).

Amend paragraph [0084] as follows:

Referring to FIG. 10, the printed circuit board 301 comprises a plurality of layers wherein each layer of the plurality of layers is spaced apart from adjacent layers, and the short-range communication antenna 340 or the receiving coil 310 (not shown in the Fig. 10) is disposed in the printed circuit board 301. Moreover, the shielding unit 380 is disposed in the printed circuit board 301. The shielding unit 380 is disposed under the receiving coil 310 or the short-range communication antenna 340. The receiving coil 310 (not shown in the Fig. 10), the short-range communication antenna 340, and the shielding unit 380 are disposed between the plurality of layers of the printed circuit board 301, ~~while~~ While the procedure of disposing the short-range communication antenna 340 or receiving coil(310)(not shown in the Fig. 10) in the printed circuit board 301 is being performed, the shielding unit 380 may be inserted into the printed circuit board 301. That is, unlike FIG. 9, since the shielding unit 380 is disposed in the printed circuit board 301, the procedure of disposing the shielding unit 380 may be included in the procedure of disposing the short-range communication antenna 340 without performing the procedure of disposing the shielding unit 380 at one side of the printed circuit board 301. That is, as described above, according to the embodiment shown in FIG. 8, when the shielding unit 380 is inserted into the printed circuit board 301, the entire thickness of the wireless power receiver 300 may be reduced corresponding to the thickness of the adhesive 303. Thus, a separate procedure of attaching the shielding unit 380 is not necessary, so the manufacturing process may be simplified.

The drawings are objected to. Applicants respectfully submit that the amendments to the specification obviate this objection. Accordingly, Applicants respectfully request that this objection be withdrawn.

The specification is objected to. Applicants respectfully submit that the amendments to the specification obviate this objection. Accordingly, Applicants respectfully request that this objection be withdrawn.

Claims 1-29 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Applicants respectfully request reconsideration. The

specification has been amended as indicated above. Applicants submit that the claims as currently presented satisfy the requirements of 35 U.S.C. §112, first paragraph. Accordingly, Applicants respectfully request that this rejection be withdrawn.

Claims 1-29 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants respectfully request reconsideration.

The specification has been amended as indicated above. Applicants submit that the claims as currently presented satisfy the requirements of 35 U.S.C. §112, second paragraph. Accordingly, Applicants respectfully request that this rejection be withdrawn.

The undersigned would like to discuss these issues during the interview.

Respectfully submitted,

Jeff Lloyd,
Patent Attorney
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Gainesville, Florida 32614-2950

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	15/673,763
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	2836
Examiner Name	Fritz M. Fleming
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code [2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U1	9,461,364-B2	10-04-2016	Lee *et al.*	ALL

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Foreign Patent Document Country Code [3] - Number [4] - Kind Code [5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T [6]
	F1	KR-10-2010-0067748-A (with English Abstract)	06-22-2010	HANRIM POSTECH CO., LTD	ALL	
	F2	JP-2009-247124-A (with English Abstract)	10-22-2009	PANASONIC CORP	ALL	
	F3	CN-101983466-A (with English Abstract)	03-02-2011	PANASONIC CORP	ALL	
	F4	CN-101517666-A (with English Abstract)	08-26-2009	PHILIPS INTELLECTUAL PROPERTY; KONINKLIJKE PHILIPS ELECTRONICS N.V	ALL	
	F5	CN-101286411-A (with English Abstract)	10-15-2008	SEIKO EPSON CORP	ALL	

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. [1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T [2]
	R1	Office Action dated November 28, 2017 in Korean Application No. 10-2014-0081260.	
	R2	Office Action dated January 5, 2018 in Chinese Application No. 201610451640.3.	
	R3	Office Action dated January 11, 2018 in U.S. Application No. 15/195,390.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

J:\SUN\LGI\417D2\IDS-Refs\2-12-2018\PTO-SB-08(3).doc/mrk

Espacenet

Bibliographic data: KR20100067748 (A) — 2010-06-22

NON-CONTACT CHARGING SYSTEM OF WIRELESS POWER TRANSMISION WITH PT-PCB CORE HAVING PLANAR SPIRAL CORE STRUCTURE

Inventor(s): JUNG CHUN KIL [KR]; KUK YOON SANG [KR] ± (JUNG, CHUN KIL, ; KUK, YOON SANG)

Applicant(s): HANRIM POSTECH CO LTD [KR] ± (HANRIM POSTECH CO., LTD)

Classification: **- international:** ***H02J17/00; H02J7/00***
- cooperative: **H02J7/025**; **H02J7/027**; **H02J7/1484** more

Application number: KR20080126269 20081212 Global Dossier

Priority number(s): KR20080126269 20081212

Also published as: KR100976158 (B1)

Abstract of KR20100067748 (A)

PURPOSE: A contactless power receiving device having power trans PCB (Printed Circuit Board) core of plane spiral type core structure is provided to have shield at the secondary core unit, thereby improving power receiving efficiency. CONSTITUTION: A rectifier block(52) rectifies inducing current by connected with the secondary core unit(51). A battery pack control unit processes data transceiving by the secondary core unit. A charger management block charges power supplied from the rectifier block to a battery cell(53). A protection circuit module block(56) transmits the charging information of the battery cell to the battery pack control cell. The secondary core unit has shield unit in lower side of a patter core.

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2010-0067748
(43) 공개일자 2010년06월22일

(51) Int. Cl.
H02J 17/00 (2006.01) *H02J 7/00* (2006.01)
(21) 출원번호 10-2008-0126269
(22) 출원일자 2008년12월12일
심사청구일자 2008년12월12일

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국윤상
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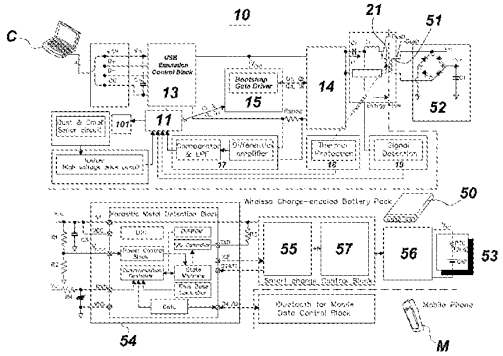
(54) 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치

(57) 요 약

본 발명은 무접점전력수신장치에 관한 것으로, 보다 상세하게는 무접점전력수신장치의 2차측코어가 평면나선형 코어구조의 파워트랜스피씨비코어로 구비되어, 수신측의 코어의 부피가 작게 되어 수신장치의 전체 크기가 작게 되어 휴대용 장치에 장착되는 장착 특성, 재작 특성이 양호하도록 하는 무접점전력수신장치에 관한 것이다.

이를 위한 본 발명은 유도자기장에 의한 전력신호를 전송받는 무접점전력수신장치(50)가 상기 2차측코어부(51)와 연결되어 유도전류를 정류하는 정류부블럭(52)(Rectifier block); 상기 2차측코어부(51)에 의해 송수신되는 데이터를 처리하는 배터리팩제어부(54); 상기 배터리팩제어부(54)의 제어에 의하여 상기 정류부블럭(52)으로부터 공급되는 전력이 배터리셀(53)에 충전되도록 하는 충전회로부블럭(55); 상기 배터리셀(53)의 충전정도를 감시하고 만충전 또는 방전 상태의 신호를 상기 배터리팩제어부(54)로 전송하는 충전감시회로부(56)가 포함되어 구비되고, 상기 2차측코어부(51)는 피씨비베이스(511)에 패턴코어(515)가 구비되어, 상기 피씨비베이스(511)가 상기 무접점전력수신장치(50)의 내부에 채결되도록 구비되며, 상기 패턴코어(515)는 평면나선형의 코어구조(PSCS, Planar Spiral Core Structure)로 하는 파워트랜스피씨비코어(PT-PCB Core, Power Transmission - Printed Circuit Board Core)로 구비되는 것을 특징으로 한다.

대 표 도



특허청구의 범위

청구항 1

무접점전력전송장치(10)에서 발생되는 유도자기장에 대하여, 무접점전력수신장치(50)의 2차측코어부(51)에서 유도자기장에 의한 전력신호를 전송받아 전원이 충전되도록 구비되는 피씨비패턴 코어가 구비된 무접점전력수신장치에 있어서,

상기 무접점전력수신장치(50)는 상기 2차측코어부(51)와 연결되어 유도전류를 정류하는 정류부블럭(52)(Rectifier block);

상기 2차측코어부(51)에 의해 송수신되는 데이터를 처리하는 배터리팩제어부(54);

상기 배터리팩제어부(54)의 제어에 의하여 상기 정류부블럭(52)으로부터 공급되는 전력이 배터리셀(53)에 충전되도록 하는 충전회로부블럭(55);

상기 배터리셀(53)의 충전정도를 감지하고 만충전 또는 방전 상태의 신호를 상기 배터리팩제어부(54)로 전송하는 충전감지회로부(56)가 포함되어 구비되고,

상기 2차측코어부(51)는 피씨비베이스(511)에 패턴코어(515)가 구비되어, 상기 피씨비베이스(511)가 상기 무접점전력수신장치(50)의 내부에 체결되도록 구비되며,

상기 패턴코어(515)는 평면나선형의 코어구조(PSCS, Planar Spiral Core Structure)로 하는 파워트랜스피씨비코어(PT-PCB Core, Power Transmission - Printed Circuit Board Core)로 구비되는 것을 특징으로 하는 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치.

청구항 2

제 1항에 있어서,

상기 2차측코어부(51)의 패턴코어(515)는, 평면의 원형나선코어 형태의 원형코어구조, 평면의 타원형나선코어 형태의 타원형코어구조, 평면의 삼각형나선코어 형태의 삼각형코어구조, 평면의 사각형나선코어 형태의 사각형코어구조, 평면의 오각형나선코어 형태의 오각형코어구조, 평면의 육각형나선코어 형태의 육각형코어구조, 평면의 다각형나선코어 형태의 다각형코어구조 중 어느 한 형태의 평면나선코어구조로 구비되는 것을 특징으로 하는 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치.

청구항 3

제 1항에 있어서,

상기 2차측코어부(51)는 상기 패턴코어(515)의 아래측으로 차폐부(61)가 구비되어지되,

상기 차폐부는 차폐패널부(62), 차폐매쉬부(63), 금속박막부(64)로 형성되어 구비되는 것을 특징으로 하는 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치.

청구항 4

제 1항 내지 제 3항 중 어느 한 항에 있어서,

상기 2차측코어부(51)의 패턴코어(515)는 평면상의 나선형 형상의 동 재질로 이루어지고,

상기 2차측코어부(51)는 피씨비베이스(511) 상에 동 재질로 되어 평면 나선형 형상으로 되는 패턴코어(515)가 위치되며, 상기 패턴코어(515) 상부로 피에스알코팅층(65, PSR Coating Layer)이 형성되어 구비되는 것을 특징으로 하는 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치.

청구항 5

제 1항 내지 제 3항 중 어느 한 항에 있어서,

상기 2차측코어부(51)의 패턴코어(515)는 평면상의 나선형 형상의 동 재질로 이루어지고,

상기 2차측코어부(51)는 피씨비베이스(511) 상에 동 재질로 되어 평면 나선형 형상으로 되는 패턴코어(515)가 위치되며, 상기 패턴코어(515)에 무전해금도금층(66, Electroness Gold Plating Layer)이 형성되어 구비되는 것을 특징으로 하는 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치.

명 세 서

발명의 상세한 설명

기 술 분 야

[0001] 본 발명은 무접점전력수신장치에 관한 것으로, 보다 상세하게는 무접점전력수신장치의 2차측코어가 평면나선형 코어구조의 파워트랜스피씨비코어로 구비되어, 수신측의 코어의 부피가 작게 되어 수신장치의 전체 크기가 작게 되어 휴대용 장치에 장착되는 장착 특성, 제작 특성이 양호하도록 하는 무접점전력수신장치에 관한 것이다.

배 경 기 술

[0002] 일반적으로 휴대폰, PDA, PMP, DMB단말기, MP3 또는 노트북과 같은 휴대용 장치들은 이동하면서 사용하기 때문에 일반 가정 전원을 직접 꽂아서 전원을 공급받을 수 없어, 일회용 배터리를 장착하거나 충방전이 가능한 배터리가 장착되는 것이다.

[0003] 그러나 이러한 휴대용 장치의 배터리에 전기를 충전시키기 위한 충전기는 일반전원으로부터 전기를 공급받아 배터리에 전원공급선 및 전원공급단자를 통하여 배터리팩에 전원을 공급하는 단자공급방식이 이용되고 있다. 하지만 이처럼 단자공급방식으로 전원을 공급하면, 충전기와 배터리가 서로 결합되거나 분리될 경우, 양측의 단자들이 서로 다른 전위차를 가지고 있어서 단자부분에서 순간방전현상이 발생된다. 이로써 양측 단자들에는 검정 이물질이 쌓이게 되며, 이로 인해서 화재가 발생할 우려도 있는 것이다. 또한 단자가 공기에 직접 노출되기 때문에 습기 또는 먼지가 묻어 자연 방전될 수 있는 등, 충전기 및 배터리의 수명과 성능을 저하시키는 문제점이 있다.

[0004] 이러한 단자공급방식의 문제점을 해결하기 위하여, 무접점 충전기가 개발된 것이다. 이와 같은 종래기술에 따른 무접점 충전기는 무접점충전기의 1차코일의 상부로, 충전하고자 하는 배터리가 내재된 단말기을 위치시키면, 배터리의 2차코일에 의하여 충전이 된다. 즉 1차코일에서 발생되는 자기장에 의해 2차코일에서는 유도기전력이 발생되는 것으로, 이처럼 유도되는 전기를 충전하게 되는 것이다.

[0005] 그러나 이러한 종래의 무접점 충전기는 단지 휴대용 단말기에 전력을 공급할 뿐, 다른 이용이 한정되어 있어 실용성에 제한이 있는 것이다.

[0006] 그리고 1차코일에서 발생되는 자기장에 대하여 금속이 놓이게 되면 자장의 변화로 인하여 1차코일에 전력손실이 상당하여 무접점충전기가 파손될 수 있는 등의 문제점이 있는 것이다. 또한 2차측코일 및 배터리팩 회로에 과전류가 흐르게 되면 발열현상이 일어나 결국 배터리팩이 파열로 인한 폭발사고가 발생할 우려가 있다. 또한 배터리팩에서의 효율도 저하되는 단점이 있다.

[0007] 나아가 대부분의 1차측코어 및 2차측코어는 얇은 가닥의 전선을 다수개 꼬아서 하나의 굵은 코어로 만든 후, 이를 권심 또는 무심코일로 되는 리쯔코일로 만들어 설치하기 때문에, 많은 양의 전선 재료가 소요되는 단점이 있다. 반면 이와 같은 리쯔코일은 대부분 그 크기가 커지기 때문에 얇고 다수의 반도체가 장착되는 휴대용 단말기 및 배터리팩에 장착하기가 곤란할 뿐만 아니라 다수의 컨트롤러 및 부재들에, 열이나 자기장으로 영향을 줄 수 있어 오작동의 원인이 될 수 있는 문제점이 있는 것이다.

발명의 내용

해결 하고자하는 과제

[0008] 상기와 같은 문제점을 해소하기 위한 본 발명은 무접점전력수신장치인 측의 수신코어인 2차측코어가 평면나선형 코어구조의 파워트랜스피씨비코어로 구비되어, 수신측의 코어의 부피가 작게 되어 수신장치의 전체 크기가 작게 되어 휴대용 장치에 장착되는 장착 특성이 양호하도록 하는 목적이 있다.

[0009] 특히 이와 같은 파워트랜스피씨비코어는 피씨비에 평면형태로 형성되기 때문에, 제작이 용이하면서 이와 함께 수신 특성도 양호하도록 하여, 전력수신 특성이 양호하면서 제작특성도 양호하도록 하는 목적이 있다.

[0010] 나아가 이와 같은 무접점전력수신장치의 2차측코어에는 차폐 쉴드가 함께 구비되도록 하여 전력수신 효율이 양호하면서 다른 부재들이 자기장의 영향을 덜 받도록 하여 안정적으로 충전되도록 하는 목적이 있다.

과제 해결수단

[0011] 상기와 같은 목적을 달성하기 위한 본 발명에 따른 무접점전력수신장치는, 무접점전력전송장치(10)에서 발생되는 유도자기장에 대하여, 무접점전력수신장치(50)의 2차측코어부(51)에서 유도자기장에 의한 전력신호를 전송받아 전원이 충전되도록 구비되는 피씨비패턴 코어가 구비된 무접점전력수신장치에 있어서, 상기 무접점전력수신장치(50)는 상기 2차측코어부(51)와 연결되어 유도전류를 정류하는 정류부블럭(52)(Rectifier block); 상기 2차측코어부(51)에 의해 송수신되는 데이터를 처리하는 배터리팩제어부(54); 상기 배터리팩제어부(54)의 제어에 의하여 상기 정류부블럭(52)으로부터 공급되는 전력이 배터리셀(53)에 충전되도록 하는 충전회로부블럭(55); 상기 배터리셀(53)의 충전정도를 감시하고 만충전 또는 방전 상태의 신호를 상기 배터리팩제어부(54)로 전송하는 충전감시회로부(56)가 포함되어 구비되고, 상기 2차측코어부(51)는 피씨비베이스(511)에 패턴코어(515)가 구비되어, 상기 피씨비베이스(511)가 상기 무접점전력수신장치(50)의 내부에 체결되도록 구비되며, 상기 패턴코어(515)는 평면나선형의 코어구조(PSCS, Planar Spiral Core Structure)로 하는 파워트랜스피씨비코어(PT-PCB Core, Power Transmission - Printed Circuit Board Core)로 구비되는 것을 특징으로 한다.

[0012] 이에 상기 2차측코어부(51)의 패턴코어(515)는, 평면의 원형나선코어 형태의 원형코어구조, 평면의 타원형나선코어 형태의 타원형코어구조, 평면의 삼각형나선코어 형태의 삼각형코어구조, 평면의 사각형나선코어 형태의 사각형코어구조, 평면의 오각형나선코어 형태의 오각형코어구조, 평면의 육각형나선코어 형태의 육각형코어구조, 평면의 다각형나선코어 형태의 다각형코어구조 중 어느 한 형태의 평면나선코어구조로 구비될 수 있다.

[0013] 이에 더하여 상기 2차측코어부(51)는 상기 패턴코어(515)의 아래측으로 차폐부(61)가 구비되어지되, 상기 차폐부는 차폐패널부(62), 차폐매쉬부(63), 금속박막부(64)로 형성되어 구비될 수 있다.

[0014] 그리고 상기 2차측코어부(51)의 패턴코어(515)는 평면상의 나선형 형상의 동 재질로 이루어지고, 상기 2차측코어부(51)는 피씨비베이스(511) 상에 동 재질로 되어 평면 나선형 형상으로 되는 패턴코어(515)가 위치되며, 상기 패턴코어(515) 상부로 피에스알코팅층(65, PSR Coating Layer)이 형성되어 구비될 수 있다.

[0015] 또한 상기 2차측코어부(51)의 패턴코어(515)는 평면상의 나선형 형상의 동 재질로 이루어지고, 상기 2차측코어부(51)는 피씨비베이스(511) 상에 동 재질로 되어 평면 나선형 형상으로 되는 패턴코어(515)가 위치되며, 상기 패턴코어(515)에 무전해금도금층(66, Electroness Gold Plating Layer)이 형성되어 구비될 수 있다.

효 과

[0016] 상기와 같이 구비되는 본 발명은 무접점전력수신장치인 측의 수신코어인 2차측코어가 평면나선형 코어구조의 파워트랜스피씨비코어로 구비되어, 수신측의 코어의 부피가 작게 되어 수신장치의 전체 크기가 작게되어 휴대용 장치에 장착되는 장착 특성이 양호하도록 하는 탁월한 효과가 있다.

[0017] 특히 이와 같은 파워트랜스피씨비코어는 피씨비에 평면형태로 형성되기 때문에, 제작이 용이하면서 이와 함께 수신 특성도 양호하도록 하여, 전력수신 특성이 양호하면서 제작특성도 양호하도록 하는 장점이 있다.

[0018] 나아가 이와 같은 무접점전력수신장치의 2차측코어에는 차폐 쉴드가 함께 구비되도록 하여 전력수신 효율이 양호하면서 다른 부재들이 자기장의 영향을 덜 받도록 하여 안정적으로 충전되도록 하는 장점이 있다.

발명의 실시를 위한 구체적인 내용

[0019] 이하 첨부되는 도면을 참조하여 상세히 설명하면 다음과 같다.

[0020] 도 1은 본 발명에 따른 무접점전력수신장치에 대한 제어구성도이고, 도 2는 본 발명에 따른 무접점전력수신장치의 2차측코어부에 대한 개략적인 층구성 예시도로, 중간에 무접점전력수신장치의 2차측코어부에 대한 단면 구조도에 대해서 상부로는 상측방향에서 보여지는 평면 형태에 대해, 하부에는 차폐부의 분리된 상태의 측단면도를 각각 도시한 것이다.

[0021] 도 3 및 도 4는 본 발명에 따른 무접점전력수신장치의 2차측코어부의 실시예시 사진으로, 도 3은 사각 형상의 단일 층으로 하는 2차측코어부에 대한 실시사진이고, 도 4는 육각형상의 복층으로 하는 2차측코어부에 대한 실시사진이다.

[0022] 도 5는 본 발명에 따른 무접점전력수신장치의 2차측코어부에 대한 성능시험 구성에 대한 개략적인 예시도로, 상측에는 육각형상의 파워트랜스피씨비코어로 되어 전류가 가해지도록 구비되고, 이러한 상측의 코어에 의해 발생되는 유도자기장에 대해서, 하측의 차폐쉴드가 구비되어 마련되는 파워트랜스피씨비코어에서 유도전류가 발생되는 전압의 정도를 측정하도록 마련되는 것이다.

[0023] 도 6 및 도 7은 본 발명에 따른 무접점전력수신장치의 2차측코어부에 대한 개략적인 측면도로, 도 6에서는 단일층으로 마련되는 2차측코어부에 대한 단면도이고, 도 7에서는 복측의 평면나선형 코어로 마련되는 2차측코어부에 대한 단면도가 각각 도시된 것이다.

[0024] 그리고 도 8은 본 발명에 따른 무접점전력수신장치의 2차측코어부의 설명을 위한 개략적인 예시도이고, 도 9는 본 발명에 따른 무접점전력수신장치로 되는 배터리팩이 무접점전력전송장치에 위치된 상태에 대한 실시예시 사진이 각각 도시된 것이다.

[0025] 즉 본 발명에 따른 평면나선형 코어구조의 파워트랜스피씨비코어가 구비된 무접점전력수신장치(50)는 도 1 내지 도 9에 도시된 바와 같이, 무접점전력전송장치(10)에서 발생되는 유도자기장에 대하여, 무접점전력수신장치(50)의 2차측코어부(51)에서 유도자기장에 의한 전력신호를 전송받아 전원이 충전되도록 구비되는 피씨비패턴 코어가 구비된 무접점전력수신장치(50)가 구비되는 것이다.

[0026] 이처럼 무접점전력전송장치(10)에서 발생되는 유도자기장을 수신받은 상기 무접점전력수신장치(50)에서는 2차측코어부(51)에서 유도전류가 발생되고, 이러한 유도전류에 의한 전력은 배터리셀(53)에 충전되는 것이다. 이처럼 발생된 전력신호는 정류되어 충전되는 것으로, 수신되는 전력의 세기를 배터리팩제어부(54)에서 감지하여 무접점전력전송장치(10) 측으로 감지데이터의 신호를 전송하여, 무접점전력전송장치(10)에서 발신되는 유도자기장이 조절되도록 구비된다. 또한 충전되는 전력이 조절되도록 하여 안정적으로 충전되도록 하면서, 휴대폰, PDA, PMP, DMB단말기, MP3 또는 노트북과 같은 휴대용 장치들(M)에 안정적으로 전원을 공급하게 되는 것이다. 특히 이러한 무접점전력수신장치(50)는 휴대용 장치들과 별체로 분리구성되어, 휴대용장치들에 장착되거나 분리가 가능하도록 하는 배터리팩 또는 커버가 있는 세미배터리팩 등으로 구비될 수도 있을 것이다. 또한 휴대용장치들의 케이스 내에 장착되어, 휴대용장치(M)들의 전원공급부와 직결되도록 일체형으로 구비될 수도 있을 것이다.

[0027] 이를 위한 무접점전력수신장치(50)의 세부구성을 살펴보면, 상기 2차측코어부(51)와 연결되어 유도전류를 정류하는 정류부블럭(52)(Rectifier block)이 구비되고, 상기 2차측코어부(51)에 의해 송수신되는 데이터를 처리하는 배터리팩제어부(54)가 구비되는 것이다.

[0028] 그리고 상기 배터리팩제어부(54)의 제어에 의하여 상기 정류부블럭(52)으로부터 공급되는 전력이 배터리셀(53)에 충전되도록 하는 충전회로부블럭(55)(Charger Management Block)가 구비되고, 상기 배터리셀(53)의 충전정도를 감시하고 만충전 또는 방전 상태의 신호를 상기 배터리팩제어부(54)로 전송하는 충전감시회로부블럭(56)가 포함되어 구비되는 것이다.

[0029] 따라서 배터리팩제어부(54)(Power receiver controler)에서는 정류부블럭(52)(Rectification Block), 충전회로부블럭(55), 충전감시회로부블럭(56)(Protection Control Block), 게이지블럭(57)(Fuel Gauge Control Block) 등 무접점전력수신장치(50)의 부재들을 제어하며 무접점전력전송장치(10) 측으로 ID 데이터신호를 발생하고 충전상태를 모니터링하도록 구비되는 것이다.

[0030] 그리고 보호회로부블럭(56)(Protection Circuit Module block, PCM)은 상기 충전회로부블럭(55)과 상기 배터리셀(53) 사이에 구비되어 상기 배터리셀(53)에 충전되는 전류를 검출하여 상기 배터리셀(53)의 충전상태 정보를 배터리팩제어부(54)로 전송하며 배터리의 과전압, 부족전압(Under voltage), 과전류, 단락 등을 감지하게 되는 것이다.

[0031] 또한 무접점전력수신장치(50)에서는 상기 2차측코어부(51)를 통하여 수신되는 전력을 감시하고, 수신되는 전력의 전압의 정도를 판별하여 안정적으로 수신되는지 판별하게 된다. 이에 수신되는 전력의 기준전압으로는 해당 무접점전력수신장치(50)의 선택 사양별로 다양하게 선택될 수 있는 것으로, 대체로 2 ~ 20V 정도로 설정될 수 있으며, 특히 일반적인 휴대용 장치에 적용되는 경우에는 대체로 5V 정도로 하여 설정될 수 있는 것이다.

[0032] 이처럼 수신되는 전력의 전압이 저전압으로 감지되는지, 그리고 수신되는 전력의 전압이 고전압으로 감지되는지 여부를 비교판별하게 되는 것이다. 예를 들면, 기준전압에 대해 앞에서의 예시와 같이 5V를 예로하는 경우에는 대체로 저전압 감지여부는 5V 보다 -1.5V 내지 -0.5V 정도가 감압된 정도로 감지되는 경우로 정하여 질 수 있을 것이다. 그리고 고전압의 기준이 되는 전압의 정도는 5V를 예로하면, 대체로 5V 보다 +1.5V 내지 +0.5V 정도가 승압된 정도로 감지되는 경우로 정하여질 수 있을 것이다.

[0033] 이처럼 감압 또는 승압된 기준치보다 낮거나 높은 전압으로 전력신호가 수신되면 배터리팩제어부(54)에서는 무접점전력수신장치(50)의 고유 ID데이터신호와 함께 전압보정의 정도에 대한 전송신호를 무접점전력전송장치(10) 측으로 발신하게 되는 것이다.

[0034] 이와 같은 무접점전력수신장치(50) 측으로 유도자기장을 발신하는 무접점전력전송장치(10) 개략적인 실시예의 구성을 살펴보면 다음과 같다.

[0035] 무접점전력전송장치(10)의 메인컨트롤블럭(11)의 제어에 의하여 1차측코어(21)에서 유도자기장이 발신되도록 구비되고, 무접점전력수신장치(50)의 2차측코어부(51)에서 유도자기장에 의한 전력신호를 전송받아 전원이 충전되도록 구비되는 것이다.

[0036] 이에 도 1에서와 같이 상기 무접점전력전송장치(10)에는 상기 무접점전력수신장치(50) 측으로 무접점 방식으로 전력신호를 전송하기 위한 공진형컨버터(14) 및 메인컨트롤블럭(11)가 구비되는 것이다.

[0037] 그리하여 상기 메인컨트롤블럭(11)의 제어에 의하여 상기 공진형컨버터(14)에 전력신호 발신을 위한 발진신호가 전송되도록 하는 게이트드라이버(15)이 구비되며, 또한 상기 무접점전력수신장치(50)로부터 전송되는 신호를 처리하여 상기 중앙제어부(11)로 전송하는 수신신호처리부(19)이 구비되는 것이다.

[0038] 그리고 상기 무접점전력전송장치(10)의 무접점충전케이스(미도시됨)에는 전방으로 전원 온/오프스위치, 신호입력을 위한 입력패널이 구비되고, 상기 무접점충전 플레이트 및 상기 무접점전력수신장치(50)에서의 충전상태를 표시하기 위한 엘씨디패널 및 충전상태엘이디 등의 표시부(101)가 구비될 수 있으며, 전원공급부(13) 등이 구비되는 것이다.

[0039] 그리하여 무접점전력전송장치(10)의 충전 플레이트에는 휴대폰, PDA, PMP, DMB단말기, MP3, UMPC 또는 노트북과 같은 휴대용 장치 또는 휴대용 장치에 탈부착이 가능한 배터리팩(즉 탈부착되어 각각 충전가능하게 이용될 수 있는 배터리팩을 세미이너팩이라 한다) 등으로 구비될 수 있는 무접점전력수신장치(50)가 놓여지는 것이고, 이에 무접점전력수신장치(50)가 놓여지면 무접점전력전송장치(10)는 이를 감지하여 충전작동을 하게 되는 것이다.

[0040] 그리고 이러한 무접점전력전송장치(10) 전원공급부(13)의 전원은, 컴퓨터(C)의 USB포트의 전원, AC adapter, Cigar Jack 등으로부터 입력되는 전원이 공급될 수도 있을 것이다.

[0041] 또한 충전 과정 중 무접점전력전송장치(10)의 온도를 검출하는 온도검출부(18)를 구비하여, 온도검출부(18)에서 검출되는 온도에 따라 과열되는 경우에는 충전작동이 정지될 수 있고, 무접점전력전송장치(10) 전체적으로 과열되는 경우에는 전체 시스템의 작동이 일시 정지되도록 구성될 수도 있다.

[0042] 나아가 전원공급부(13), 게이트드라이버(15), 공진형컨버터(14) 또는 수신신호처리부(19) 등과 연결되어 각각 전류의 흐름을 감시하도록 전류검출부(17) 등과 같은 전류센싱부재가 함께 구비될 수 있으며, 이러한 전류센싱부재에 의하여 해당 부재들이 과전류, 과전압 상태로 되면 충전 작동을 정지하거나 시스템의 작동을 정지하도록 하고, 이에 대한 신호를 발신하도록 구성될 수 있다. 물론 전류검출부(17)를 통하여 무접점전력수신장치(50)로부터 전송되는 신호를 검출하도록 구비될 수도 있을 것이다.

[0043] 이와 같이 구비되는 본 발명에 따른 무접점전력수신장치(50)의 상기 2차측코어부(51)는 무접점전력전송장치(10)로부터 발신되는 유도자기장 신호를 양호하게 수신하기 위하여, 피씨비베이스(511)에 패턴코어(515)가 구비되어, 상기 피씨비베이스(511)가 상기 무접점전력수신장치(50)의 내부에 체결되도록 구비되는 것이다.

[0044] 이러한 상기 패턴코어(515)는 평면나선형의 코어구조(PSCS, Planar Spiral Core Structure)로 하는 파워트랜스피씨비코어(PT-PCB Core, Power Transmission - Printed Circuit Board Core)로 구비되는 것이다. 즉 파워트랜스피씨비코어는 피씨씨(CCL, FCCL(Flexible Copper Clad Laminated) 등이 포함되어 구비되는 피씨비)에, 단일층 또는 복수 층으로 하여 동재질로 된 평면 나선형 코어를 형성한 것이다.

[0045] 특히 이러한 상기 2차측코어부(51)의 패턴코어(515)는, 평면의 원형나선코어 형태의 원형코어구조, 평면의 타원형나선코어 형태의 타원형코어구조, 평면의 삼각형나선코어 형태의 삼각형코어구조, 평면의 사각형나선코어 형태의 사각형코어구조, 평면의 오각형나선코어 형태의 오각형코어구조, 평면의 육각형나선코어 형태의 육각형코어구조, 평면의 다각형나선코어 형태의 다각형코어구조 중 어느 한 형태의 평면나선코어구조로 구비될 수 있는 것이다. 그리하여 종래에서와 같이 다수의 얇은 전선을 꼬아서 코어를 만든 리즈코어에서는 많은 작업공정이 필요하게 되고, 뿐만 아니라 많은 양의 전선이 소요되는 것이 문제점이었다. 그러나 본 발명에서와 같이 파워트랜스피씨비코어로 되는 평면나선형의 코어구조로 하여 2차측코어부(51)의 패턴코어(515)를 형성하기 때문에, 피씨비베이스(511) 상에 형성하여 제조과정이 간단하여 쉽게 제조가 가능할 뿐만 아니라, 제조된 2차측코어부(51)를 배터리팩에 용이하게 설치할 수 있는 등의 장점이 있는 것이다.

[0046] 이와 같이 다양한 형태의 평면 나선형 코어구조로 이루어지는 파워트랜스피씨비코어(PT-PCB Core)인 패턴코어(515)는 피씨비베이스(511) 상에, 도 6과 같이 단일 층의 평면 나선형 코어구조를 갖도록 이루어질 수도 있을 것이다. 또한 도 7과 같이 패턴코어(515)가 상부코어(516)와 하부코어(517)로 하는 두 개의 평면코어층으로 하는 등 다수의 평면 코어 층구조를 갖도록 구비될 수도 있을 것이다. 따라서 소규모로 이루어지는 휴대용장치용 배터리팩으로 구비되는 경우에는 단일층의 평면코어구조로 갖게 될 수 있을 것이다. 반면 많은 전력이 소요되어야 하는 휴대용 장치의 배터리팩에서는 다수의 층구조로 하는 평면 코어 층 구조를 갖게 되어 전력수신율이 더욱 양호하도록 구비될 수 있을 것이다.

[0047] 이에 상기 2차측코어부(51)의 패턴코어(515)는 평면상의 나선형 형상의 동 재질로 이루어지는 것이다.

[0048] 또한 상기 2차측코어부(51)는 피씨비베이스(511) 상에 동 재질로 되어 평면 나선형 형상으로 되는 패턴코어(515)가 위치되며, 상기 패턴코어(515) 상부로 피에스알코팅층(65, PSR Coating Layer)이 형성되어 구비될 수 있을 것이다.

[0049] 이처럼 피에스알코팅층(65)이 형성되는 경우에는 동 재질로 되는 2차측코어부(51)의 패턴코어(515)가 손상됨을 방지하게 되어 유도자기장에 의한 전력신호를 양호하게 수신하게 되는 것이다.

[0050] 다른 실시로는 패턴코어(515)가 동 재질로 이루어져 평면 나선형 형상으로 이루어지고, 이에 이러한 상기 패턴코어(515)에 무전해금도금층(66, Electroness Gold Plating Layer, EGPL)이 형성되어 구비될 수 있을 것이다.

[0051] 이처럼 무전해금도금층(66)이 형성되는 경우에는 동 재질로 되는 2차측코어부(51)의 패턴코어(515)가 손상됨을 방지할 뿐만 아니라 1차측인 무접점전력전송장치(10) 측에서 발신되는 유도자기장에 의한 전력신호의 수신효율이 향상되어, 전체적으로 전력 충전효율이 양호하도록 하는 장점이 있다.

[0052] 나아가 이러한 상기 2차측코어부(51)는 상기 패턴코어(515)의 아래측으로 차폐부(61)(HPES : Hanrim Postech

Electro-magnetic shield)가 구비될 수 있을 것이다.

[0053] 특히 상기 차폐부(61)(HPES : Hanrim Postech Electro-magnetic shield)는 차폐패널부(62), 차폐매쉬부(63), 금속박막부(64)로 형성되어 구비될 수 있는 것이다.

[0054] 이에 차폐패널부(62)는 센더스트 55 ~ 75 중량부에 대하여 25 ~ 55 중량부의 폴리우레탄이 포함되어 이루어져 구비될 수 있는 것이다.

[0055] 이러한 센더스트(sendust)는 알루미늄, 규소, 철 등으로 조성되는 것으로, 고투자율 합금에 해당되는 것이다. 이러한 차폐성능이 탁월한 센더스트와 폴리우레탄을 함께 조성하여 전송차폐패널을 구비한 것이다. 이에 센더스트가 55 중량부 이하이면 차폐성능이 저하될 우려가 있고, 반면 75 중량부 이상일 경우에는 투여되는 양에 비하여 성능이 향상되지 않게 된다.

[0056] 이처럼 패널 형태로 이루면서 센더스트가 포함되어 이루어지는 차폐패널(62)에 의하여 2차측코어부 부분에서 자기장이 효과적을 차폐될 수 있는 것이다.

[0057] 그리고 차폐매쉬부(63)는 유도자기장에 의해 발생되는 유도기전력에 대한 와전류를 저감하게 되는 부재로, 망형상으로 형성되는 폴리에스터에 와전류저감조성물이 도금되어 이루어지는 것으로, 상기 와전류저감조성물은 니켈 55 ~ 65 중량부에 대하여 35 ~ 45 중량부의 아연이 포함되어 이루어져 구비될 수 있는 것이다.

[0058] 그리하여 상기 무접점전력수신장치(50)에서는 와전류가 발생될 우려가 있기 때문에, 이러한 와전류는 와전류저감부재인 차폐매쉬부(63)에 의하여 소멸되도록 구비될 수 있는 것이다.

[0059] 그리고 니켈과 아연으로 되는 와전류저감조성물이 폴리에스터의 표면에 도금되는 것이기 때문에, 결국 차폐매쉬부(63)는 금속망형상으로 형성되는 것으로, 자기장에 의하여 발생될 수 있는 와전류(일명 "맴돌이전류")가 와전류저감부재인 금속망의 매쉬에 의하여 소용돌이효과로 감소되도록 하여, 무접점전력수신장치(50)의 회로가 보호되도록 구비되는 것이다. 즉 이러한 와전류저감부재의 금속망의 매쉬에 의하여, 많은 수의 금속망 매쉬별로 맴돌이전류가 감소되도록 하기 때문에, 배터리팩 전체적으로는 자기장에 의한 맴돌이 전류가 감소되는 것이다. 이에 와전류저감부재는 금속망형상으로 100 매쉬 내지 200 매쉬 정도의 금속망으로, 보다 바람직하게는 135 매쉬로 이루어질 수 있다.

[0060] 나아가 금속박막부(64)는 알루미늄 박막으로 형성되는 것으로 차폐부(61)(HPES : Hanrim Postech Electro-magnetic shield)의 제일 하측에서 최종적으로 자기장을 차단하여, 회로에 영향을 주지않도록 구비되는 것이다.

[0061] 이와 같이 구비되는 본 발명에 따른 평면나선형 코어구조(PSCS, Planar Spiral Core Structure)의 파워트랜스퍼씨비코어(PT-PCB Core, Power Transmission - Printed Circuit Board Core)가 구비된 무접점전력수신장치(50)에서의 상세 구성에 대해 살펴보면 다음과 같다.

[0062] 이러한 파워트랜스퍼씨비코어(PT-PCB Core)로 되는 2차측코어부(51)는, 도 6에서와 같이 피씨비베이스(511) 상부로 단일의 패턴코어(515)로 형성될 수 있을 것이다. 그리고 아래 측으로는 차폐부(61)(HPES : Hanrim Postech Electro-magnetic shield)가 마련될 수 있을 것이다. 그리하여 2차측코어부(51)의 패턴코어(515)를 통하여 유도자기장으로부터 유도전류가 발생되어 충전되게 된다. 또한 차폐부(61)에 의하여, 배터리팩의 부재들이 유도자기장에 의한 영향을 받지않게 되는 것이다.

[0063] 이와 같은 본 발명에 따른 평면나선형 코어구조의 파워트랜스퍼씨비코어가 구비된 무접점전력수신장치(50)의 2차측코어부(51)는, 도 7에서와 같이, 피씨비베이스(511) 상부로 구비되는 패턴코어가 코어피씨비(512)에 의하여 상부코어(516)와 하부코어(517)로 하는 2층 구조로 구비될 수 있을 것이다. 그리고 이러한 상부코어(516)와 하부코어(517)를 이어주는 비아연결부(518)가 함께 구비되어, 정류부브릭(52)과 연결되는 단자의 일측단자는 상부코어(516)와 연결되고, 타측단자는 하부코어(517)와 연결되도록 마련될 수 있을 것이다. 따라서 2차측코어부(51)의 패턴코어(515)가 단일로 이루어지는 것보다, 상부코어(516)와 하부코어(517)로 하여 형성되기 때문에 1차측의 무접점전력전송장치(10)로부터 전송되는 유도자기장의 신호를 더욱 원활하게 수신할 수 있는 것이다.

[0064] 이에 종래기술에 따른 코어인 리프코어로 구비되는 경우와, 본 발명에서와 같이 파워트랜스퍼씨비코어로 되는 패턴코어(515)로 되는 경우에 있어서의 효율을 살펴보면 다음과 같다.

표 1

[0065] (종래의 리쯔코어와의 비교표)

항목	리쯔 코어	PSR PTPCB core	EGPL-PTPCB core
소재	동(99.99%)	동(70㎛)+PSR 코팅	동(70㎛)+ 무전해금도금(0.03㎛)
두께	0.35mm	0.4mm	0.4mm
형태크기	32X32mm	32X32mm	32X32mm
형태	사각	평면사각형	평면육각형
턴수	20(리쯔형태)	24/(1Layer)	24/(2Layer)
가닥수/(1턴)	7	1	1
와어어 굵기	0.15Φ	1mm/2oz.	1mm/2oz.
인덕턴스	7.7uH	11uH	7.8uH
Q(no shield)	27	9	20
DCR(내부저항)	230mΩ	850mΩ	350mΩ
효율 @2.5W(5V x 500mA)	61%	53%	60%
Temp. @2.5W(5V x 500mA)	40	42	40
인덕턴수 변화율	1.5%	0.5%	0.5%
동작 주파수	100~250kHz	100~250kHz	100~250kHz
Cost	Middle (설비투자 필요)	Low	Middle (설비투자 불필요)
성능	보통	보통	우수

[0066] (표 1)에서 동 재질의 코어에 PSR코팅된 일실시예에 대한 것과, 동 재질의 코어에 무전해금도금된 일실시예를 보인 것을 표기하였다. 물론 본 발명은 상기의 수치에 의하여 한정되는 것은 아니며, 본 발명의 사상 범주 내에서 다양한 수치로 하여 적용되어 실시될 수 있음은 당연한 것이다. (표 1)에서 효율과 온도는 1차측인 무접점전력전송장치(10)에서 유도자기장 발생을 위하여 입력되는 파워에 대하여, 2차측인 무접점전력수신장치(50)에서 수신되는 출력 파워의 비('2차측 DC Output Power' / '1차측 DC Input Power')로 되는 효율(또는 온도)을 나타낸 것이고, 2.5W의 부하가 2차측에 걸렸을 때의 효율(또는 온도)을 나타낸 것이다.

[0067] 이처럼 본 발명에서 동 재질로 하여 PSR코팅되거나 또는 무전해금도금층을 형성하여 파워트랜스피쉬비코어로 하여 2차측코어부(51)를 형성하기 때문에, 효율은 기존의 리쯔코어와 유사하게 나오더라도 코어 자체를 제조하기 위하여 소요되는 재료의 양이 적게 소모될 뿐만 아니라, 제조과정도 단순하게 제조되는 장점이 있다. 물론 무접점전력수신장치(50)에 설치도 용이하게 되는 것은 당연하다 할 것이다.

[0068] 나아가 유도자기장에 대한 전력신호 수신 효율에 있어서 코어에서는 인덕턴스 변화율이 안정적이어야 하나, 종래의 리쯔코어에서는 인덕턴스변화율이 높은 반면 본 발명에 따른 파워트랜스피쉬비코어의 평면나선형 코어구조로 되는 경우에는 인덕턴스변화율이 안정적으로 되기 때문에 전체적으로 전력신호의 수신효율이 안정적이고 향상되는 특징이 있는 것이다.

[0069] 특히 이러한 본 발명에 따른 파워트랜스피쉬비코어로 되는 패턴코어(515)에서는 피씨비 상부로 구비되는 동 재질의 코어에 있어서, 도 3에서와 같이 PSR 코팅되는 경우와, 도 4에서와 같이 무전해금도금되어 마련되는 경우에 대해서 표 1에서와 같이 그 성능에 대해서 각각 살펴본 것이다.

[0070] 이와 같이 구비되는 본 발명에 따른 무접점전력수신장치(50)의 2차측코어부(51)의 효율을 살펴보면 다음과 같다. 즉 도 8에서와 같이, 코어의 내측지름을 Din이라고 하고, 외측지름을 Dout이라 할때, 우선 인덕턴스 L의 계산값은 current sheet apporximation 방식에 의하여 다음과 같이 계산될 수 있다.

[0071] (식1) $L=\mu \times n^2 \times d_{avg} \times c_1(\ln(c_2/\rho)+c_3\times\rho+c_4\times\rho^2)$

[0072] 여기서,

[0073] $\mu = 4\pi\times10^{-7}$, n=the number of turn, $d_{avg}=(d_{out}+d_{in})/2$, $\rho=(d_{out}-d_{in})/(d_{out}+d_{in})$,

[0074] $c_1=1.09$, $c_2=2.23$, $c_3=0$, $c_4=0.17$ 이다.

[0075] 또한 Q(quality factor)의 경우 다음과 같이 계산된다.

[0076] (식2) $Q = \omega L/R_{eq}$

[0077] 여기서,

[0078] $\omega=2\times\pi\times f$, L=inductance, f=frequency, R_{eq}=등가 저항

[0079] 이라고 했을 때, 보통 리쯔코어의 경우 Q값이 표 1과 같이 20 ~ 50의 범위의 값을 갖는다. 이에 반해 본 발명에서와 같이 평면나선형 코어구조(평면 PCB winding core)를 갖게 되는 경우에는 낮은 Q값(예 20 이하)을 갖을 수 있다. 이는 낮은 DCR값에 기인하는데, DCR 값을 개선할 수 있도록 FCCL(Flexible Copper Clade Laminate) 등을 포함하는 평면 피씨비코어에 PSR(Photo Solder Resist) 잉크를 이용한 코팅층이 형성되도록 구비될 수 있다. 이러한 PSR 잉크는 부식을 방지하고 절연을 하기 위한 코팅재로, 이러한 방식을 이용했을 경우에 DCR 값이 높아서 낮은 Q값을 얻게 된다.

[0080] 그리하여 본 발명에서는 이에 더하여 FCCL을 포함하는 평면 피씨비코어 상의 동 재질의 코어에 무전해금도금(0.03㎛)을 하여 DCR값을 1/3로 낮추고 가격을 비슷하게 하면서 성능이 개선되도록 한 것이다.

[0081] 다음 시험으로 상기에서와 같이 평면나선형 코어구조인 파워트랜스피씨비코어(PT-PCB Core)에 더하여, 유도자기장을 차단하기 위한 차폐쉴드가 구비되어 시험을 하였다.

표 2

[0082] (차폐쉴드가 구비된 코어에서의 효율)

구분	단층 평면 PCB 코어	복층 평면 PCB 코어
Q(with Shield)	12	27
효율(@2.5W)	58%	67%

[0083] 상기 표1과 표2에서와 같이, 도 2 및 도 6, 도 7 등에서와 같이 차폐부(61)가 구비되는 경우에는 차폐부(61)가 구비되지 않는 경우보다 효율이 향상된다. 즉 단일층의 코어로 구비되는 경우에, 표 1에서와 같이 차폐부 쉴드가 구비되지 않는 경우에는 Q가 9이고 효율이 53%으로 되는 반면, 차폐부 쉴드가 함께 구비되는 단일층의 코어의 경우 표 2에서와 같이 Q가 12로 58% 효율을 보이고 있다. 마찬가지로 복층으로 평면 PCB 코어가 구비되는 경우에는 차폐부 쉴드가 구비되지 않은 표 1에서는 Q가 20으로 효율은 60%인 반면, 차폐부 쉴드가 함께 구비되는 경우에는 표 2에서와 같이 Q가 27이고 효율이 67%로 향상된 효율을 보이고 있는 것이다.

[0084] 다음으로 이와 같은 본 발명에 따른 평면나선형 코어구조인 파워트랜스피씨비코어(PT-PCB Core)에 대한 특성시험에 대한 것이다. 즉 도 5에서와 같이, 동일 형태로 구비되는 파워트랜스피씨비코어로, 일측의 코어에서는 일정 전류를 흐르게 하여 유도자기장이 발생되도록 하고, 다른 코어에서는 이러한 자기장에 의하여 발생되는 전압을 측정하도록 구비된 것이다.(d : 이격거리, 본 시험에서는 대략 3mm를 예로 하여 측정함).

[0085] 여기서 차폐부가 구비된 경우에 대한 유도전압의 수신 효율(SE, Shield Efficiency)는 차폐부가 구비된 경우의 평균 전압값(Vrms without Shield)과 차폐부가 구비되지 않은 경우의 평균 전압값(Vrms with 3Layer Shield)으로 하여 다음 식과 같이 나타낼 수 있다.(rms = root mean square).

[0086] (식3) $SE = 20\log_{10}(Vrms\ without\ Shield/Vrms\ with\ 3Layer\ shield)$

[0087] 으로 계산될 수 있다.

[0088] 입력측 전류가 0.5A일 경우, Vrms without Shield 일 경우 170mV로 측정되었으며, 반면 차폐부 쉴드가 구비된 Vrms with 3Layer Shield 에서는 0.5mV로 측정되어,

[0089] $SE=20\log_{10}(170/0.5)=50.62(dB)$

[0090] 의 값을 얻을 수 있는 것이다.

[0091] 일반적으로 40dB 이상의 특성일 경우 평균적 수치인데, 대략 50dB 정도의 특성이 나타난 것으로 차폐부 쉴드의 구비에 따른 성능이 우수함을 알 수 있다.

[0092] 상술한 바와 같이, 본 발명의 바람직한 실시예를 참조하여 설명하였지만, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에 의하여 하기의 특허청구범위에 기재된 본 발명의 사상 및 영역으로부터 벗어나지 않는 범위 내에서 본 발명을 다양하게 수정 또는 변형하여 실시할 수 있다.

도면의 간단한 설명

[0093] 도 1은 본 발명에 따른 무접점전력수신장치에 대한 제어구성도.

[0094] 도 2는 본 발명에 따른 무접점전력수신장치의 2차측코어부에 대한 개략적인 층구성 예시도.

[0095] 도 3 및 도 4는 본 발명에 따른 무접점전력수신장치의 2차측코어부의 실시예시 사진.

[0096] 도 5는 본 발명에 따른 무접점전력수신장치의 2차측코어부에 대한 성능시험 구성에 대한 개략적인 예시도.

[0097] 도 6 및 도 7은 본 발명에 따른 무접점전력수신장치의 2차측코어부에 대한 개략적인 측면도.

[0098] 도 8은 본 발명에 따른 무접점전력수신장치의 2차측코어부의 설명을 위한 개략적인 예시도.

[0099] 도 9는 본 발명에 따른 무접점전력수신장치로 되는 배터리팩이 무접점전력전송장치에 위치된 상태에 대한 실시예시 사진.

[0100] <도면의 주요 부분에 대한 부호의 설명>

[0101] 10 : 무접점전력전송장치 50 : 무접점전력수신장치

[0102] 51 : 2차측코어부 52 : 정류부블럭

[0103] 53 : 배터리셀 54 : 배터리팩제어부

[0104] 55 : 충전회로부블럭 56 : 충전감시회로부

[0105] 61 : 차폐부 62 : 차폐패널부

[0106] 63 : 차폐메쉬부 64 : 금속박막부

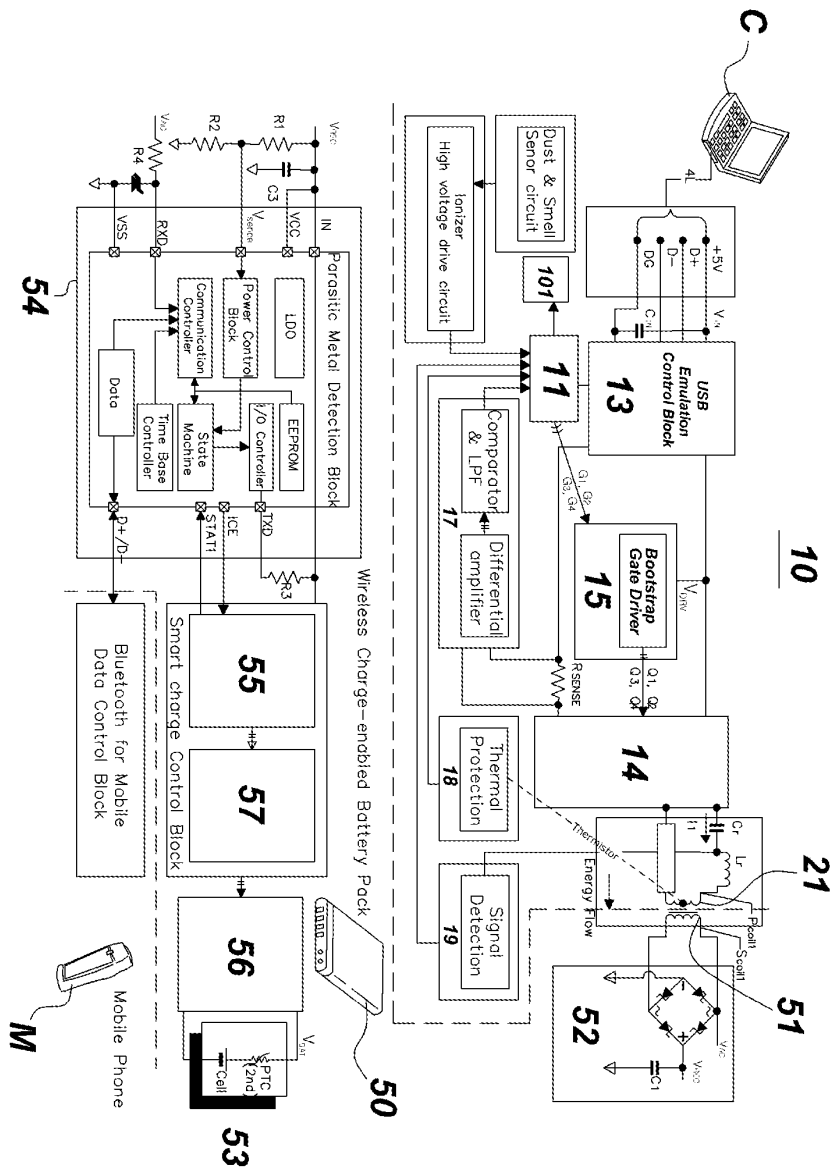
[0107] 511 : 퍼씨비베이스 512 : 패턴코어

[0108] 513 : 차폐패널부 514 : 차폐메쉬부

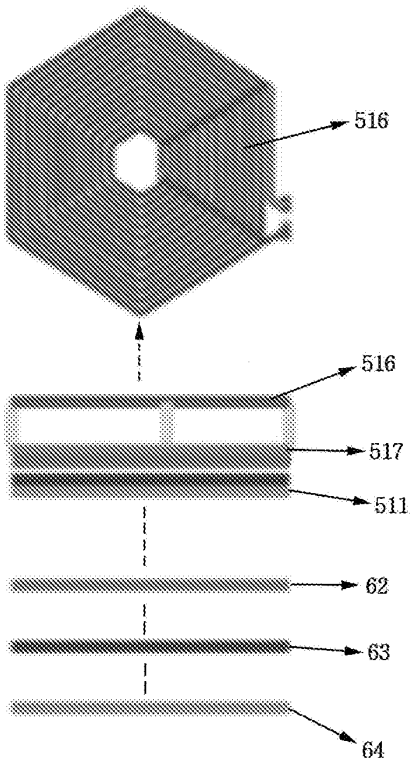
[0109] 515 : 금속박막부

도면

도면1



도면2



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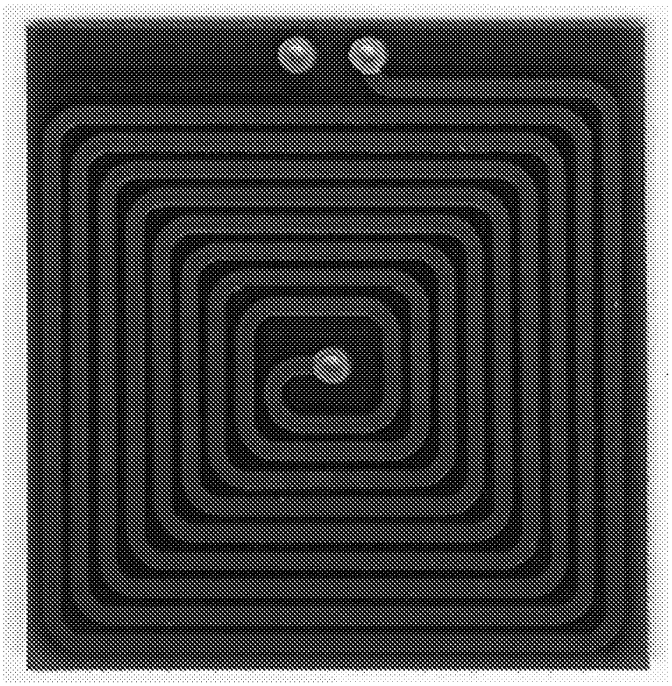

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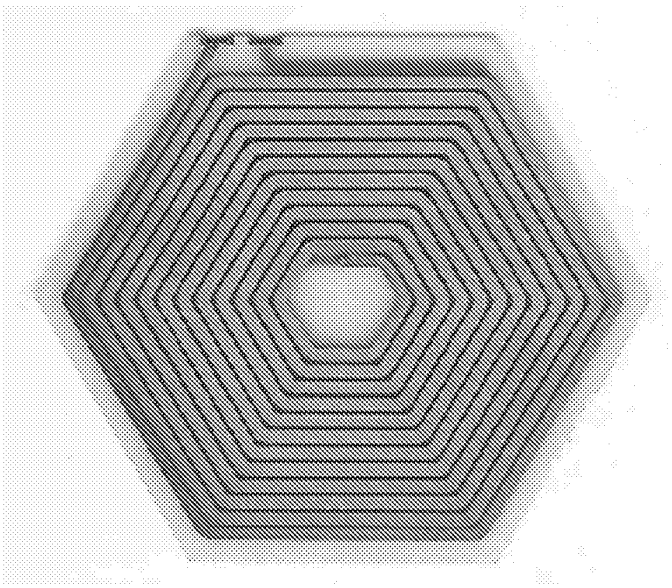
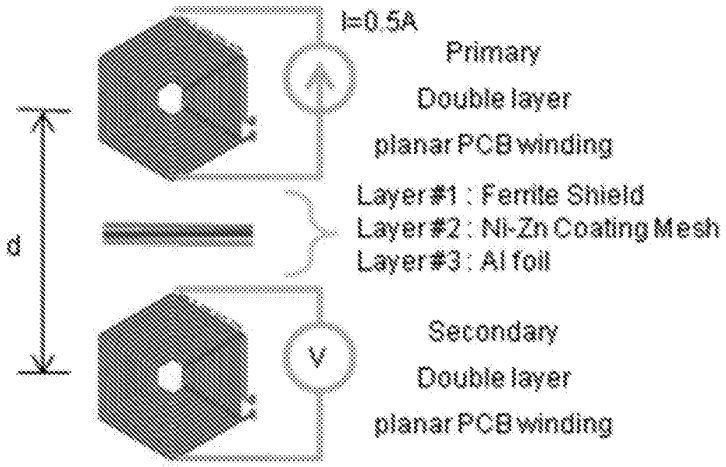
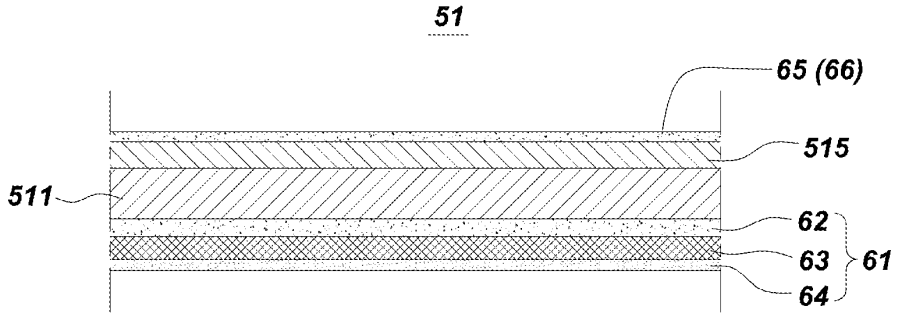


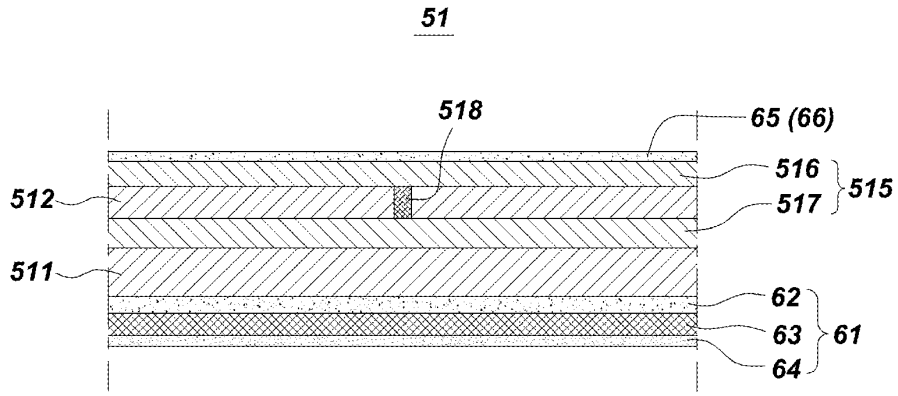
도면5


I=0.5A
Primary
Double layer
planar PCB winding
Layer#1 : Ferrite Shield
Layer#2 : Ni-Zn Coating Mesh
Layer#3 : Al foil
d
V
Secondary
Double layer
planar PCB winding

도면6


51
65 (66)
515
511
62
63
61
64

도면7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518
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515
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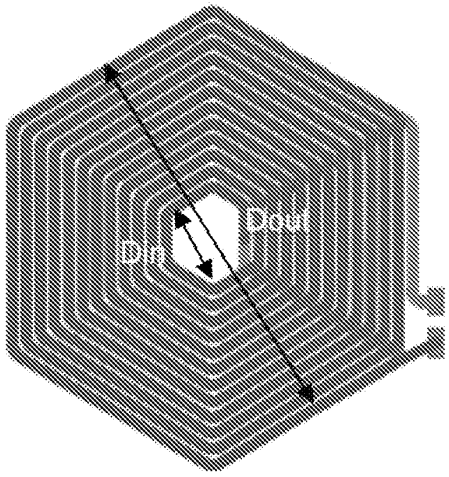
62
63
61
64

도면8



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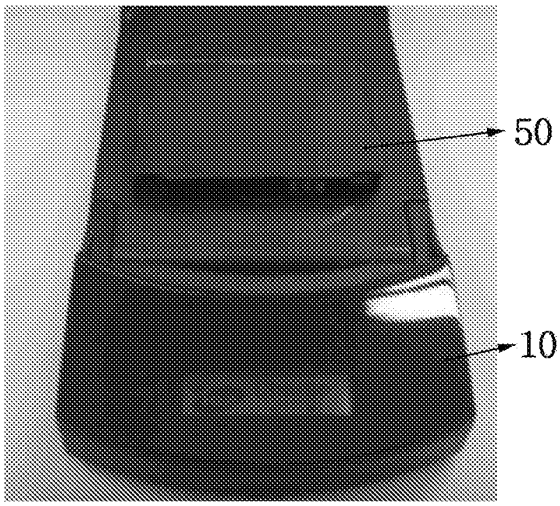

Espacenet

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ELECTRONIC APPARATUS, CHARGER AND ELECTRONIC APPARATUS CHARGING SYSTEM

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Applicant(s): PANASONIC CORP ± (PANASONIC CORP)

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Abstract of JP2009247124 (A)

PROBLEM TO BE SOLVED: To provide an electronic apparatus capable of being billed for fee of power charging even if a secondary battery of an electronic apparatus is in an overdischarged state, and coming out of an overdischarged state, and to provide a charger. ;SOLUTION: The charger 3 transmits power before performing proximity non-contact communication with the electronic apparatus 2, continues the proximity non-contact communication until a preliminary charging stop notification signal is transmitted from the electronic apparatus 2, performs proximity non-contact communication relating to billing processing with the electronic apparatus 2 when the preliminary charging stop notification signal is transmitted. After completion of communication relating to billing processing, the charger transmits power to the electronic apparatus 2 again. The electronic apparatus 2 charges the secondary battery 28 by the power transmitted from the charger 3, charges the battery so that proximity non-contact communication relating the billing processing can be performed, then, performs proximity non-contact communication relating to the billing processing with the charger 3, and then, charges the battery 28 until being fully charged by the resumption of power transmission from the charger 3. As described above, non-contact

charging and proximity non-contact communication are performed between the electronic apparatus 2 and the charger 3 on time division basis. ;COPYRIGHT: (C)2010,JPO&INPIT

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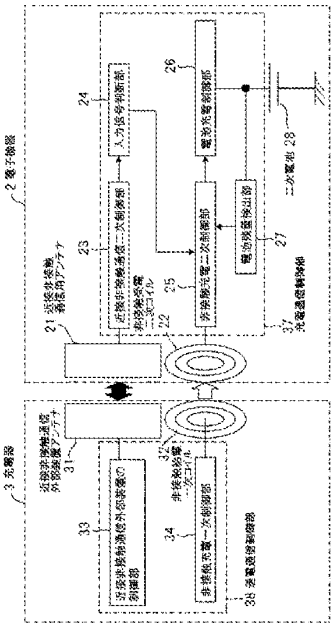
最終頁に続く

(54)【発明の名称】電子機器、充電器、及び電子機器充電システム

(57)【要約】
【課題】電子機器の二次電池が過放電状態になっていても充電に要する課金を受けることができると共に、過放電状態から抜け出すことができる電子機器及び充電器を提供する。
【解決手段】充電器３は、電子機器２との間で近接非接触通信を行う前に送電を行い、この送電を、電子機器２から予備充電停止通知信号が送られてくるまで継続し、予備充電停止通知信号が送られてくると電子機器２との間で課金処理に係る近接非接触通信を行う。課金処理に係る通信が終了した後、電子機器２に対して再び送電を行う。電子機器２は、充電器３からの送電により二次電池２８の充電を行い、課金処理に係る近接非接触通信を行えるまで充電を行った後、充電器３との間で課金処理に係る近接非接触通信を行い、その後、充電器３からの送電の再開により二次電池２８が満充電になるまで充電を行う。このように、電子機器２と充電器３との間で非接触充電と近接非接触通信を時分割で行う。
【選択図】図２



【特許請求の範囲】
【請求項1】
二次電池を電源として用いる電子機器を充電し、かつ前記電子機器と近接非接触通信が可能な充電器であって、
前記電子機器に電磁誘導で電力を送電する送電コイルと、前記近接非接触通信に用いるアンテナと、前記送電と前記近接非接触通信を制御する送電通信制御部を備え、
前記送電通信制御部は、待機状態で前記電子機器を検出すると第１の送電を開始し、
前記第１の送電中に前記電子機器から送電を停止する旨の通知を受けると前記第１の送電を停止し、
前記第１の送電終了後に前記近接非接触通信を開始し、
近接非接触通信が終了すると、第２の送電を開始するように制御する充電器。
【請求項2】
請求項１に記載の充電器であって、
前記アンテナと前記送電コイルが重ねて配置された充電器。
【請求項3】
請求項１又は請求項２に記載の充電器であって、
前記アンテナがループアンテナであり、前記ループアンテナの中心と、前記送電コイルの中心が一致している充電器。
【請求項4】
請求項３に記載の充電器であって、
前記ループアンテナの導線の一部と前記送電コイルの導線の一部が共通である充電器。
【請求項5】
請求項１から請求項４のいずれかに記載の充電器であって、
前記アンテナに接続され、電気的な導通と遮断を切り替える切替スイッチを更に備え、
前記送電通信制御部は、前記近接非接触通信の間は前記切替スイッチを導通状態にし、前記第1の送電の間、又は前記第２の送電の間は前記切替スイッチを遮断状態にする充電器。
【請求項6】
充電器によって充電可能な二次電池を電源として用い、かつ前記充電器と近接非接触通信が可能な電子機器であって、
前記充電器より電磁誘導で電力を受電する受電コイルと、前記受電される電力を基に充電される二次電池と、前記近接非接触通信に用いるアンテナと、前記充電と前記近接非接触通信を制御する充電通信制御部を備え、
前記充電通信制御部は、前記受電コイルに受電があると、第一条件が成立するまで前記二次電池に対して第１の充電を開始し、
前記第１の充電中に前記第一条件が成立すると送電を停止する旨の通知を前記充電器に送り、
前記送電を停止する旨の通知の後に前記近接非接触通信を開始し、
前記近接非接触通信が終了すると、第二条件が成立するまで前記二次電池に対して第２の充電を行う電子機器。
【請求項7】
請求項６に記載の電子機器であって、
前記アンテナと前記受電コイルが重ねて配置された電子機器。
【請求項8】
請求項６又は請求項７に記載の電子機器であって、
前記アンテナがループアンテナであり、前記ループアンテナの中心と、前記受電コイルの中心が一致している電子機器。
【請求項9】
請求項８に記載の電子機器であって、

前記ループアンテナの導線の一部と前記受電コイルの導線の一部が共通である電子機器。

【請求項10】

請求項６から請求項９のいずれかに記載の電子機器であって、

前記アンテナに接続され、電気的な導通と遮断を切り替える切替スイッチを更に備え、

前記充電通信制御部は、前記近接非接触通信の間は前記切替スイッチを導通状態にし、前記第1の充電の間、又は前記第２の充電の間は前記切替スイッチを遮断状態にする電子機器。

【請求項11】

請求項６から請求項１０のいずれかに記載の電子機器であって、

前記第一条件が、前記二次電池の電圧が第一の所定値以上であり、

前記第二条件が、前記二次電池の電圧が第二の所定値であり、

前記第二の所定値が前記第一の所定値より大きい電子機器。

【請求項12】

請求項６から請求項１０のいずれかに記載の電子機器であって、

前記第一条件が、連続充電の所定時間経過であり、

前記第二条件が、前記二次電池の電圧が第二の所定値である電子機器。

【請求項13】

請求項１から請求項５のいずれかに記載の充電器と請求項６から請求項１２のいずれかに記載の電子機器を備える電子機器充電システム。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、携帯電話等の電子機器と、該電子機器に充電を行う充電器と、該電子機器と該充電器からなる電子機器充電システムとに関する。

【背景技術】

【0002】

携帯電話等の携帯型の電子機器には、その電源を確保するために、通常、繰り返し充放電が可能な二次電池が用いられている。また、従来の電子機器には、二次電池への充電を非接触状態で行うようにしたものもある（例えば、特許文献１参照）。

【0003】

二次電池への充電を非接触状態で行う電子機器において、非接触充電用の受電コイルと近接非接触通信（フェリカ（登録商標）等）用のループアンテナが近接して配置される場合、受電コイルで発生する高調波ノイズの悪影響により近接非接触通信の誤動作を誘発する可能性がある。

【0004】

なお、このような高調波ノイズの悪影響を防止する方法として、例えば特許文献２に、２つ以上の近接非接触通信アンテナのそれぞれの同調回路の共振周波数を他の同調回路の共振周波数に対してずらすようにした技術がある。

【0005】

【特許文献1】特開２０００－０７６３９９号（特許第３１８０８６号）公報

【特許文献2】特開２００６－２９５４６９号公報

【発明の開示】

【発明が解決しようとする課題】

【0006】

しかしながら、近接非接触通信を使って課金を受けてから非接触充電を開始する場合で、電子機器の二次電池が過放電状態（機器を作動させることができる電圧を下回った状態）にある場合、電圧不足により電子機器の近接非接触通信機能が動作しないことから、課金を受けることができない。課金を受けることができないので、非接触充電を開始することができず、永遠に過放電状態から抜け出すことができない。

【0007】

本発明は、かかる事情に鑑みてなされたものであり、電子機器の二次電池が過放電状態になっていても充電に要する課金を受けることができると共に、過放電状態から抜け出すことができる電子機器及び充電器を提供することを目的とする。

【課題を解決するための手段】

【0008】

本発明の充電器は、二次電池を電源として用いる電子機器を充電し、かつ前記電子機器と近接非接触通信が可能な充電器であって、前記電子機器に電磁誘導で電力を送電する送電コイルと、前記近接非接触通信に用いるアンテナと、前記送電と前記近接非接触通信を制御する送電通信制御部を備え、前記送電通信制御部は、待機状態で前記電子機器を検出すると第１の送電を開始し、前記第１の送電中に前記電子機器から送電を停止する旨の通知を受けると前記第１の送電を停止し、前記第１の送電終了後に前記近接非接触通信を開始し、近接非接触通信が終了すると、第２の送電を開始するように制御する。

【0009】

この構成によれば、電子機器との間で近接非接触通信を行う前に送電（第１の送電）を行うので、電子機器の二次電池が過放電状態になっていても充電されることから、電子機器との間で課金処理を行うことができる。また、電子機器との間で近接非接触通信を行った後に再び送電（第２の送電）を行うので、電子機器の二次電池が引き続き充電されることから、電子機器は過放電状態から抜け出すことができる。この場合、最初の充電が予備充電であり、課金処理が終わった次の充電が本充電である。

【0010】

また、高調波ノイズが発生する送電時に近接非接触通信を行わないので、近接非接触通信に対するノイズの影響が生じない。

【0011】

前記アンテナと前記送電コイルが重ねて配置されてもよい。

【0012】

また、前記アンテナがループアンテナであり、前記ループアンテナの中心と、前記送電コイルの中心が一致していてもよい。

【0013】

また、前記ループアンテナの導線の一部と前記送電コイルの導線の一部が共通であってもよい。

【0014】

また、前記アンテナに接続され、電気的な導通と遮断を切り替える切替スイッチを更に備え、前記送電通信制御部は、前記近接非接触通信の間は前記切替スイッチを導通状態にし、前記第1の送電の間、又は前記第２の送電の間は前記切替スイッチを遮断状態にしてもよい。

【0015】

本発明の電子機器は、充電器によって充電可能な二次電池を電源として用い、かつ前記充電器と近接非接触通信が可能な電子機器であって、前記充電器より電磁誘導で電力を受電する受電コイルと、前記受電される電力を基に充電される二次電池と、前記近接非接触通信に用いるアンテナと、前記充電と前記近接非接触通信を制御する充電通信制御部を備え、前記充電通信制御部は、前記受電コイルに受電があると、第一条件が成立するまで前記二次電池に対して第１の充電を開始し、前記第１の充電中に前記第一条件が成立すると送電を停止する旨の通知を前記充電器に送り、前記送電を停止する旨の通知の後に前記近接非接触通信を開始し、前記近接非接触通信が終了すると、第二条件が成立するまで前記二次電池に対して第２の充電を行う。

【0016】

この構成によれば、受電コイルに受電があると、第一条件が成立するまでの期間に二次電池の充電（第１の充電）を行うので、二次電池が過放電状態になっていても充電器との間で課金処理を行うことができる。また、第一条件の成立後に近接非接触通信を行い、この近接非接触通信後は、第二条件が成立するまで二次電池の充電（第２の充電）を行うの

で、過放電状態から抜け出すことができる。また、第一条件が成立した時点で充電が停止し、その状態が近接非接触通信の終了時まで継続するので、その間、近接非接触通信に対するノイズの影響が生じない。

【0017】

前記アンテナと前記受電コイルが重ねて配置されてもよい。

【0018】

また、前記アンテナがループアンテナであり、前記ループアンテナの中心と、前記受電コイルの中心が一致していてもよい。

【0019】

また、前記ループアンテナの導線の一部と前記受電コイルの導線の一部が共通であってもよい。

【0020】

また、前記アンテナに接続され、電気的な導通と遮断を切り替える切替スイッチを更に備え、前記充電通信制御部は、前記近接非接触通信の間は前記切替スイッチを導通状態にし、前記第1の充電の間、又は前記第２の充電の間は前記切替スイッチを遮断状態にしてもよい。

【0021】

また、前記第一条件が、前記二次電池の電圧が第一の所定値以上であり、前記第二条件が、前記二次電池の電圧が第二の所定値であり、前記第二の所定値が前記第一の所定値より大きくてもよい。

【0022】

また、前記第一条件が、連続充電の所定時間経過であり、前記第二条件が、前記二次電池の電圧が第二の所定値であってもよい。

【0023】

本発明の電子機器充電システムは、上記充電器と上記電子機器を備える。

【発明の効果】

【0024】

本発明によれば、電子機器の二次電池が過放電状態になっていても充電に要する課金を受けることができると共に、過放電状態から抜け出すことができる電子機器及び充電器を提供することができる。

【発明を実施するための最良の形態】

【0025】

以下、本発明を実施するための好適な実施の形態について、図面を参照して詳細に説明する。

【0026】

（実施の形態１）

図１は、本発明の実施の形態１に係る電子機器充電システムの概観を示す斜視図である。図１において、本実施の形態に係る電子機器充電システム１は、携帯電話、ＰＨＳ（Personal Handy-phone System）、ＰＤＡ（Personal Digital Assistant）等の電子機器２と、電子機器２に対して非接触に充電を行う充電器３とを備える。電子機器２は、充電器３と非接触の状態で充電器３から電力の給電を受けて充電可能な電池（二次電池）に充電することができる。ここで、非接触とは、電子機器２と充電器３が、金属端子を介して直接電気的に導通しない状態で、両者の間で電力（電波）、信号等がやり取り可能であることをいう。

【0027】

電子機器２には、充電器３と近接非接触通信を行うための近接非接触通信アンテナ２１と、充電器３から電磁誘導で電力を受けるための非接触受電二次コイル２２が機器本体の同一面上に設けられている。充電器３には、電子機器２と近接非接触通信を行うための近接非接触通信外部装置アンテナ３１と、電子機器２に電磁誘導で電力を送るための非接触給電一次コイル３２が機器本体の同一面上に設けられている。

【0028】
図２は、本実施の形態に係る電子機器充電システム１の電子機器２及び充電器３の概略構成を示すブロック図である。図２において、電子機器２は、上述した近接非接触通信用アンテナ２１及び非接触受電二次コイル２２と、近接非接触通信二次制御部２３と、入力信号判断部２４と、非接触充電二次制御部２５と、電池充電制御部２６と、電池残量検出部２７と、リチウムイオン電池等の充電可能な二次電池２８とを備える。近接非接触通信用アンテナ２１は、充電器３の近接非接触通信外部装置アンテナ３１との間での通信に使用される。非接触受電二次コイル２２は、充電器３の非接触給電一次コイル３２との間で電磁結合して電力の供給を受けるのに使用される。また、非接触受電二次コイル２２は、ＩＤ情報、充電完了信号等の充電器３への負荷変調等を利用した送信に使用される。
【0029】
近接非接触通信二次制御部２３は、充電器３から送信された課金要求信号を近接非接触通信用アンテナ２１にて受信し、受信した課金要求信号に従って課金処理を行い、課金処理後、課金処理完了信号を近接非接触通信用アンテナ２１から充電器３へ送信する。入力信号判断部２４は、近接非接触通信二次制御部２３における通信伝送モード（課金）状態の判断を行う。
【0030】
非接触充電二次制御部２５は、電子機器２に付与されたＩＤ情報を非接触受電二次コイル２２から充電器３へ負荷変調等を利用して送信し、また充電器３から伝送された電力を非接触受電二次コイル２２にて受電する。また、非接触充電二次制御部２５は、予備充電と満充電を終えたことを充電器３に通知するための充電完了信号を非接触受電二次コイル２２から充電器３へ負荷変調等を利用して送信する。また、非接触充電二次制御部２５は、電池残量検出部２７で検出された二次電池２８の電池残量が所定電圧以上か未満かを判断する。電池残量検出部２７は、二次電池２８の電池電圧を電池残量として検出する。電池充電制御部２６は、非接触充電二次制御部２５による電池残量判定に基づき、二次電池２８の充電開始停止を制御する。充電時には非接触受電二次コイル２２で受電された電力を用いて二次電池２８の充電を行う。
【0031】
また、電子機器２において近接非接触通信二次制御部２３、入力信号判断部２４、非接触充電二次制御部２５、電池充電制御部２６、及び電池残量検出部２７は、充電と近接非接触通信を制御する充電通信制御部３７を構成し、充電器３において近接非接触通信外部装置の制御部３３と非接触充電一次制御部３４は、送電と近接非接触通信を制御する送電通信制御部３８を構成する。
【0032】
図３は、電子機器２の充電及び課金通信動作を示す図である。図３において、縦軸は二次電池２８の電池電圧、横軸は時間である。また、所定値（第一の所定値）Ｖａは電子機器２が課金処理を実行できる最小の電圧値である。なお、この場合の課金とは、電子機器２が充電器３を使用して充電を行う際に発生する料金のことである。
【0033】
さて、電子機器２の使用に伴い二次電池２８の電池電圧Ｖｐが低下し、所定値Ｖａを下回る過放電状態であるＶｂ（＜Ｖａ）まで陥ったとする。この過放電状態のまま放置されている状態で、ユーザが電子機器２の過放電状態に気付いて電子機器２を充電器３に設置すると（時刻ｔｐで電子機器２を充電器３に設置すると）、設置した時刻ｔｐから充電が開始されて二次電池２８の電池電圧Ｖｐが上昇して行く。二次電池２８の電池電圧Ｖｐが所定値Ｖａに達すると、電子機器２は課金通信が可能な状態となる。これにより、課金通信が開始される。課金通信が行われることで二次電池２８の電池電圧Ｖｐが降下して行くが、課金通信終了後に本充電が開始される。本充電は二次電池２８の電池電圧Ｖｐが満充電となる値（第二の所定値）になるまで継続される。なお、当然ながら本充電の期間中に電子機器２が充電器３から外された場合には充電が途中で中止する。
【0034】

このように、電子機器２は、非接触方式で充電する充電器３によって充電可能な二次電池２８を電源として用い、かつ充電器３と近接非接触通信が可能であり、非接触受電二次コイル２２に受電があると、その受電によって電池電圧Ｖｐが所定値Ｖａ以上になるまで二次電池２８を充電（予備充電）し、電池電圧Ｖｐが所定値Ｖａ以上になると送電を停止する旨の予備充電停止通知信号を充電器３へ送信し、その直後から充電器３との間で近接非接触通信である課金通信を開始する。そして、課金通信が終了すると、充電器３からの受電によって電池電圧Ｖｐが所定値Ｖａより大きな値となるまで二次電池２８を充電（本充電）する。

【0035】

図２に戻り、充電器３は、上述した近接非接触通信外部装置アンテナ３１及び非接触給電一次コイル３２と、近接非接触通信外部装置の制御部３３と、非接触充電一次制御部３４とを備える。近接非接触通信外部装置の制御部３３は、電子機器２に課金要求信号の送信を行うと共に、電子機器２からの課金処理完了信号の受信を行う。非接触充電一次制御部３４は、電子機器２側へ電力の供給と停止を行う。また、非接触充電一次制御部３４は、非接触給電一次コイル３２に電流が流れるか否かにより負荷の有無を検出する。この場合、非接触給電一次コイル３２と電磁的に結合する磁性体が非接触給電一次コイル３２の付近にあれば、非接触給電一次コイル３２に電流が流れることから負荷を検出できる。

【0036】

また、非接触充電一次制御部３４は、非接触給電一次コイル３２に流れる電流の値によって異物を検出する。この場合、電子機器２の非接触受電二次コイル２２とその他の物（例えば１０円玉）とでは非接触給電一次コイル３２に流れる電流の値に違いがあるので、非接触受電二次コイル２２のときに非接触給電一次コイル３２に流れる電流の値を記憶しておくことで、この電流値との比較によって電子機器２かその他の物との違いを判定することができる。なお、非接触給電一次コイル３２上に非接触受電二次コイル２２以外の物（例えば１０円などの硬貨）を置いたときに非接触給電一次コイル３２に流れる電流の値も記憶しておくことで、その物を判定することもできる。

【0037】

また、非接触充電一次制御部３４は、非接触給電一次コイル３２で受信された信号からＩＤ認証を行う。この場合、電子機器２を充電器３に設置することで電子機器２からＩＤ情報が送信されてくるので、非接触充電一次制御部３４はこのＩＤ情報を取得してＩＤ認証を行う。

【0038】

このように、充電器３は、二次電池２８を電源として用いる電子機器２を非接触方式で充電し、かつ電子機器２と近接非接触通信が可能であり、待機状態で電子機器２を検出すると送電を開始し、送電を開始した後、電子機器２から送電を停止する旨の予備充電停止通知信号を受信すると送電を停止し、その直後から電子機器２との間で近接非接触通信である課金通信を開始し、この課金通信が終了すると送電を開始する。

【0039】

次に、本実施の形態に係る電子機器充電システム１の電子機器２及び充電器３の動作を説明する。図４は、充電器３の動作を示すフローチャートである。図４において、充電器３に電源を投入することで、充電器３が起動する（ステップＳ１０）。充電器３は、起動後にスタンバイモードに移行して負荷の確認を行う（ステップＳ１１）。即ち、スタンバイモードに移行すると、非接触給電一次コイル３２の電流値を調べて負荷の確認を行う。この確認で負荷ありと判断すると、認証モードに移行して認証ＩＤの確認を行う（ステップＳ１２）。この確認において認証ＩＤを確認できない場合は正規負荷ではないとして認証エラーと判断し、エラーモードに移行する。エラーモードで負荷の確認を行い（ステップＳ１３）、その後、ステップＳ１１に戻る。ステップＳ１２の判定で認証ＩＤを確認できた場合は認証ＯＫとして電力伝送モードに移行して予備的な充電を行う為の送電（第１の送電）を行う（ステップＳ１４）。

【0040】

予備充電中も負荷の有無の判定や、予備充電停止通知の有無、異物の有無を判定し、負荷がなくなった場合（即ち電子機器２が充電器３から外された場合）は、負荷なしとしてステップＳ１１に戻り、予備充電停止通知がある場合は予備充電を停止し（ステップＳ１５）、異物があった場合はステップＳ１３に移行する。これらに対して、正規負荷（ＩＤが認証された負荷）、異物なし及び予備充電停止通知なしの場合はそのまま予備充電を継続する。

【0041】

充電器３は、電子機器２から予備充電停止通知があると、予備充電を停止する（ステップＳ１５）。そして、通信伝送モードに移行し課金処理を行う（ステップＳ１６）。課金処理中も負荷の有無の判定、不正規負荷（ＩＤが認証されていない負荷）か否かの判定及び課金処理完了か否かの判定を行い、負荷がなくなった場合（即ち電子機器２が充電器３から外された場合）は負荷なしとしてステップＳ１１に戻り、不正規負荷である場合はエラーモードに移行して負荷確認を行ってステップＳ１１に戻り、課金処理が完了した場合は課金処理を完了する（ステップＳ１７）。これらに対して、正規負荷で課金処理が未完了の場合はそのまま課金処理を継続する。

【0042】

課金処理が完了した後、電力伝送モードに移行し、二次電池２８が満充電状態になるまで充電する為の送電（第２の送電）を行う（ステップＳ１８）。本充電中も負荷の有無の判定、不正規負荷か否かの判定及び満充電の有無の判定を行い、負荷がなくなった場合（即ち電子機器２が充電器３から外された場合）は負荷なしとしてステップＳ１１に戻り、不正規負荷である場合はエラーモードに移行して負荷確認を行ってステップＳ１１に戻り、満充電ありの場合は本充電停止モードに移行する（ステップＳ１９）。これらに対して、満充電なし、異物なし及び正規負荷の場合はそのまま本充電を継続する。

【0043】

満充電ありとして本充電停止モードに移行すると、本充電を停止するが、停止するまでの間に負荷の有無の判定を行い、負荷がある場合はこの判定を継続して行い、負荷がない場合はこの判定を終えてステップＳ１１に戻る。

【0044】

このように充電器３では、非接触給電一次コイル３２上の負荷の有無を確認し、負荷があれば認証ＩＤを確認し、認証ＩＤを確認できれば正規負荷と判断して予備充電のための給電を行い、予備充電を終えると、当該正規負荷に対する課金処理を行い、課金処理を終えると、当該正規負荷に対して本充電を行う。

【0045】

次に、図５は電子機器２の動作を示すフローチャートである。図５において、電子機器２が充電器３に設置されて充電器３から給電があると、この給電によって非接触回路（近接非接触通信二次制御部２３、入力信号判断部２４、非接触充電二次制御部２５、電池充電制御部２６及び電池残量検出部２７）が起動する（ステップＳ３０）。そして、充電器２からの認証要求コマンドの有無を判定し、認証要求コマンドがなければ同コマンドがあるまでこの判定を繰り返し、同コマンドがあれば認証モードに移行し、充電器３に認証ＩＤを通知する（ステップＳ３１）。

【0046】

充電器３に認証ＩＤを通知した後、予備充電モードに移行し、二次電池２８に対して充電（第１の充電）を開始する。予備充電中は二次電池２８の電池電圧Ｖｐが所定値Ｖａ以上であるか、所定値Ｖａ未満であるかの判定を行うと共に、充電器２からの電力伝送が所定時間ないかどうか判定を行う（ステップＳ３２）。充電器２からの電力伝送が所定時間ない場合は電源をオフする。また、二次電池２８の電池電圧Ｖｐが所定値Ｖａ未満である場合は、所定値Ｖａに達するまで予備充電を継続する。また、二次電池２８の電池電圧Ｖｐが所定値Ｖａ以上である場合は、充電器２に予備充電停止を通知する（ステップＳ３３）。そして、充電器２からの課金要求の有無を判定し、課金要求がなければこの判定を繰り返し、課金要求があれば課金処理を行う（ステップＳ３４）。そして、課金処理が終了

すると、充電器３に課金処理完了を通知する（ステップＳ３５）。

【0047】

課金処理完了通知の送出を完了した後、本充電モードに移行し、本充電（第２の充電）を開始する（ステップＳ３６）。本充電中は満充電の有無を判定し、満充電なしの場合（即ち満充電でない場合）は本充電を継続し、満充電ありの場合（即ち満充電になった場合）は充電器３に本充電停止を通知する（ステップＳ３７）。なお、本充電中に電子機器２が充電器３から外されると自動的に電源をオフする。また、満充電の基準は、所定値Ｖａを超える電圧値であればどのような値でもよく、二次電池２８の仕様に従って決定すればよい。このとき決定した値が第二の所定値に対応し、所定値（第一の所定値）Ｖａを超える値となる。

【0048】

本充電停止通知処理中は、本充電停止通知の送出が完了したかどうか判定し、本充電停止通知の送出を完了していなければ本充電停止通知処理を継続する。本充電停止通知の送出を完了した後、自動的に電源をオフする。

【0049】

図６は、電子機器２と充電器３間の信号の送受信を示すシーケンス図である。図６に示すように、充電器３は、最初にスタンバイモードに移行し、負荷確認信号を定期的に送信して負荷検出を行う。そして、負荷を検出すると認証モードに移行し、負荷を認証するために認証要求信号を送信する。この認証要求信号に対して負荷から認証ＩＤ信号が送信されてくると、該認証ＩＤ信号より認証を行い、認証ＯＫであれば予備充電の電力伝送モードに移行し、電力の伝送を開始する。負荷である電子機器２は充電器３から給電を受けて、二次電池２８の電池電圧Ｖｐが所定値Ｖａ以上になるまで定期的に正規負荷信号を送信する。そして、電池電圧Ｖｐが所定値Ｖａ以上になると、予備充電を終えたとして予備充電停止通知信号を送信する。

【0050】

充電器３は、電子機器２からの予備充電停止通知信号を受信すると、電力の伝送を停止し、通信伝送モードに移行する。通信伝送モードに移行すると、電子機器２に課金要求信号を送信する。電子機器２は課金要求信号を受信すると、課金処理を開始する。そして、課金処理が完了すると、充電器３に課金処理完了を示す信号を送信する。充電器３は、電子機器２からの課金処理完了を示す信号を受信すると、本充電の電力伝送モードに移行し、電力の伝送を開始する。電子機器２は、充電器３から電力の伝送が開始されると、二次電池２８に対して本充電を開始する。そして、本充電を行っている間、定期的に正規負荷信号を送信する。そして、二次電池２８が満充電になると、充電器３に本充電停止通知として満充電信号を送信する。充電器３は、電子機器２からの満充電信号を受信すると、電力の伝送を停止し、電力伝送モードから本充電停止モードに移行して、定期的に負荷確認信号を送信する。そして、電子機器２が充電器３から外されると、充電器３は負荷なしを検出する。

【0051】

以上のように、本実施の形態の電子機器充電システム１によれば、電子機器２と充電器３との間で非接触充電と近接非接触通信を時分割で行い、電子機器２の二次電池２８が過放電状態であれば、電子機器２が充電器３から給電を受けて、二次電池２８に課金処理を行えるだけの電力を得るための予備充電を行い、予備充電の完了後は電子機器２と充電器３との間で課金処理を行うための課金通信を行い、課金処理の完了後は電子機器２が充電器２から給電を受けて二次電池２８が満充電になるまで本充電を行うので、電子機器２の二次電池２８が過放電状態になっていても課金を受けることができ、また本充電を行うことで過放電状態から抜け出すことができる。また、非接触受電二次コイル２２の高調波ノイズが発生する期間は近接非接触通信を行わないことから、近接非接触通信に対するノイズの影響がない。

【0052】

（実施の形態２）

図７は、本発明の実施の形態２に係る電子機器充電システムの概観を示す斜視図である。また、図８は本実施の形態に係る電子機器充電システム１Ａの電子機器２Ａ及び充電器３Ａの概略構成を示すブロック図である。図７又は図８に示すように、本実施の形態に係る電子機器充電システム１Ａは、電子機器２Ａ及び充電器３Ａの夫々において近接非接触通信アンテナと非接触充電コイルを重ねて配置した構成としたものである。即ち、電子機器２Ａにおいては、近接非接触通信アンテナ２１と非接触受電二次コイル２２を重ねて配置し、更に具体的には、近接非接触通信アンテナ２１をループアンテナとし、そのループアンテナの中心と非接触受電二次コイル２２の中心が一致する構成とした。また、充電器３Ａにおいては、近接非接触通信外部装置アンテナ３１と非接触給電一次コイル３２を重ねて配置し、更に具体的には、上記の電子機器２Ａの構成と同様に、近接非接触通信外部装置アンテナ３１をループアンテナとし、そのループアンテナの中心と非接触給電一次コイル３２の中心が一致する構成としたものである。近接非接触通信アンテナと非接触充電コイルを重ねて配置することで、これらの機器本体に対する専有面積を小さくすることができ、電子機器２Ａ及び充電器３Ａの小型化に対応できる。更に、近接非接触通信アンテナ２１の中心と非接触受電二次コイル２２の中心が一致し、近接非接触通信外部装置アンテナ３１の中心と非接触給電一次コイル３２の中心が一致することで、近接非接触通信アンテナ２１と近接非接触通信外部装置アンテナ３１の位置と自動的に非接触受電二次コイル２２と非接触給電一次コイル３２の位置を一度に合わせることができる。

【0053】

加えて電子機器２Ａにおいて、近接非接触通信アンテナ２１がループアンテナの場合、そのループアンテナの導線の一部と非接触受電二次コイル２２の導線の一部を共通にしてもよい。これにより、共通な導線で構成される近接非接触通信アンテナ２１の中心と非接触受電二次コイル２２の中心は当然に一致することになる。更に、近接非接触通信アンテナ２１と非接触受電二次コイル２２を合わせた体積と質量を削減することができ、電子機器２Ａを小型化、軽量化することができる。

【0054】

同様に充電器３Ａにおいて、近接非接触通信外部装置アンテナ３１がループアンテナの場合、そのループアンテナの導線の一部と非接触給電一次コイル３２の導線の一部を共通にしてもよい。これにより、共通な導線で構成される近接非接触通信外部装置アンテナ３１の中心と非接触給電一次コイル３２の中心は当然に一致することになる。更に、近接非接触通信外部装置アンテナ３１と非接触給電一次コイル３２を合わせた体積と質量を削減することができ、充電器３Ａを小型化、軽量化することができる。

【0055】

また、電子機器２Ａ及び充電器３Ａの夫々において近接非接触通信アンテナと非接触充電コイルを重ねて配置することで、これらの間で干渉が起こるので、一方を使用するときは他方を回路から外すようにしている。使用しない方を回路から外すために電子機器２Ａは、切替スイッチ２９ａ，２９ｂと、切替スイッチ２９ａ，２９ｂの切替えを制御する競合制御部３０を有し、充電器３Ａは、切替スイッチ３５ａ，３５ｂと、切替スイッチ３５ａ，３５ｂの切替えを制御する競合制御部３６を有している。例えば、充電器３Ａが電子機器２Ａに対して充電を行うときは、充電器３Ａの競合制御部３６は、切替スイッチ３５ａをオフ（開状態、遮断状態）、切替スイッチ３５ｂをオン（閉状態、導通状態）にし、電子機器２Ａの競合制御部３０は、切替スイッチ２９ａをオフ（開状態、遮断状態）、切替スイッチ２９ｂをオン（閉状態、導通状態）にする。

【0056】

二次電池２８の充電用に非接触給電一次コイル３２から非接触受電二次コイル２２へ送電する電力は、近接非接触通信アンテナ２１と近接非接触通信外部装置アンテナ３１の近接非接触通信で利用する電力に比べると極めて大きい。その為に非接触受電二次コイル２２で発生する高調波の電力も比較的大きいために、近接非接触通信への影響は無視できず、近接非接触通信機能に誤動作を発生させる要因になりうる。

【0057】

そこで上述のように切替スイッチ３５ａ，３５ｂ，２９ａ，２９ｂに対して競合制御を行うことにより、非接触給電一次コイル３２から非接触受電二次コイル２２へ送電している間は、近接非接触通信アンテナ２１と近接非接触通信二次制御部との間に電流が流れることはなく、近接非接触通信機能に誤動作が発生することがなくなる。

【0058】

更にこの競合制御により、近接非接触通信中は非接触給電一次コイル３２と非接触受電二次コイル２２に電流が流れることはなく、近接非接触通信で利用する電力が非接触給電一次コイル３２又は非接触受電二次コイル２２で吸収されることがなくなる。これにより、近接非接触通信をより確実に行えるようになる。

【0059】

このように、電子機器２Ａ及び充電器３Ａの夫々において近接非接触通信アンテナと非接触充電コイルを重ねて配置した構成とすることで、これらの機器本体に対する専有面積を小さくすることができ、電子機器２Ａ及び充電器３Ａの更なる小型化が可能となる。なお、本実施の形態においても、電子機器２Ａと充電器３Ａとの間で非接触充電と近接非接触通信を時分割で行うことは上述した実施の形態１と同様であり、同様の効果が得られる。

【0060】

なお、上記実施の形態では、電子機器２（２Ａ）の二次電池２８の電圧Ｖｐが所定値Ｖａ以上になるまで二次電池２８の予備充電を行うようにしたが、この予備充電期間を電圧値基準で決定する以外に、時間で決定するようにしてもよい。即ち、予備充電としての連続充電を所定時間経過するまで行うようにしてもよい。

【0061】

なお、電子機器２Ａにおいて近接非接触通信二次制御部２３、入力信号判断部２４、非接触充電二次制御部２５、電池充電制御部２６、電池残量検出部２７、及び競合制御部３０は、充電と近接非接触通信を制御する充電通信制御部３９を構成し、充電器３Ａにおいて近接非接触通信外部装置の制御部３３、非接触充電一次制御部３４、及び競合制御部３６は、送電と近接非接触通信を制御する送電通信制御部４０を構成する。

【産業上の利用可能性】

【0062】

本発明は、電子機器の二次電池が過放電状態になっていても充電に要する課金を受けることができると共に、過放電状態から抜け出すことができるといった効果を有し、携帯電話、ＰＨＳ、ＰＤＡ等の電子機器と、この電子機器に対して非接触に充電を行う充電器とを備える電子機器充電システムへの適用が可能である。

【図面の簡単な説明】

【0063】

【図1】本発明の実施の形態１に係る電子機器充電システムの概観を示す斜視図
【図2】図１の電子機器充電システムの電子機器及び充電器の概略構成を示すブロック図
【図3】図１の電子機器充電システムの電子機器における充電動作を示す図
【図4】図１の電子機器充電システムの充電器の動作を示すフローチャート
【図5】図１の電子機器充電システムの電子機器の動作を示すフローチャート
【図6】図１の電子機器充電システムの電子機器と充電器間の信号の送受信を示すシーケンス図
【図7】本発明の実施の形態２に係る電子機器充電システムの概観を示す斜視図
【図8】図７の電子機器充電システムの電子機器及び充電器の概略構成を示すブロック図

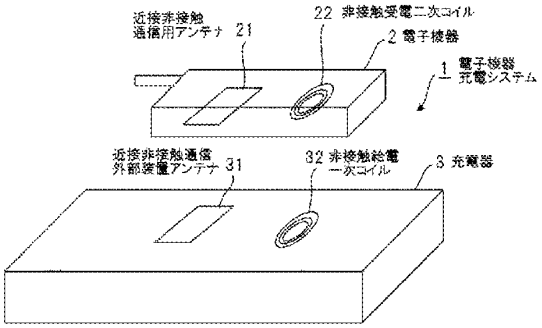
【符号の説明】

【0064】

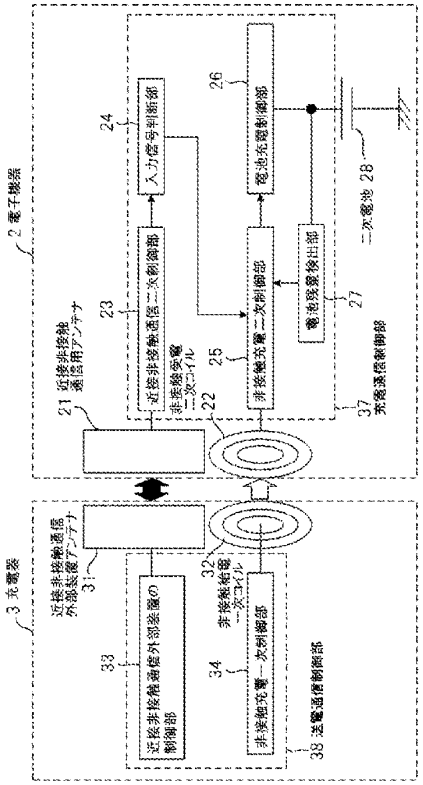
１、１Ａ　電子機器充電システム
２、２Ａ　電子機器
３、３Ａ　充電器
２１　近接非接触通信用アンテナ

２２　非接触受電二次コイル
２３　近接非接触通信二次制御部
２４　入力信号判断部
２５　非接触充電二次制御部
２６　入力信号判断部
２７　電池残量検出部
２８　二次電池
２９ａ、２９ｂ、３５ａ、３５ｂ　切替スイッチ
３０、３６　競合制御部
３１　近接非接触通信外部装置アンテナ
３２　非接触給電一次コイル
３３　近接非接触通信外部装置の制御部
３４　非接触充電一次制御部
３７、３９　充電通信制御部
３８、４０　送電通信制御部

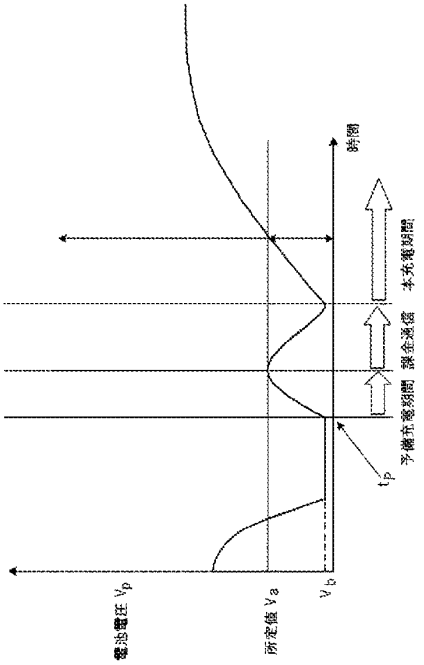
【図1】



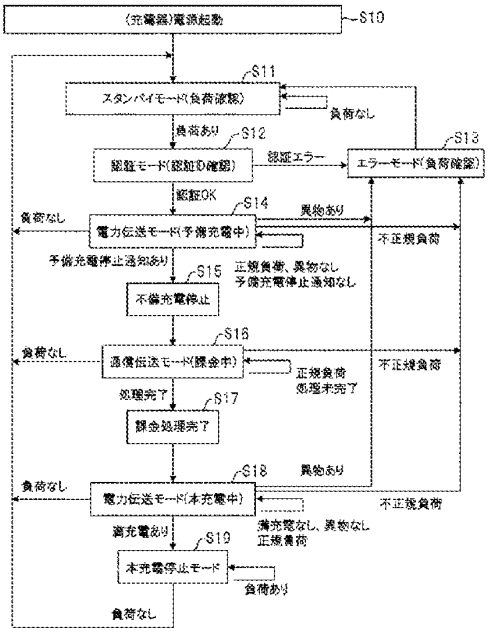
【図2】



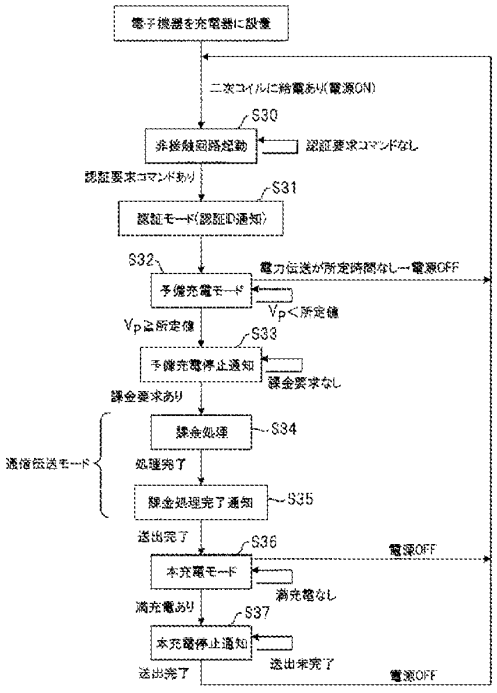
【図3】


時間
本充電期間
課金通信
予備充電期間
t_p
整流電圧 V_p
所定値 V_a
V_b

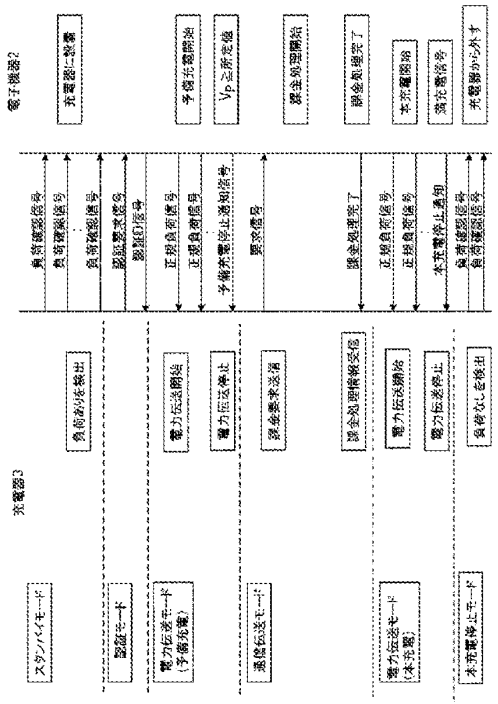
【図4】


(充電器)電源起動
S10
S11
スタンバイモード(負荷検知)
負荷なし
負荷あり
S12
認証モード(認証ID確認)
認証エラー
S13
エラーモード(負荷確認)
認証OK
S14
異物あり
負荷なし
電力伝送モード(予備充電中)
不正規負荷
予備充電停止通知あり
S15
正規負荷、異物なし
予備充電停止通知なし
不備充電停止
S16
負荷なし
通信伝送モード(課金中)
正規負荷
処理未完了
不正規負荷
処理完了
S17
課金処理完了
S18
異物あり
負荷なし
電力伝送モード(本充電中)
不正規負荷
満充電なし、異物なし
正規負荷
満充電あり
S19
本充電停止モード
負荷あり
負荷なし

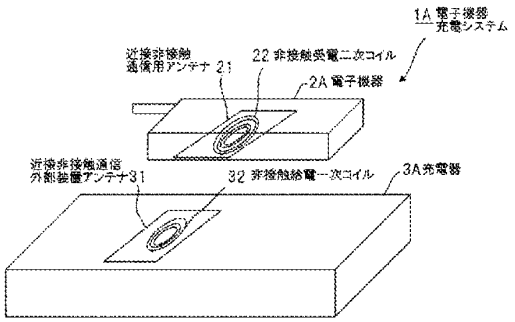
【図5】


電子機器を充電器に設置
二次コイルに給電あり(電源ON)
S30
非接触回路起動
認証要求コマンドなし
認証要求コマンドあり
S31
認証モード(認証ID通知)
S32
電力伝送が所定時間なし→電源OFF
予備充電モード
V_p<所定値
V_p≧所定値
S33
予備充電停止通知
課金要求なし
課金要求あり
通信伝送モード
S34
課金処理
処理完了
S35
課金処理完了通知
送出完了
S36
電源OFF
本充電モード
満充電なし
満充電あり
S37
本充電停止通知
送出未完了
送出完了
電源OFF

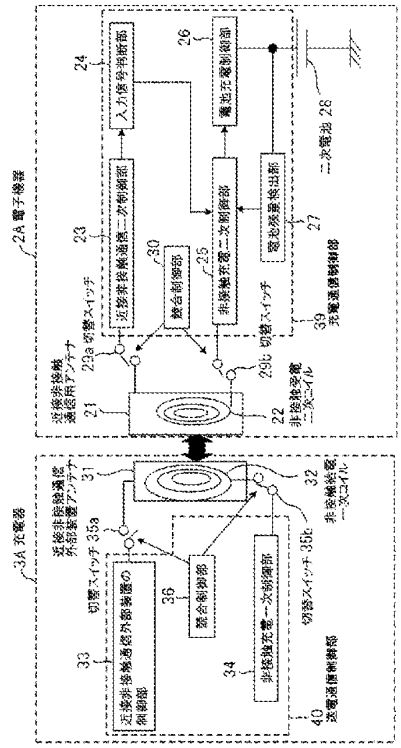
【図6】


電子機器?
充電器に設置
予備充電開始
V_p≧所定値
課金処理開始
課金処理完了
本充電開始
満充電検知
充電器から外す
負荷確認信号
負荷確認信号
負荷確認信号
認証要求信号
認証ID信号
正規負荷信号
正規負荷信号
予備充電停止通知信号
要求信号
課金処理完了
正規負荷信号
正規負荷信号
本充電停止通知
負荷確認信号
負荷確認信号
充電器?
負荷ありを検出
電力伝送開始
電力伝送停止
課金要求送信
課金処理情報受信
電力伝送開始
電力伝送停止
負荷なしを検出
スタンバイモード
認証モード
電力伝送モード(予備充電)
通信伝送モード
電力伝送モード(本充電)
本充電停止モード

【図7】


1A 電子機器充電システム
近接非接触通信用アンテナ 21
22 非接触受電二次コイル
2A 電子機器
近接非接触通信外部装置アンテナ31
32 非接触給電一次コイル
3A 充電器

【図8】


2A 電子機器
3A 充電器
近接非接触通信用アンテナ
非接触受電二次コイル
近接非接触通信外部装置アンテナ
非接触給電一次コイル
二次電池 28
充電通信制御部 39
送電通信制御部 40

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Electronic device, battery charger, and electronic device battery-charging system

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Abstract of CN101983466 (A)

Disclosed are an electronic device capable of paying the cost for charging a secondary battery of the electronic device even if the secondary battery is overdischarged and escaping from the overdischarge and a battery charger. The battery charger (3) transmits power to the electronic device (2) before proximity contactless communication with the electronic device (2) and continues the power transmission until a preliminary battery-charging stop report signal is sent from the electronic device (2). When the preliminary battery-charging stop report signal is sent to the battery charger (3), thebattery charger (3) performs proximity contactless communication concerning the charge/payment for the battery-charging with the electronic device (2). When the communication concerning the charge/payment is ended, the battery charger (3) transmits power to the electronic device (2) again. The electronic device (2) charges the secondary battery (28) through the power transmission from the batterycharger (3). When the secondary battery (28) is charged to an extent that proximity contactless communication can be performed, the electronic device (2) performs proximity

contactless communication concerning the charge/payment with the battery charger (3). Thereafter, power transmission from the battery charger (3) is resumed, and the electronic device (2) fully charges the secondary battery (28). Thus, contactless battery-charging and proximity contactless communication between the electronic device (2) and the battery charger (3) are performed in a time-division way.

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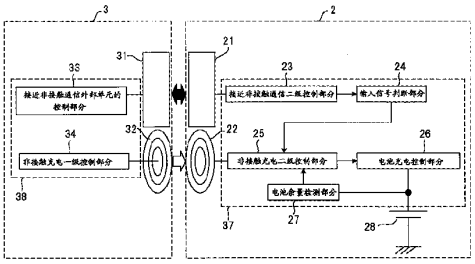
(54)发明名称

电子设备、充电器和电子设备充电系统

(57)摘要

公开了一种电子设备，其能够接收充电处理所需要的充电计费，即使所述电子设备的二次电池进入过放电状态，并能够使其自身摆脱过放电状态，以及用于相同用途的充电器。充电器(3)在其与电子设备(2)进行接近非接触通信之前执行电力传送，持续这个电力传送直到所述电子设备(2)发送预备充电停止通知信号，并在所述预备充电停止通知信号被发送时，关于记账处理执行与所述电子设备(2)之间的接近非接触通信。在关于所述充电/记账处理的通信结束之后，所述充电器(3)再次对电子设备(2)进行充电。所述电子设备(2)通过利用电力传送，对二次电池(28)充电，然后执行所述充电，达到关于记账处理的接近非接触通信能够进行的水平，然后关于记账处理、与所述充电器(3)进行接近非接触通信，然后，重启来自充电器(3)的电力传送以执行所述充电，直到所述二次电池(28)被完全充电。用这种方式，所述非接触充电和接近非接触通信在时分系统的电子设备(2)和充电器(3)之间执行。



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1. 一种用于对采用二次电池作为电源的电子设备充电的充电器，其能够与所述电子设备进行接近非接触通信，所述充电器包括：

电力传送线圈，其通过电磁感应将电力传送给所述电子设备；

用于进行接近非接触通信的天线；以及

电力传送和通信控制部件，其控制电力传送和所述接近非接触通信；

其中，所述电力传送和通信控制部件进行如下操作：

当所述电子设备被检测为处于待机状态时，开始第一电力传送，

当在所述第一电力传送期间从所述电子设备接收到指示停止所述电力传送的通知时，停止第一电力传送，

在所述第一电力传送被终止之后，开始接近非接触通信，以及

当所述接近非接触通信被终止时，开始第二电力传送。

2. 如权利要求 1 所述的充电器，其中，所述天线和电力传送线圈被安排为处于重叠状态。

3. 如权利要求 1 或 2 所述的充电器，其中，所述天线由环路天线构成，且所述环路天线的中心被设置为与所述电力传送线圈的中心重合。

4. 如权利要求 3 所述的充电器，其中，所述环路天线的导线的一部分与所述电力接收线圈的导线的一部分被公共地形成。

5. 如权利要求 1 至 4 中的任一个所述的充电器，还包括：

连接到所述天线的切换开关，其切换对所述天线的电导通及切断；

其中，所述电力传送和通信控制部件使所述切换开关在接近非接触通信期间进入导通状态，并使所述切换开关在第一电力传送或第二电力传送期间进入切断状态。

6. 一种电子设备，其采用可由充电器充电的二次电池作为电源，并能够与所述充电器进行接近非接触通信，所述电子设备包括：

电力接收线圈，其通过电磁感应从所述充电器接收电力；

利用所接收的电力而被充电的二次电池；

用于进行接近非接触通信的天线；以及

充电和通信控制部件，其控制所述充电和所述接近非接触通信；

其中，所述充电和通信控制部件进行如下操作：

当经由电力接收线圈接收到电力时，开始对二次电池的第一充电，直到满足第一条件为止；

当在第一充电期间满足第一条件时，发送指示停止电力传送的通知；

在所述指示停止电力传送的通知被发送之后，开始接近非接触通信；和

当所述接近非接触通信被终止时，开始二次电池的第二充电，直到满足第二条件为止。

7. 如权利要求 6 所述的电子设备，其中，所述天线和电力接收线圈被安排为处于重叠状态。

8. 如权利要求 6 或 7 所述的电子设备，其中，所述天线由环路天线构成，且所述环路天线的中心被设置为与电力接收线圈的中心重合。

9. 如权利要求 8 所述的电子设备，其中，所述环路天线的导线的一部分与电力传送线圈的导线的一部分被公共地形成。

10. 如权利要求 6 至 9 中的任一个所述的电子设备，还包括：

连接到所述天线的切换开关，其切换对所述天线的电导通以及切断；

其中，所述充电和通信控制部件使所述切换开关在接近非接触通信期间进入导通状态，并使所述切换开关在第一充电或第二充电期间进入切断状态。

11. 如权利要求 6 至 10 中的任一个所述的电子设备，其中，所述第一条件对应于二次电池的电压大于第一预定值的情形；

所述第二条件对应于二次电池的电压等于第二预定值的情形；以及

所述第二预定值大于所述第一预定值。

12. 如权利要求 6 至 10 中的任一个所述的电子设备，其中，所述第一条件对应于已经经过了预定的连续充电时间的情形；以及

所述第二条件对应于二次电池的电压等于第二预定值的情形。

13. 一种电子设备充电系统，包括：

如权利要求 1 至 5 中的任一个所述的充电器；以及

如权利要求 6 至 12 中的任一个所述的电子设备。

电子设备、充电器和电子设备充电系统

技术领域

[0001] 本发明涉及诸如蜂窝电话等的电子设备、用于对所述电子设备充电的充电器、以及由所述电子设备和充电器组成的电子设备充电系统。

背景技术

[0002] 在诸如蜂窝电话等的移动电子设备中，通常，采用可以重复地充 / 放电的二次电池来保证电源。另外，一些传统的电子设备被设计为以非接触的方式对二次电池充电（例如，见专利文献 1）。

[0003] 在以非接触方式对二次电池充电的电子设备中，当用于非接触充电的电力接收线圈和用于接近非接触通信（例如，Felica（注册商标）等）的环路天线被安排得相互紧密邻近时，由于在电力接收线圈中产生的谐波噪声的不利影响，在所述接近非接触通信中可能会引发故障。

[0004] 另外，作为关于预防这些谐波噪声的不利影响的方法，例如，在专利文献 2 中，公开了使两个或更多个接近非接触通信天线中的一个调谐电路的谐振频率与其余调谐电路的谐振频率偏移的技术。

[0005] 专利文献 1 ：JP-A-2000-076399（日本专利 No. 318086）

[0006] 专利文献 2 ：JP-A-2006-295469

发明内容

[0007] 本发明要解决的问题

[0008] 然而，在电子设备经由接近非接触通信接收到充电计费之后启动所述非接触充电的情况下，当这个电子设备的二次电池处于过放电状态（所述二次电池的电压降低到设备能够操作的电压之下的状态）时，因为电压不足，所述电子设备的接近非接触通信功能不能工作，因此，这个电子设备不能接收充电计费。因此，所述电子设备不能启动非接触充电，这是因为，这个电子设备不能接收充电计费，由此，这个电子设备也永远不能使其自身摆脱过放电状态。

[0009] 已考虑了这些情况作出了本发明，并且，本发明的一个目标是提供 ：电子设备，其即使在所述电子设备的二次电池进入过放电状态的情况下，也能够接收充电处理所需要的充电计费，并还能够使其自身摆脱过放电状态 ；以及用于该电子设备的充电器。

[0010] 解决所述问题的手段

[0011] 本发明的充电器对采用二次电池作为电源的电子设备进行充电，且能够与所述电子设备进行接近非接触通信，该充电器包括 ：通过电磁感应向所述电子设备传送电力的电力传送线圈 ；用于接近非接触通信的天线 ；以及用于控制电力传送和接近非接触通信的电力传送和通信控制部件 ；其中所述电力传送和通信控制部件在所述电子设备被检测为处于待机状态时，启动第一电力传送，在所述第一电力传送期间接收到来自所述电子设备的、指示要停止所述电力传送的通知时，停止第一电力传送，在所述第一电力传送终止之后，启动

接近非接触通信，以及当所述接近非接触通信终止时，启动第二电力传送。

[0012] 根据这个配置，所述充电器在与电子设备进行接近非接触通信之前执行电力传送（第一电力传送）。因此，所述充电器即使当所述电子设备的二次电池处于过放电状态时，也能够提供充电，这样，所述充电器能够对电子设备应用记账处理。另外，所述充电器在所述充电器与电子设备进行接近非接触通信之后，再次执行电力传送（第二电力传送）。因此，所述电子设备的二次电池可以被连续地充电，使得所述电子设备可以使其自身摆脱过放电状态。在这种情况下，所述第一充电对应于预备充电，而完成记账处理之后的充电对应于常规充电。

[0013] 另外，在产生谐波噪声的电力传送期间不进行接近非接触通信。因此，所述接近非接触通信绝不会受到噪声的影响。

[0014] 另外，所述天线和电力传送线圈可被安排处于重叠状态。

[0015] 另外，所述天线可以由环路天线组成，且所述环路天线的中心被设置为与电力传送线圈的中心重合。

[0016] 另外，所述环路天线的导线的一部分与电力接收线圈的导线的一部分可被公共形成。

[0017] 另外，所述充电器还可以包括连接到天线的切换开关，用于切换对所述天线的电导通及切断；其中所述电力传送和通信控制部件使所述切换开关在接近非接触通信期间进入导通状态，并使所述切换开关在第一电力传送或第二电力传送期间进入切断状态。

[0018] 本发明的一种电子设备采用可由充电器再充电的二次电池作为电源，并能够与所述充电器进行接近非接触通信，该电子设备包括：电力接收线圈，用于通过电磁感应从所述充电器接收电力；由接收到的电力所充电的二次电池；用于进行接近非接触通信的天线；以及充电和通信控制部件，其控制所述充电和接近非接触通信。其中，所述充电和通信控制部件在经由电力接收线圈接收到电力时，启动对二次电池的第一充电，直到满足第一条件为止；在第一充电期间满足第一条件时，发送指示要停止电力传送的通知；在所述指示要停止电力传送的通知之后，启动接近非接触通信；以及当所述接近非接触通信终止时，启动二次电池的第二充电，直到满足第二条件为止。

[0019] 根据这个配置，当经由电力接收线圈接收到电力时，所述充电器对二次电池执行充电（第一充电），直到满足第一条件为止。因此，所述电子设备即使当所述二次电池落入其过放电状态时，也能够对充电器应用记账处理。另外，所述电子设备在满足第一条件之后进行接近非接触通信，且所述电子设备在接近非接触通信之后，执行对二次电池的充电（第二充电），直到满足第二条件为止。因此，所述电子设备能够使其自身摆脱过放电状态。另外，所述充电在满足第一条件的时间点停止，且这个状态持续到结束接近非接触通信为止。因此，噪声对接近非接触通信的影响不会在这个状态期间引起。

[0020] 所述天线和电力接收线圈可被安排处于重叠状态。

[0021] 另外，所述天线可以由环路天线组成，且所述环路天线的中心可被设置为与电力接收线圈的中心重合。

[0022] 另外，所述环路天线的导线的一部分与电力传送线圈的导线的一部分可被公共地形成。

[0023] 另外，所述充电器还可以包括连接到天线的切换开关，用于切换对所述天线的电

导通及切断；其中所述电力传送和通信控制部件使所述切换开关在接近非接触通信期间进入导通状态，并使所述切换开关在第一充电或第二充电期间进入切断状态。

[0024] 另外，所述第一条件可以对应于二次电池的电压大于第一预定值的情况，所述第二条件可以对应于二次电池的电压为第二预定值的情况，以及所述第二预定值可以大于第一预定值。

[0025] 另外，所述第一条件可以对应于已经经过了预定的连续充电时间的情况，以及所述第二条件可以对应于二次电池的电压为第二预定值的情况。

[0026] 本发明的一种电子设备充电系统包括上述充电器、以及上述电子设备。

[0027] 本发明的优势

[0028] 根据本发明，可以提供这样的电子设备和充电器，其即使在所述电子设备的二次电池进入过放电状态时，也能够接收充电所需要的充电计费，并能够使其自身摆脱过放电状态。

附图说明

[0029] 图 1 是显示根据本发明的实施例 1 的电子设备充电系统的轮廓的透视图；

[0030] 图 2 是显示了图 1 所示的电子设备充电系统的电子设备和充电器的示意配置的框图；

[0031] 图 3 是显示了图 1 所示的电子设备充电系统中的电子设备的充电操作的视图；

[0032] 图 4 是显示了图 1 所示的电子设备充电系统的充电器的操作的流程图；

[0033] 图 5 是显示了图 1 所示的电子设备充电系统的电子设备的操作的流程图；

[0034] 图 6 是显示了图 1 所示的电子设备充电系统的电子设备和充电器之间的信号传送 / 接收的顺序图；

[0035] 图 7 是示出根据本发明的实施例 2 的电子设备充电系统的轮廓的透视图；

[0036] 图 8 是显示了图 7 所示的电子设备充电系统的电子设备和充电器的示意配置的框图。

[0037] 参考编号和符号的说明

[0038] 1，1A 电子设备充电系统

[0039] 2，2A 电子设备

[0040] 3，3A 充电器

[0041] 21 接近非接触通信天线

[0042] 22 非接触电力接收二级线圈

[0043] 23 接近非接触通信二级控制部分

[0044] 24 输入信号判断部分

[0045] 25 非接触充电二级控制部分

[0046] 26 电池充电控制部分

[0047] 27 电池余量检测部分

[0048] 28 二次电池

[0049] 29a，29b，35a，35b 切换开关

[0050] 30，36 冲突控制部分

[0051] 31 接近非接触通信外部单元天线

[0052] 32 非接触供电一级线圈

[0053] 33 接近非接触通信外部单元的控制部分

[0054] 34 非接触充电一级控制部分

[0055] 37,39 充电和通信控制部分

[0056] 38,40 电力传送通信控制部分

具体实施方式

[0057] 下文将参考附图说明实施本发明的优选实施例。

[0058] [实施例 1]

[0059] 图 1 是根据本发明的实施例 1 的电子设备充电系统的轮廓的透视图。在图 1 中，本发明的电子设备充电系统 1 包括诸如蜂窝电话、PHS（个人手持电话系统）、PDA（个人数字助理）等的电子设备 2、以及用于以非接触的方式对电子设备 2 充电的充电器 3。所述电子设备 2 能够通过在与充电器 3 处于非接触的状态下接收从充电器 3 馈送的电力，来对可充电电池（二次电池）充电。这里，所述“非接触状态”表示这样的状态：所述电子设备 2 和充电器 3 能够在不经由金属端子直接电连接的状态下相互传送电力（无线电波）、信号等。

[0060] 在电子设备 2 中，在设备本体的相同平面上提供了用于与充电器 3 进行接近非接触通信的接近非接触通信天线 21、以及用于通过电磁感应从充电器 3 接收电力的非接触电力接收二级线圈 22。在充电器 3 中，在充电器本体的相同平面上提供了用于与电子设备 2 进行接近非接触通信的接近非接触通信外部单元天线 31、以及用于通过电磁感应向电子设备 2 传送电力的非接触供电一级线圈 32。

[0061] 图 2 是显示了根据本发明的电子设备充电系统 1 的电子设备 2 和充电器 3 的示意配置的框图。在图 2 中，所述电子设备 2 包括上面所述的接近非接触通信天线 21 和非接触电力接收二级线圈 22、接近非接触通信二级控制部分 23、输入信号判断部分 24、非接触充电二级控制部分 25、电池充电控制部分 26、电池余量检测部分 27、以及诸如锂离子电池等的可充电二次电池 28。所述接近非接触通信天线 21 被用于与充电器 3 的接近非接触通信外部单元天线 31 进行通信。所述非接触电力接收二级线圈 22 被电磁连接到充电器 3 的非接触供电一级线圈 32，并被用于接收电力供应。另外，所述非接触电力接收二级线圈 22 被用于通过利用负载调制等向充电器 3 传送 ID 信息、充电完成信号等等。

[0062] 所述接近非接触通信二级控制部分 23 经由接近非接触通信天线 21 接收从充电器 3 传送的记账请求信号，根据所接收到的记账请求信号执行记账处理，并在记账处理之后经由接近非接触通信天线 21 向充电器 3 传送记账处理完成信号。所述输入信号判断部分 24 在接近非接触通信二级控制部分 23 中判断通信传送模式（记账）状态。

[0063] 所述非接触充电二级控制部分 25 利用负载调制等，从非接触电力接收二级线圈 22 向充电器 3 传送分配给电子设备 2 的 ID 信息，并经由非接触电力接收二级线圈 22 接收从充电器 3 传送的电力。另外，所述非接触充电二级控制部分 25 通过利用负载调制等，从非接触电力接收二级线圈 22 向充电器 3 传送充电完成信号，该充电完成信号用于向充电器 3 通知所述充电处理完成。另外，所述非接触充电二级控制部分 25 判断由电池余量检测部分 27 所检测出的电池余量是处于超过预定电压还是低于预定电压的状态。所述电池余量

检测部分 27 检测二次电池 28 的电池电压作为电池余量。所述电池充电控制部分 26 基于非接触充电二级控制部分 25 关于电池余量的判断来控制二次电池 28 的充电的起始 / 停止。所述电池充电控制部分 26 利用非接触电力接收二级线圈 22 所接收到的电力来执行二次电池 28 的充电。

[0064] 另外，在电子设备 2 中，所述接近非接触通信二级控制部分 23、输入信号判断部分 24、非接触充电二级控制部分 25、电池充电控制部分 26 和电池余量检测部分 27 组成了控制充电和接近非接触通信的充电和通信控制部分 37。另外，在充电器 3 中，接近非接触通信外部单元的控制部分 33 和非接触充电一级控制部分 34 组成了控制电力传送和接近非接触通信的电力传送通信控制部分 38。

[0065] 图 3 是显示了电子设备 2 的充电和记账通信操作的视图。在图 3 中，纵坐标表示二次电池 28 的电池电压，而横坐标表示时间。另外，预定值（第一预定值）Va 表示电子设备 2 能够执行记账处理的最小电压值。此情况下的所述“记账”表示当电子设备 2 利用充电器 3 实施充电时需要的充电计费。

[0066] 这里，假定这样的情形：二次电池 28 的电池电压 Vp 根据电子设备 2 的使用而降低，然后降低到 Vb（＜ Va），作为所述电池电压 Vp 降低到预定值 Va 之下的过放电状态。在二次电池 28 被保持在其过放电状态的情况下，当用户意识到电子设备 2 的过放电状态、然后将电子设备 2 置于充电器 3 上时（当用户在时刻 tp 将电子设备 2 置于充电器 3 上时），从放置时刻 tp 开始充电，二次电池 28 的电池电压 Vp 逐渐上升。当二次电池 28 的电池电压 Vp 达到预定值 Va 时，所述电子设备 2 进入能够进行记账通信的状态。相应地，所述记账通信被启动。二次电池 28 的电池电压 Vp 由于进行了记账通信而逐渐降低，在所述记账通信结束后启动常规充电。所述常规充电持续直到二次电池 28 的电池电压 Vp 变为二次电池 28 的电池电压 Vp 对应于完全充电电压的值（第二预定值）为止。在这种情况下，当然，当电子设备 2 在常规充电期间从充电器 3 移除时，所述充电被暂停。

[0067] 用这种方式，在电子设备 2 能够采用可由在非接触系统中进行充电的充电器 3 再充电的二次电池 28 作为电源、且能够与充电器 3 保持接近非接触通信的情形下，当经由非接触电力接收二级线圈 22 接收电力时，所述电子设备 2 利用所接收到的电力对所述二次电池 28 充电（预备充电），直到电池电压 Vp 超过预定值 Va 为止，然后，当电池电压 Vp 超过预定值 Va 时，向充电器 3 传送指示电力的供应应该停止的预备充电停止通知信号。紧接在其后，所述电子设备 2 开始保持作为与充电器 3 的接近非接触通信的记账通信。然后，当所述记账通信结束时，所述电子设备 2 利用从充电器 3 接收到的电力对二次电池 28 充电（常规充电），直到电池电压 Vp 增加到大于预定值 Va 的值为止。

[0068] 回到图 2，所述充电器 3 包括上面所述的接近非接触通信外部单元天线 31 和非接触供电一级线圈 32、接近非接触通信外部单元的控制部分 33、以及非接触充电一级控制部分 34。接近非接触通信外部单元的控制部分 33 向电子设备 2 传送记账请求信号，并从电子设备 2 接收记账处理完成信号。所述非接触充电一级控制部分 34 执行电子设备 2 一侧的电力的供应和停止。另外，所述非接触充电一级控制部分 34 响应于是否有电流流经非接触供电一级线圈 32，来检测是否存在负载。在这种情况下，当电磁连接到非接触供电一级线圈 32 的磁性材料位于非接触供电一级线圈 32 的邻近时，所述非接触充电一级控制部分 34 能够基于电流流经非接触供电一级线圈 32 的事实，检测出所述负载。

[0069] 另外，响应于流经非接触供电一级线圈 32 的电流的值，所述非接触充电一级控制部分 34 检测到异物。在这种情况下，流经非接触供电一级线圈 32 的电流的值在电子设备 2 的非接触电力接收二级线圈 22 与其他物体（如十日元硬币）之间不同。因此，如果流经非接触供电一级线圈 32 的电流值在非接触电力接收二级线圈 22 位于附近时被存储，则所述非接触充电一级控制部分 34 能够通过比较检测到的值与这个存储的值，来判断电子设备 2 与其他物体之间的差异。在这个情况下，如果在除了非接触电力接收二级线圈 22 之外的其他物体（如，十日元硬币等等）被放在非接触供电一级线圈 32 上时、也存储流经非接触供电一级线圈 32 的电流的值，则所述非接触充电一级控制部分 34 能够判断所关注的物体。

[0070] 另外，所述非接触充电一级控制部分 34 基于非接触供电一级线圈 32 所接收到的信号进行 ID 认证。在这种情况下，通过将电子设备 2 置于充电器 3 上而从电子设备 2 传送 ID 信息。因此，所述非接触充电一级控制部分 34 获取这个 ID 信息，并进行 ID 认证。

[0071] 用这种方式，所述充电器 3 能够在非接触系统中对将二次电池 28 用作电源的电子设备 2 充电，并能够保持与电子设备 2 的接近非接触通信。另外，当充电器 3 检测到电子设备 2 处于待机模式时，所述充电器 3 开始向电子设备 2 传送电力。在电力传送开始之后，当充电器 3 接收到来自电子设备 2 的、指示电力的传送应该被停止的预备充电停止通知信号时，充电器 3 停止所述电力的传送。紧接在这个停止之后，所述充电器 3 开始保持作为与电子设备 2 的接近非接触通信的记账通信。然后，当所述记账通信终止时，所述充电器 3 开始电力的传送。

[0072] 接下来，下文将说明根据本实施例的电子设备充电系统 1 中的电子设备 2 和充电器 3 的各个操作。图 4 是显示了充电器 3 的操作的流程图。在图 4 中，当充电器 3 的电源被打开时，所述充电器 3 被启动（步骤 S10）。在启动之后，所述充电器 3 进入待机模式，以检查负载（步骤 S11）。即，当充电器 3 进入待机模式时，这个充电器 3 检查非接触供电一级线圈 32 的电流值，以判断是否存在负载。如果通过此检查判断存在负载，则充电器 3 进入认证模式，以确认认证 ID（步骤 S12）。如果通过这个确认判断不能确认认证 ID，则充电器 3 判断认证错误，这是因为没有施加规则的负载。然后，所述充电器 3 进入错误模式。接着，所述充电器 3 在这个错误模式中检查负载（步骤 S13），然后，所述充电器 3 返回步骤 S11。在步骤 S12，如果判断所述认证 ID 能够被确认，则所述充电器 3 进行电力传送模式的判断，这是因为所述认证 ID 是通过 (OK)，然后执行以预备充电为目的的电力传送（第一电力传送）（步骤 S14）。

[0073] 在所述预备充电期间，仍然判断是否施加了负载、是否发出了预备充电停止通知、以及是否发现了异物。如果没有负载被施加（即，所述电子设备 2 从充电器 3 移除），则判断没有施加负载，且充电器 3 返回步骤 S11。如果发出了预备充电停止通知，则预备充电被停止（步骤 S15）。如果发现异物，则充电器 3 返回步骤 S13。与上面相反，如果判断施加了规则负载（其 ID 被认证）、没有发现异物、且没有发出预备充电停止通知，则仍然继续照旧进行预备充电。

[0074] 如果充电器 3 接收到来自电子设备 2 的预备充电停止通知，则其停止所述预备充电（步骤 S15）。然后，所述充电器 3 返回通信传送模式，并执行记账处理（步骤 S16）。在记账处理期间，仍然判断是否施加了负载、是否施加了不规则的负载（其 ID 未被认证）、以及是否完成了记账处理。如果没有负载被施加（即，电子设备 2 从充电器 3 移除），则判断

负载没有被施加，所述充电器 3 返回步骤 S11。如果施加了不规则的负载，则充电器 3 进入错误模式，以检查所述负载，然后所述充电器 3 返回步骤 S11。如果完成了记账处理，则这个记账处理被完成（步骤 S17）。与上面相反，如果判断施加了规则的负载且记账处理仍未完成，则充电器 3 继续照旧进行所述记账处理。

[0075] 在记账处理完成之后，所述充电器 3 进入电力传送模式。然后，所述充电器 3 传送电力（第二电力传送），以对二次电池 28 充电，直到二次电池 28 进入完全充电状态为止（步骤 S18）。在常规充电期间，仍然判断是否施加了负载、是否施加了不规则的负载、以及所述电池是否被完全充电。如果没有负载被施加（即，电子设备 2 从充电器 3 移除），则判断没有施加负载，所述充电器 3 返回步骤 S11。如果施加了不规则的负载，则充电器 3 进入错误模式，以检查所述负载，然后返回步骤 S11。如果所述电池被完全充电，则充电器 3 进入常规充电停止模式（步骤 S19）。与上面相反，如果判断所述电池未被完全充电、未发现异物、且施加了规则的负载，则充电器 3 仍然继续照旧进行常规充电。

[0076] 如果充电器 3 在判断电池被完全充电之后进入常规充电停止模式，则常规充电终止。在这种情况下，判断是否施加了负载，直到常规的充电被停止为止。如果判断施加了负载，则仍然继续所述判断。如果判断没有施加负载，则所述判断终止，且充电器 3 返回步骤 S11。

[0077] 用这种方式，所述充电器 3 检查负载是否出现在非接触供电一级线圈 32 上。如果存在所述负载，则认证 ID 被确认。如果认证 ID 被确认，则判断施加了规则的负载，并执行用于预备充电的供电。如果预备充电终止，则执行用于规则负载的记账处理。如果记账处理终止，则执行用于规则负载的常规充电。

[0078] 接下来，图 5 是显示电子设备 2 的操作的流程图。在图 5 中，当电子设备 2 被置于充电器 3 上，且从充电器 3 馈送电力时，所述非接触电路（接近非接触通信二级控制部分 23、输入信号判断部分 24、非接触充电二级控制部分 25、电池充电控制部分 26、以及电池余量检测部分 27）响应于这个电力馈送而启动（步骤 S30）。然后，所述电子设备 2 判断是否从充电器 3 发出了认证请求命令。如果所述认证请求命令没有被发出，则所述电子设备 2 重复这个判断操作，直到所述认证请求命令被发出为止。如果发出了认证请求命令，则电子设备 2 进入认证模式，然后向充电器 3 通知所述认证 ID（步骤 S31）。

[0079] 在电子设备 2 向充电器 3 通知所述认证 ID 之后，这个电子设备 2 进入预备充电模式，并开始对二次电池 28 的充电（第一充电）。在预备充电期间，判断二次电池 28 的电池电压 Vp 是大于预定值 Va 还是低于预定值 Va，还判断是否在预定时间内从充电器 3 传送电力（步骤 S32）。如果未在预定时间内从充电器 3 传送电力，则电源关断。另外，如果二次电池 28 的电池电压 Vp 低于预定值 Va，则预备充电持续，直到电池电压 Vp 达到预定值 Va 为止。另外，如果二次电池 28 的电池电压 Vp 高于预定值 Va，则电子设备 2 通知充电器 3 所述预备充电停止（步骤 S33）。然后，判断是否从充电器 3 发出了记账请求。如果没有发出记账请求，则这个判断被重复。相反，如果发出了记账请求，则执行记账处理（步骤 S34）。然后，如果完成了所述记账处理，则电子设备 2 通知充电器 3 所述记账处理完成（步骤 S35）。

[0080] 在完成记账处理完成信号的发出之后，所述电子设备 2 进入常规充电模式，然后启动常规充电（第二充电）（步骤 S36）。在常规充电期间，判断所述电池是否被完全充电。如果所述电池未被完全充电（即，未实现完全充电），则电子设备 2 继续常规充电。相反，如

果所述电池被完全充电（即，完全充电已实现），则电子设备 2 向充电器 3 通知所述常规充电停止（步骤 S37）。这里，当电子设备 2 在常规充电期间从充电器 3 移除时，其自动地关断电源。另外，可以采用超过预定值 Va 的任意电压值作为完全充电的标准，且这个标准可以依照二次电池 28 的规范来判断。这时判断的值对应于大于预定值（第一预定值）的第二预定值。

[0081] 在常规充电停止通知处理期间，所述电子设备 2 判断常规充电停止通知的发出是否完成。如果所述常规充电停止通知的发出未完成，则电子设备 2 继续常规充电停止通知处理。在常规充电停止通知的发出完成之后，所述电子设备 2 自动地关断电源。

[0082] 图 6 是显示了电子设备 2 和充电器 3 之间的信号传送 / 接收的顺序图。如图 6 所示，所述充电器 3 首先进入待机模式，并周期性地发出负载检查信号，以检测是否施加了负载。然后，当所述充电器 3 检测到负载时，这个充电器 3 进入认证模式，然后发出认证请求信号，以认证所述负载。当响应于所述认证请求信号从负载发回认证 ID 信号时，所述充电器 3 基于这个认证 ID 信号执行认证处理。如果所述认证是通过 (OK)，则充电器 3 进入用于预备充电的电力传送模式，并启动电力的传送。充当负载的电子设备 2 接收到从充电器 3 馈送的电力，并周期性地传送正规负载信号，直到二次电池 28 的电池电压 Vp 超过预定值 Va 为止。然后，当电池电压 Vp 超过预定值 Va 时，所述电子设备 2 判断预备充电结束，并发出预备充电停止通知信号。

[0083] 当充电器 3 从电子设备 2 接收到预备充电停止通知信号时，这个充电器 3 停止电力的传送，并进入通信传送模式。当所述充电器 3 进入通信传送模式时，这个充电器 3 向电子设备 2 传送记账请求信号。当所述电子设备 2 接收到记账请求信号时，这个设备启动记账处理。然后，当记账处理完成时，所述电子设备 2 向充电器 3 传送指示记账处理完成的信号。当所述充电器 3 接收到来自电子设备 2 的指示记账处理完成的信号时，这个充电器 3 进入用于常规充电的电力传送模式，并开始电力的传送。充电器 3 一旦开始电力传送，所述电子设备 2 便立即启动对二次电池 28 的常规充电。然后，所述电子设备 2 在进行常规充电的同时，周期性地传送正规负载信号。然后，当所述二次电池 28 被完全充电时，所述电子设备 2 向充电器 3 传送完全充电信号作为常规充电停止通知。当所述充电器 3 接收到来自电子设备 2 的完全充电信号时，这个充电器 3 停止所述电力的传送，并从电力传送模式进入常规充电停止模式，并周期性地发出负载检查信号。然后，当电子设备 2 从充电器 3 移除时，所述充电器 3 检测到没有负载被施加。

[0084] 如上所述，根据本实施例的电子设备充电系统 1，所述非接触充电和接近非接触通信以时分系统的方式在电子设备 2 和充电器 3 之间进行。在电子设备 2 的二次电池 28 处于其过放电状态时，所述电子设备 2 接收从充电器 3 馈送的电力，然后执行预备充电，以获取仅对二次电池 28 的记账处理所需的电力，然后，在预备充电完成之后，进行电子设备 2 与充电器 3 之间的记账处理所需的记账通信，然后接收从充电器 3 馈送的电力，并在所述记账处理完成之后执行常规充电，直到二次电池 28 被完全充电。因此，所述电子设备 2 即使当电子设备 2 的二次电池 28 处于其过放电状态也可以接收记账处理信息，且所述电子设备 2 还可以通过执行常规充电使其自身摆脱过放电状态。另外，在非接触电力接收二级线圈 22 产生谐波噪声的时期内不进行所述接近非接触通信。因此，接近非接触通信绝不会受到所述噪声的影响。

[0085] [实施例 2]

[0086] 图 7 是示出根据本发明的实施例 2 的电子设备充电系统的轮廓的透视图。另外，图 8 是显示了根据本实施例的电子设备充电系统 1A 的电子设备 2A 和充电器 3A 的示意配置的框图。如图 7 或图 8 所示，根据本实施例的电子设备充电系统 1A 被构建为使得接近非接触通信天线和非接触充电线圈以重叠的状态被分别安排在电子设备 2A 和充电器 3A 中。即，在电子设备 2A 中，所述接近非接触通信天线 21 和非接触电力接收二级线圈 22 被安排处于重叠状态。更具体地，所述接近非接触通信天线 21 由环路天线组成，而非接触电力接收二级线圈 22 安排为使得其中心与环路天线的中心重合。另外，在充电器 3A 中，所述接近非接触通信外部单元天线 31 和非接触供电一级线圈 32 被安排处于重叠状态。更具体地，类似电子设备 2A 的配置，所述接近非接触通信外部单元天线 31 由环路天线组成，而非接触供电一级线圈 32 安排为使得其中心与环路天线的中心重合。因为接近非接触通信天线和非接触充电线圈被安排处于重叠状态，所以，在设备本体中它们占用的面积减小，且这样的安排能够响应于电子设备 2A 和充电器 3A 的尺寸的减小。此外，使接近非接触通信天线 21 的中心与非接触电力接收二级线圈 22 的中心重合，并使接近非接触通信外部单元天线 31 的中心与非接触供电一级线圈 32 的中心重合。因此，接近非接触通信天线 21 和接近非接触通信外部单元天线 31 的位置可以被一次自动地设置为与非接触电力接收二级线圈 22 和非接触供电一级线圈 32 的位置重合。

[0087] 另外，在电子设备 2A 中，当接近非接触通信天线 21 由环路天线构成时，环路天线的导线的一部分与非接触电力接收二级线圈 22 的导线的一部分可以被公共地形成。相应地，由公共导线形成的、接近非接触通信天线 21 的中心和非接触电力接收二级线圈 22 的中心相互自然地重合。因此，接近非接触通信天线 21 和非接触电力接收二级线圈 22 的体积和质量可以在总体上减小，且可以获得电子设备 2A 在尺寸和质量上的降低。

[0088] 类似地，在充电器 3A 中，当接近非接触通信外部单元天线 31 由环路天线构成时，环路天线的导线的一部分与非接触供电一级线圈 32 的导线的一部分可以被公共地形成。相应地，由公共导线形成的、接近非接触通信外部单元天线 31 的中心和非接触供电一级线圈 32 的中心相互自然地重合。因此，接近非接触通信外部单元天线 31 和非接触供电一级线圈 32 的体积和质量可以在总体上减小，且可以获得充电器 3A 在尺寸和质量上的降低。

[0089] 另外，当接近非接触通信天线和非接触充电线圈以重叠的方式分别被安排在电子设备 2A 和充电器 3A 中时，在它们之间会产生干扰。因此，当一个部件被使用时，另一个部件在操作中会从电路切断。为了从电路切断不使用的部件，所述电子设备 2A 装配了切换开关 29a、29b 和用于控制切换开关 29a 和 29b 的切换的冲突控制部分 30。另外，所述充电器 3A 装配了切换开关 35a、35b 和用于控制切换开关 35a 和 35b 的切换的冲突控制部分 36。例如，当充电器 3A 向电子设备 2A 进行充电时，充电器 3A 的冲突控制部分 36 关断切换开关 35a（断开状态，切断状态），并导通切换开关 35b（闭合状态，导通状态），而电子设备 2A 的冲突控制部分 30 关断切换开关 29a（断开状态，切断状态），并导通切换开关 29b（闭合状态，导通状态）。

[0090] 与在接近非接触通信天线 21 与接近非接触通信外部单元天线 31 之间的接近非接触通信中利用的电力相比，从非接触供电一级线圈 32 馈送到非接触电力接收二级线圈 22 以对二次电池 28 充电的电力极高。因此，由非接触电力接收二级线圈 22 产生的谐波的电

力相对较高。因此，对接近非接触通信的影响不能被忽略，其可能充当引起接近非接触通信功能中的故障的因素。

[0091] 因此，如上所述，因为对切换开关 35a、35b、29a 和 29b 应用了冲突控制，所以，当电力从非接触供电一级线圈 32 被馈送给非接触电力接收二级线圈 22 时，电流绝不会在接近非接触通信天线 21 与接近非接触通信二级控制部分 23 之间流动。因此，故障绝不会出现在接近非接触通信功能中。

[0092] 此外，根据这个冲突控制，在接近非接触通信期间，电流绝不会在非接触供电一级线圈 32 和非接触电力接收二级线圈 22 之间流动，且绝不会引起这样的情形：要在接近非接触通信中利用的电力被非接触供电一级线圈 32 或非接触电力接收二级线圈 22 吸收。因此，用户能够更稳定地实施接近非接触通信。

[0093] 用这个方式，接近非接触通信天线和非接触充电线圈以重叠的方式分别被安排在电子设备 2A 和充电器 3A 中。因此，在设备本体中它们占用的面积减小，且能够获得电子设备 2A 和充电器 3A 的尺寸的进一步减小。在本实施例中，与上述实施例 1 相似，所述非接触充电和接近非接触通信以时分系统的方式在电子设备 2A 和充电器 3A 之间执行，且能够获得相似的优势。

[0094] 在本实施例中，二次电池 28 的预备充电被继续，直到电子设备 2(2A) 的二次电池 28 的电压 Vp 超过预定值 Va 为止。但是，这个预备充电周期可以基于除电压值以外的时间来确定。即，可以执行作为预备充电的连续充电，直到经过了预定的时间为止。

[0095] 这里，在电子设备 2A 中，接近非接触通信二级控制部分 23、输入信号判断部分 24、非接触充电二级控制部分 25、电池充电控制部分 26、电池余量检测部分 27、以及冲突控制部分 30 组成了控制充电和接近非接触通信的充电和通信控制部分 39。另外，在充电器 3A 中，接近非接触通信外部单元的控制部分 33、非接触充电一级控制部分 34 以及冲突控制部分 36 组成了控制电力馈送和接近非接触通信的电力传送通信控制部分 40。

[0096] 参考特定的实施例详细地解释了本发明。但是对于本领域的技术人员来说应该清楚，在不脱离本发明的精神和范围的情况下，可以做不同的变动和修改。

[0097] 本申请是基于 2008 年 3 月 31 日递交的日本专利申请（日本专利申请 No.2008-091245）；其中，通过引用将其内容包含于此。

[0098] 工业适用性

[0099] 本发明具有这样的优势：电子设备即使在所述电子设备的二次电池进入过放电状态时，也能够接收充电所需要的充电计费，并能够使其自身摆脱过放电状态，其可以被应用于装配有诸如蜂窝电话、PHS、PDA 等的电子设备、以及以非接触的方式向这个电子设备进行充电的充电器的电子设备充电系统。

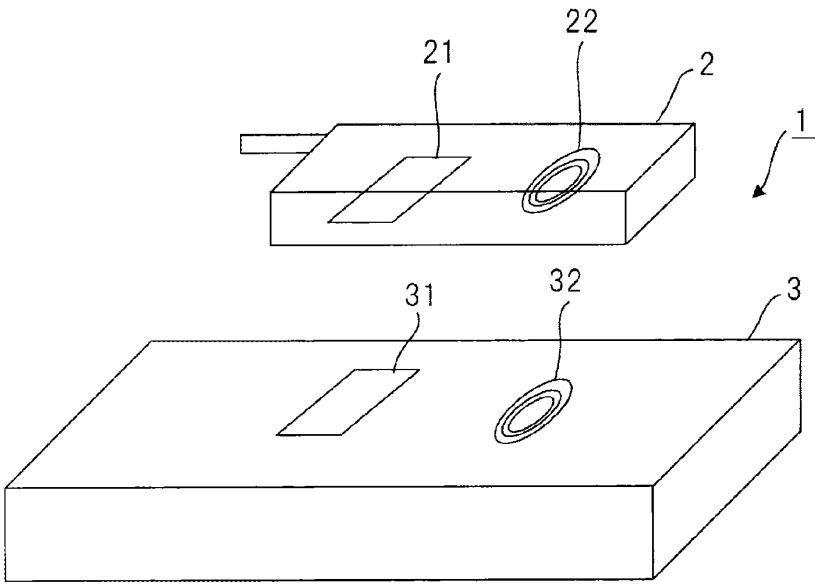

图 1

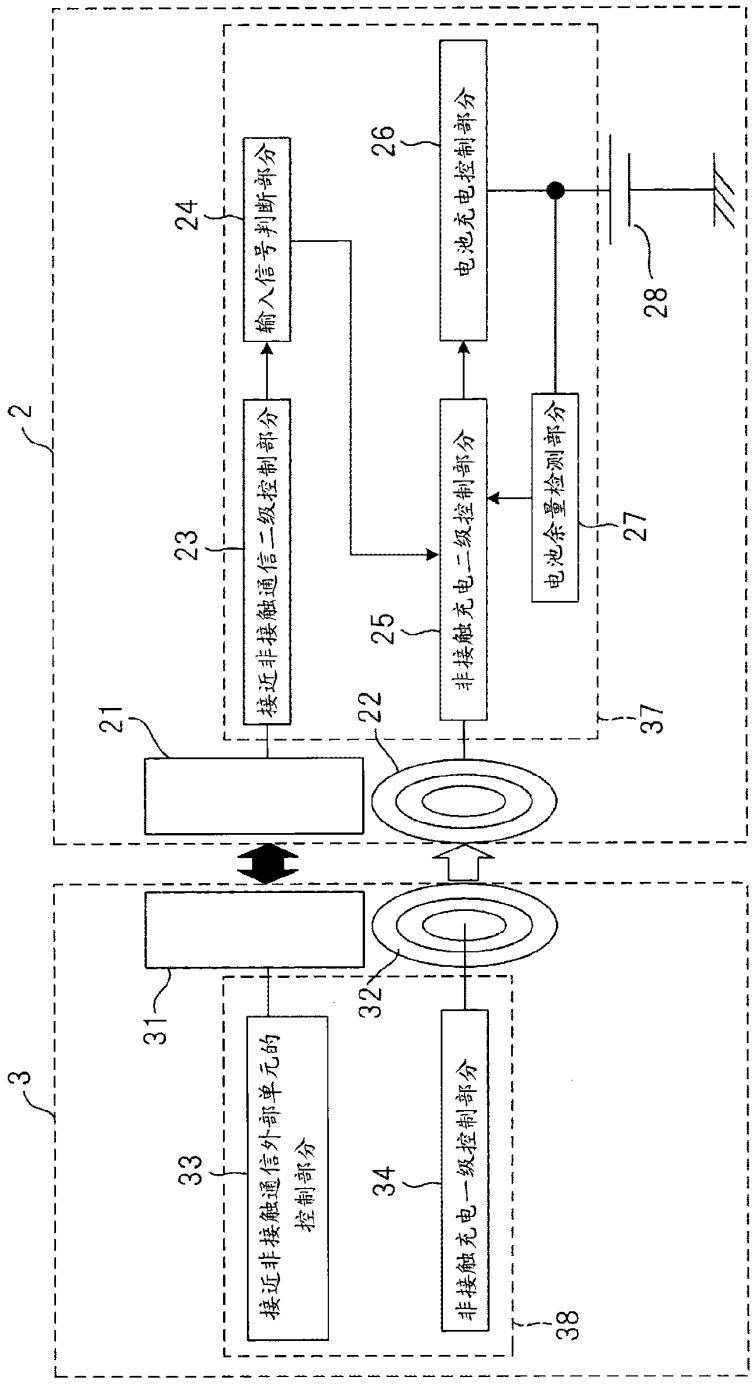

图 2

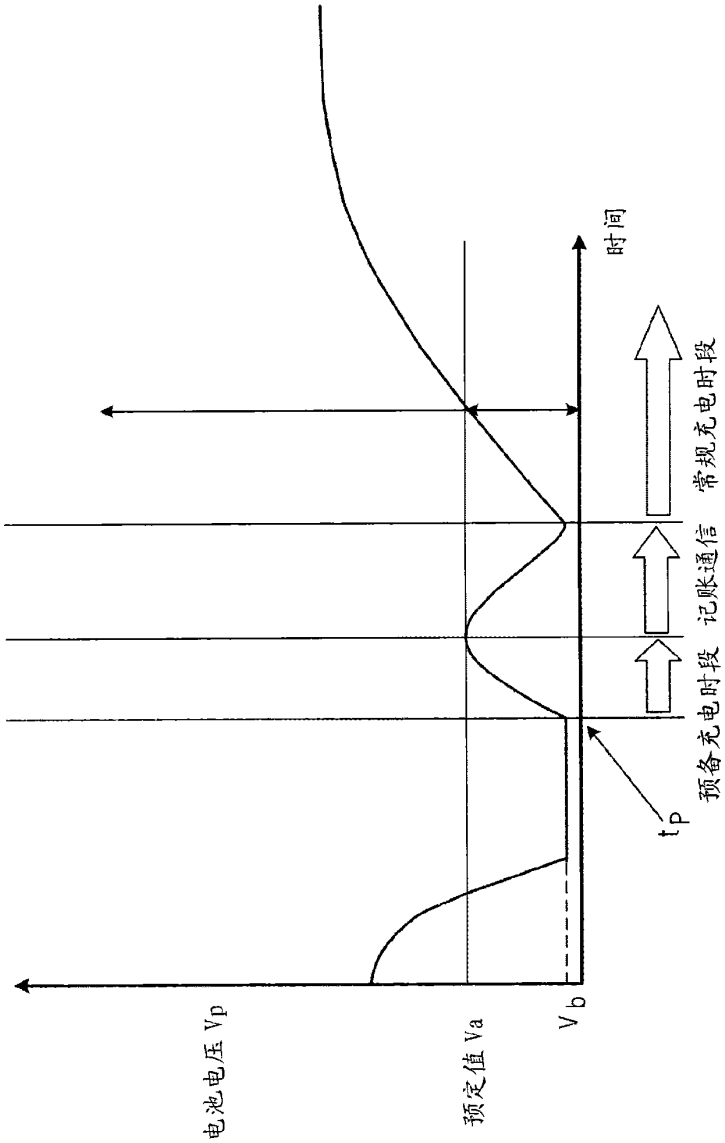

图 3

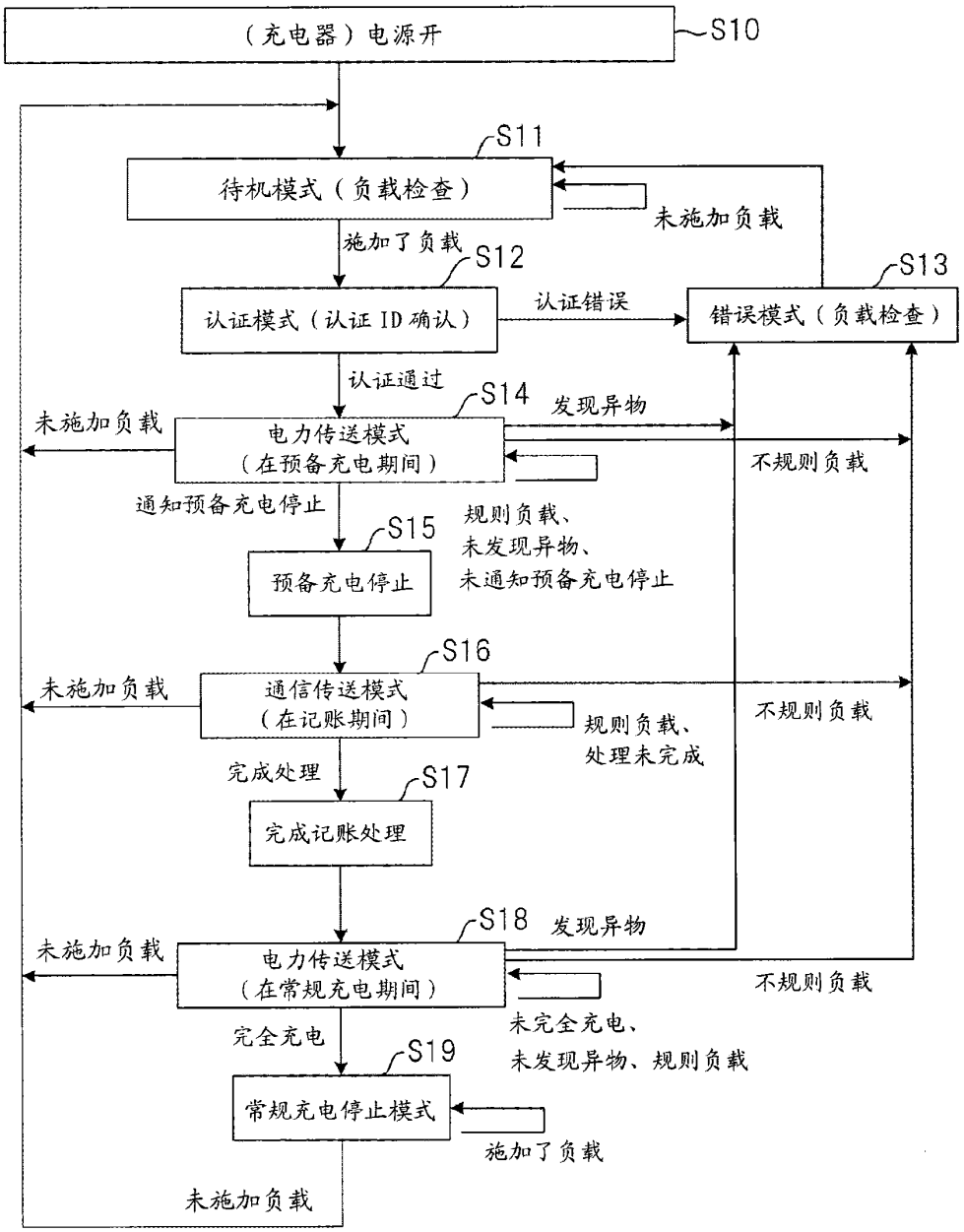

图 4

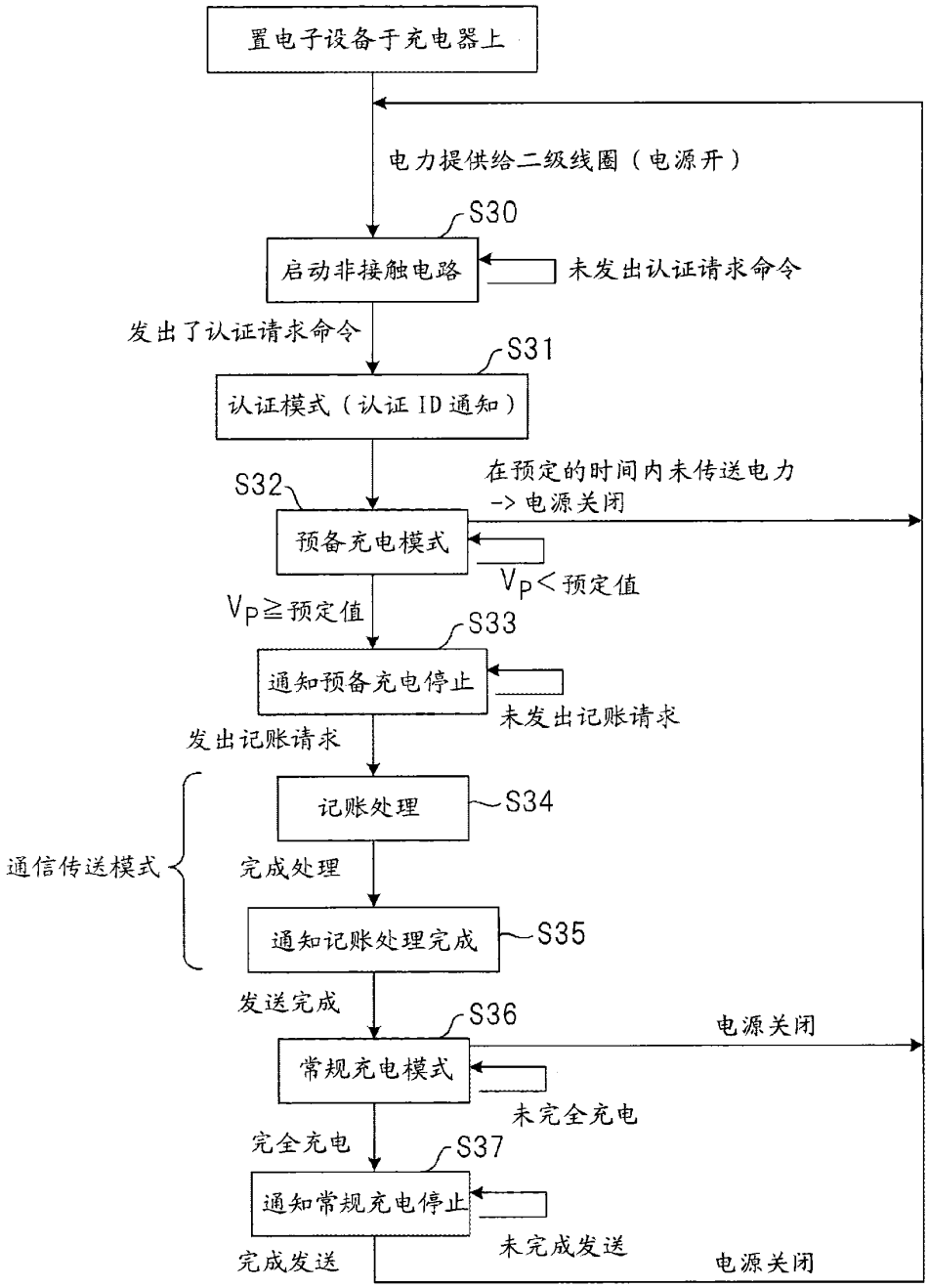

图 5

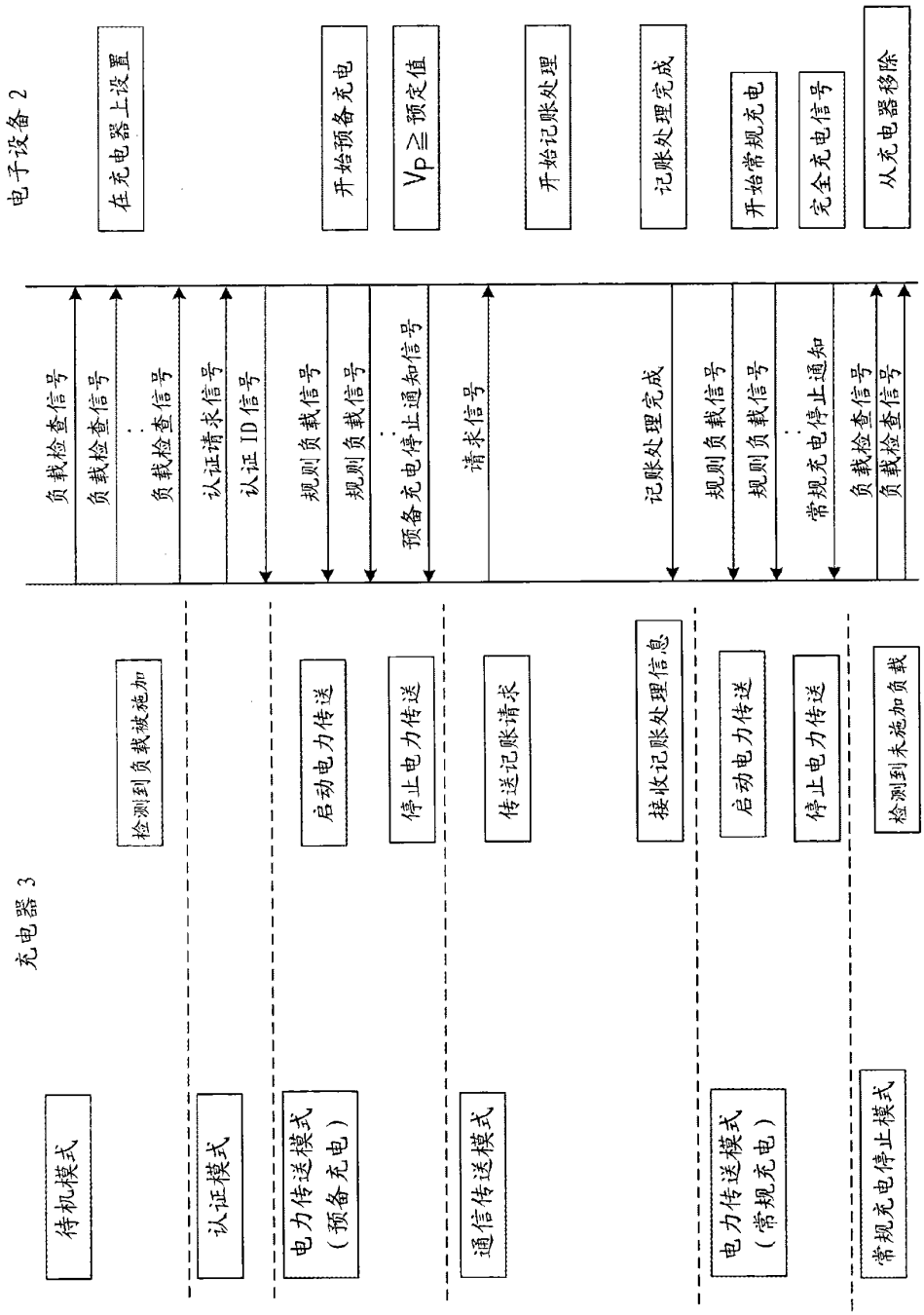

图 6

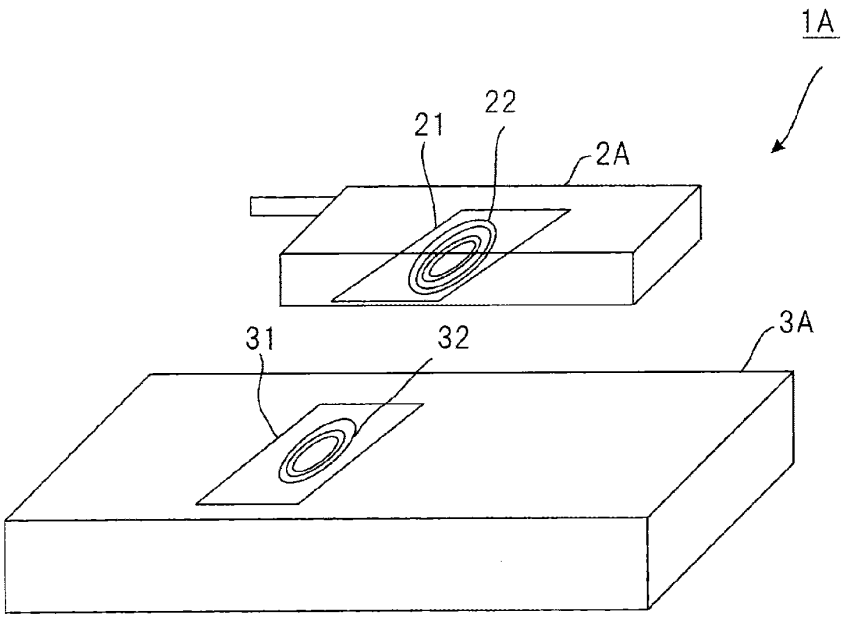

图 7

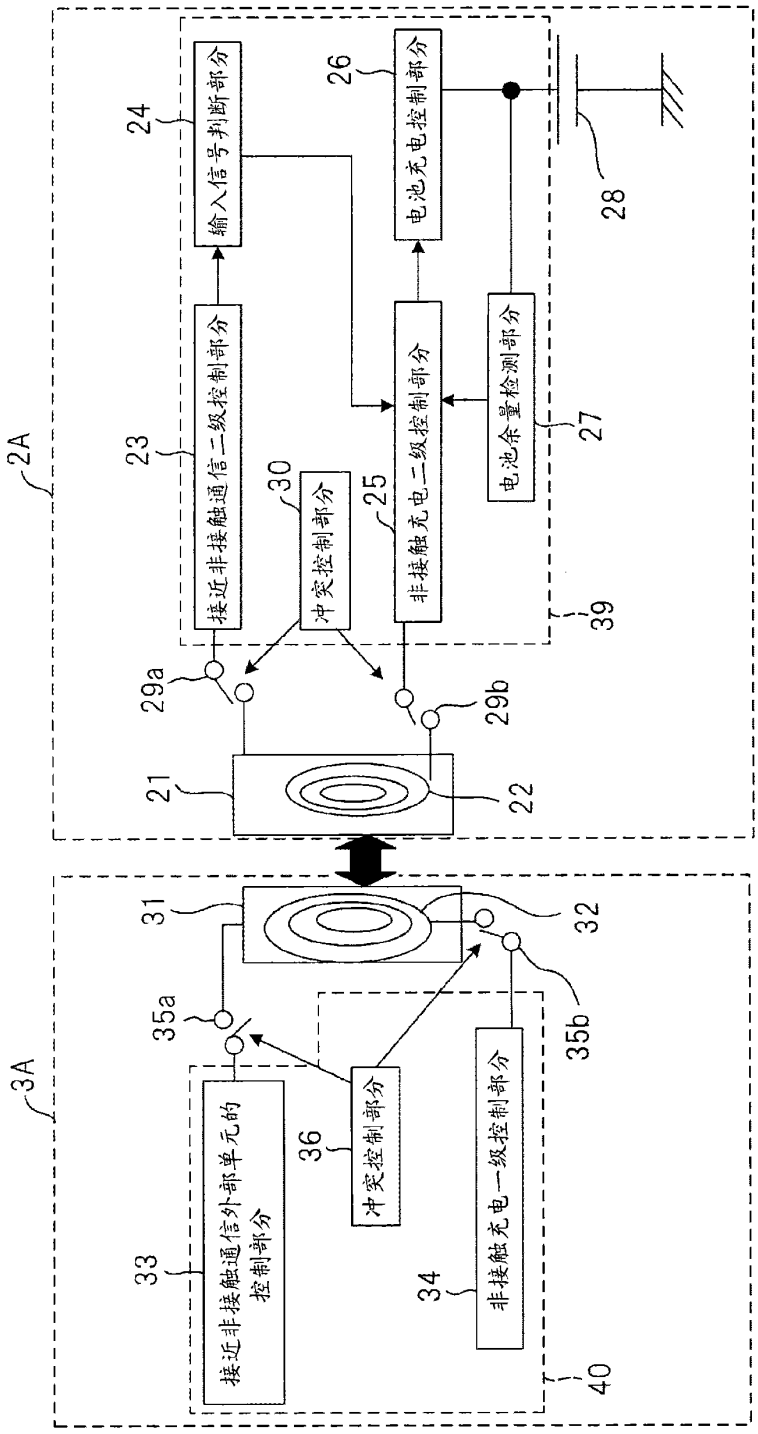

图 8

Espacenet

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An apparatus, a system and a method for enabling electromagnetic energy transfer

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Abstract of CN101517666 (A)

An apparatus 10 for electromagnetic energy transfer comprises a charging fixture 1 with a contact surface 4 and a generator coil 2 forming a resonator circuit with a capacitance. The charging fixture 1 is preferably arranged as an elongated bar whereon a plurality of chargeable electronic devices 5 can be arranged. In order to implement electromagnetic energy transfer from the charging fixture 1 to the electronic device 5 the latter has to be arranged with a pick-up circuit for generating secondary alternating current in a loop, preferably a secondary resonator circuit. In order to fix a position of the electronic device 5 on the charging bar 1, the charging bar is preferably arranged with a projection 3 extending in a plane of the contact surface 4. The electronic device 5 can be shaped to be hanged on the projection and removed from it in accordance with arrow 6.

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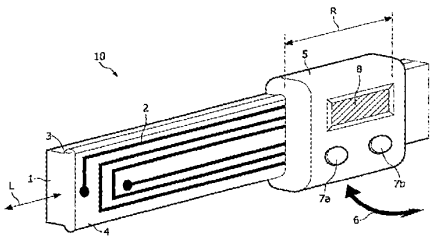
用于实现电磁能量传递的装置、系统和方法

[57] 摘要

用于电磁能量传递的装置 10 包括充电固定机构 1，其具有接触面 4 和发生器线圈 2，发生器线圈 2 与电容构成谐振器电路。 充电固定机构 1 优选地布置为伸长的棒，在其上可以布置多个可充电电子设备 5。 为了实现从充电固定机构 1 到电子设备 5 的电磁能量传递，必须将后者布置为具有拾取电路，用于在环路中，优选地在次级谐振器电路中，产生次级交流电。 为了在充电棒 1 上固定电子设备 5 的位置，优选地将充电棒布置为具有在接触面 4 的平面中延伸的凸起部 3。 可以改变电子设备 5 的形状以便悬挂在凸起部上，并按照箭头 6 从其移去。



1、一种装置（10），具有充电固定机构（1），所述充电固定机构（1）具有接触面（4），用于经由所述接触面向多个电子设备（5）传递电磁能量，其中，将所述电子设备布置为具有各自的拾取电路，用于当所述电子设备位于所述接触面上时接收所述电磁能量，所述装置包括基本上配套于所述接触面布置的初级绕组（2），其特征在于，

将所述初级绕组（2）布置为谐振器电路的一部分，所述谐振器电路被设计为能够实现到各个拾取电路的电磁能量传递。

2、如权利要求 1 所述的装置，其中，将所述初级绕组（2）布置在所述充电固定机构（1）中，所述充电固定机构（1）在一个尺寸（L）上充分伸长。

3、如权利要求 1 或 2 所述的装置，其中，所述初级绕组（2）包括唯一的伸长的线圈，其被布置为产生基本上在整个所述接触面（4）内的交变磁场。

4、如权利要求 1 或 2 所述的装置，其中，所述初级绕组包括多个线圈元件（22），其被布置为产生基本上在整个所述接触面（27）内的网状交变磁场。

5、如权利要求 4 所述的装置，其中，以交叠方式布置所述线圈元件，每一个线圈元件的区域还布置有传感器（24），用于检测所述电子设备在该线圈元件的所述区域中的存在，以便按需要选择性地激活该线圈元件。

6、如权利要求 5 所述的装置，其中，将所述传感器布置为检测所述电子设备的电磁反馈，所述电子设备被设计为从所述装置接收所述电磁能量。

7、如权利要求 5 所述的装置，其中，将所述传感器布置为检测所述电

子设备的软磁心，所述电子设备被设计为从所述装置接收所述电磁能量。

8、如前述任意一项权利要求所述的装置，其中，所述充电固定机构（1）被布置为充分超过所述电子设备的额定尺寸（R），并且还包括用于将所述电子设备（5）定位在所述接触面（4）上的部件，用于定位的所述部件被布置为在所述接触面上固定所述电子设备的停留位置。

9、如权利要求 8 所述的装置，其中，用于定位的所述部件包括在被设计用于接纳所述电子设备（5）的所述接触面的平面中的凸起部（3）。

10、如权利要求 8 所述的装置，其中，用于定位的所述部件包括碰锁机构。

11、如权利要求 8 所述的装置，其中，用于定位的所述部件包括永磁体，其被布置为与所述电子设备交互作用，从而以磁力将其吸引到所述接触面。

12、一种用于电磁能量传递的系统（40），包括：根据前述任意一项权利要求所述的装置（41）；以及电子设备（42），其被布置为具有用于接收所述电磁能量的拾取电路。

13、如权利要求 12 所述的系统，其中，所述电子设备仅当位于所述充电固定机构上时，才是电可操作的。

14、如权利要求 12 所述的系统，其中，所述系统还包括充电指示器（a、b、c、d）。

15、如权利要求 12 所述的系统，其中，将所述电子设备和/或所述充电固定机构的所述初级绕组布置在印刷电路板上。

16、如权利要求 12、13、14 或 15 中任意一项所述的系统，其中，将所述充电固定机构布置为具有安装部件，用于将所述充电固定机构安装在基本上垂直的表面上。

17、如权利要求 12、13、14 或 15 中任意一项所述的系统，其中，将所述充电固定机构集成到另一设备中。

18、一种用于实现电磁能量传递的方法，包括以下步骤：

提供具有充电固定机构的装置，所述充电固定机构具有接触面，用于实现经由所述接触面向多个电子设备的电磁能量传递，所述装置包括基本上配套于所述接触面布置的初级绕组，其中，将所述初级绕组布置为谐振器电路的一部分，所述谐振器电路被设计为以感应方式传递能量；

将至少一个电子设备放置在所述接触面上，将所述电子设备布置为具有用于接收所述电磁能量的拾取电路；

激活所述谐振器电路，从而实现到所述电子设备的所述电磁能量传递。

用于实现电磁能量传递的装置、系统和方法

技术领域

本发明涉及一种装置，具有充电固定机构（fixture），该充电固定机构具有接触面，用于经由该接触面向多个电子设备传递电磁能量，其中，所述多个电子设备被布置为具有各自的拾取电路，用于当所述电子设备位于接触面上时接收电磁能量，所述装置包括初级绕组，其被布置为基本上配套于接触面。

本发明还涉及一种用于电磁能量传递的系统，其包括如前文所述的设备。

本发明还涉及一种用于实现电磁能量传递的方法。

背景技术

由 US 2005/0189910 A1 了解了如开始段中所述的一种装置。已知的装置涉及一种电池充电器系统，其包括充电模块，该充电模块具有初级充电电路，其被布置为基本上平行于该已知装置的平坦接触面。该初级电路包括变压器的初级绕组。该已知装置被布置为，当配有次级电路的电子设备位于该已知装置的接触面上时，以感应方式对该电子设备进行充电，其中该次级电路被设计为充当该变压器的次级绕组。该已知装置还包括高频电流源，其将该电流输入到初级绕组。所用的初级变压器电路通过包含初级变压器绕组的接触面以高频发射电磁能量。由电子设备的拾取电路构成的次级变压器绕组耦合该能量，并产生次级高频交变电压，其随后由适合的整流器进行整流，并输入到电子设备的电池中，用于充电的目的。以此方式，在初级充电器电路与电子设备之间无需电接触。

该已知装置的缺点在于，必须采用特定手段来确保通过变压器的初级绕组的恒定通量，因为对于平面形螺旋绕组，磁通量分布沿着初级绕组的横截面是不均匀的。这就使得该已知装置更昂贵，并需要精心设计的电子电路来补偿磁通量的不均匀性。

发明内容

本发明的目的是提供一种用于电磁能量传递的装置，其是简单、廉价且操作可靠的。

为此，在根据本发明的装置中，将初级绕组布置为谐振电路的一部分，该谐振电路被设计为能够实现到各个拾取电路的电磁能量传递。

本发明的技术措施基于这样的领悟：即，通过将初级绕组布置为包含电容性和电感性元件的谐振电路的一部分，充分简化了电子设备的架构。作为优点，即使对于脉冲 AC 电源，谐振电路也能够如同可以由开关模式电源便利地产生的那样，提供接近于正弦曲线形的电压和电流形状。此外，克服了在磁通量中的不均匀性问题。

根据本发明的装置适于充电许多种电子设备的可充电电池，特别是移动电子设备，包括移动电话，家庭设备，医学设备，健康监控设备，个人护理单元等。可替换地或者附加地，可以将电子设备布置为不具有任何能量存储单元，以便只有当其位于充电固定机构上时才可操作。例如，这种电子设备可以是灯，或者任何其它适合的设备。具体地，根据本发明的装置适于对用于在重病特别护理病区中进行患者监控的智能无线医学传感器进行再次充电，该传感器应当是被气密密封的。这种设备需要电池，其必须是可再次充电的。在医学护理情况下，具有电接触的常规解决方案易于被污染。因此，电磁充电方法是优选的。现有的解决方案需要规定的固定机构来实现明确定义的磁电路，例如在本身已知的牙刷中实现。但这个固定机构仍不便操纵。而且，在医学环境中，必须操纵几个相似的设备。因此，需要一种无线感应解决方案，其不需要设备的准确定位，并能够操纵多个设备。在根据本发明的装置中，将电子设备放置在接触面上，特别是充电固定机构上。优选地，充电固定机构实现为伸长的组件，具有基本上大于其它尺寸的接触面尺寸。在优选实施例中，充电固定机构实现为棒形。在这个实施例中，获得了使用便利性的实质改善，因为用户能够简单地将电子设备最终定位在棒上的任何位置，且仍能达到预期的技术效果。因此，根据本发明的装置提供了一种对移动电子设备简便可靠的充电，尤其是当需要这种设备气密密封而不存在与电源的任何电接触时。

在该装置的一个实施例中，初级绕组包括唯一的伸长的线圈，其被布置为产生基本上在整个接触面内的交变磁场。

优选地，充电固定机构，特别是棒，包含长的发生器线圈，其产生沿着棒的长度方向是均匀的交变磁场。每一个移动电子设备都包含接收器线圈，交变磁场在其中产生用于对电池进行充电的电压。因此，可以在充电固定机构的任意位置上对任何电子设备进行充电。

在本发明进一步的实施例中，初级绕组包括多个线圈元件，其被布置为产生基本上在整个接触面内的网状交变磁场。

在第二解决方案中，充电固定机构，特别是棒，包含多个发生器线圈，其能够产生交变磁场。优选地，以交叠方式布置线圈元件，每一个线圈元件的区域还布置了传感器，用于检测所述电子设备在该线圈元件的所述区域中的存在，以便按需要选择性地激活该线圈元件。在这种布置中，只有在电子设备位于其区域上时才激发线圈元件，从而减小了装置的初级绕组的功耗。可替换地，可以在充电棒上为电子设备提供离散的位置，从而更好地控制在充电固定机构与接收电磁能量的电子设备之间的磁耦合。而且，在该实施例中，仅需较少的冗余线圈。注意在该实施例中，在充电固定机构内的线圈不必交叠。发射器线圈可以并联或串联或以适合的结合方式连接到彼此的发生器。

在根据本发明的装置的再另一实施例中，将充电固定机构布置为充分超过所述电子设备的额定尺寸，并且还包括用于将所述电子设备定位在所述接触面上的部件，用于定位的所述部件被布置为在所述接触面上固定所述电子设备的停留位置。

优选地，将用于定位的部件布置为以机械方式在所述装置的接触面上固定电子设备的停留位置。优选地，用于定位的部件包括在被设计用于接纳电子设备的所述接触面的平面中的凸起部。这个特征的适合的实施例是钩形凸起部，可以将电子设备悬挂在其上。以此方式，电子设备的重量进一步改善了在充电表面与电子设备之间接触。此外，因为用于定义电子设备在正交方向上的停留位置的定位部件补偿了电子设备在纵向方向上的定位自由度，所以实现了更佳的磁耦合。可替换地或者附加地，用于定位的部件包括碰锁机构。再可替换地或者附加地，用于定位的部件包括永磁体，

其被布置为与电子设备交互作用，从而以磁力将其吸引到接触面。再可替换地，用于定位的部件可以包括可释放的销钉，其被布置在充电固定机构的接触面上，以便通过将电子设备放到接触固定机构并且按压销钉，来操作机械开关，从而激活相应的线圈。

一种用于电磁能量传递的系统包括参考前文所述的装置和电子设备，将电子设备布置为具有用于接收电磁能量的拾取电路。还参考图 4 来进一步论述根据本发明的系统。

一种实现电磁能量传递的方法包括以下步骤：

提供具有充电固定机构的装置，所述充电固定机构具有接触面，所述接触面能够实现经由所述接触面向多个电子设备进行电磁能量传递，所述装置包括基本上配套于所述接触面布置的初级绕组，其中，将所述初级绕组布置为谐振器电路的一部分，所述谐振器电路被设计为以感应方式传递能量，

将至少一个电子设备置于所述接触面上，将所述电子设备布置为具有用于接收所述电磁能量的拾取电路；

激活所述谐振器电路，从而实现到所述电子设备的所述电磁能量传递。

参考在下文中所述的实施例来阐述本发明的这些及其它方面，并由此变得明显。

附图说明

图 1 显示了根据本发明的装置的第一实施例的示意图。

图 2 显示了根据本发明的装置的第二实施例的示意图。

图 3 显示了用于单一发生器线圈系统的电路图的示意图。

图 4 显示了在根据本发明的系统中电子装置电路图的一个实施例的示意图。

图 5 显示了根据本发明的系统的一个实施例的示意图。

具体实施方式

图 1 显示了根据本发明的装置的第一实施例的示意图。装置 10 包括充电固定机构 1，其具有接触面 4。优选地，以平面结构来布置接触面 4。配

套于接触面 4 的平面布置了发生器线圈 2，其构成初级绕组。发生器线圈 2 被布置为构成具有电容（未示出）的谐振器电路的一部分，以便在使用中构成具有穿过线圈 2 横截面的基本上均匀的通量的振荡磁场。将参考图 3 来论述装置 10 的操作。优选地，将充电固定机构 1 布置为在由 L 示意性给出的方向上的伸长的棒，在其上可以布置多个可充电电子设备 5。该实施例的优点在于，可以有效地对电子设备 5 进行充电，而不用考虑它在棒 1 上的位置，因为棒的尺寸 L 充分大于电子设备的额定尺寸（complementary dimension）R。优选地，电子设备 5 包括开按钮 7a 和关按钮 7b 以及该设备的电池（未示出）的充满电的指示器 8。为了实现从充电固定机构 1 到电子设备 5 的这种电磁能量的传递，必须将电子设备 5 布置为具有拾取电路（未示出），用于根据法拉第定律在环路中产生次级交流电流。为了在充电棒 1 上固定电子设备 5 的位置，优选地将充电棒布置为具有在接触面 4 的平面中延伸的凸起部 3。可以改变电子设备 5 的形状以便悬挂在凸起部上，并按照箭头 6 从凸起部移去。

图 2 显示了根据本发明的装置的第二实施例的示意图。装置 20 包括充电固定机构 21，具有接触面 27。优选地，以平面结构布置接触面 27。配套于接触面 27 的平面布置了多个交叠的发生器线圈 22，发生器线圈 22 构成初级绕组。发生器线圈 22 被布置为每一个都构成具有电容（未示出）或者一组电容（未示出）的谐振器电路的一部分，以便在使用中构成具有穿过线圈 22 横截面的基本上均匀的通量的振荡磁场。由虚线示意性显示的走线 25 表示部分重叠的电感线圈的电感线圈走线。所述装置的这个实施例的操作类似于参考图 3 所述的。优选地，将充电固定机构 21 布置为伸长的棒，在其上可以布置多个可充电电子设备 28。这个实施例的优点在于，可以有效地对电子设备 28 进行充电，而不用考虑它在棒 21 上的位置。再优选地，充电棒 21 包括一组传感器 24，其被布置为仅激发在其区域中设置了电子设备 28 的线圈。传感器 24 优选地是压力传感器或亮度传感器。再优选地，传感器被布置为检测电子设备 28 的电磁反馈。这种传感器的适合的实例包括铁氧体（ferrite）传感器和 RF-ID 传感器。为了实现从充电固定机构 21 到电子设备 28 的电磁能量传递，必须将电子设备 28 布置为具有拾取电路（未示出），用于根据法拉第定律在环路中产生次级交流电流。为了在充电

棒 21 上固定电子设备 28 的位置，优选地将充电棒布置为具有在接触面 27 的平面中延伸的凸起部 23。可以改变电子设备 28 的形状以便悬挂在凸起部上，并按照箭头 26 从凸起部其移去。

图 3 显示了用于单一发生器线圈系统的电路图 30 的示意图，其可以用于产生穿过发生器线圈 35 的交变电流。它包括两个开关 33a 和 33b，依次开关以便将输入电压 31 输入到线圈 35，从而在输出上产生矩形交变电压。开关 33a、33b 的操作受控制器 32 控制，从而控制工作频率。串联的电容器 34 与发生器线圈 35 的电感性一起构成谐振电路。选择电容器 34 以便使这个谐振电路的谐振频率与所述工作频率匹配。这样，交变电流是正弦曲线，并具有低成分的高次谐波，高次谐波会干扰其它电子设备。发射器和/或接收器中的谐振电路可以包括与电感器绕组并联的电容。除了串联电容器 34 之外还可以使用它。在发射器中，它可以补偿电感器电流，以便驱动器发现较少的感应电流，并从而具有较少的损耗。还可以用它代替串联电容器 34。尤其是在电子设备中，并联电容器对于具有较高电阻率的负载是有利的，因为在此情况下更好地匹配了阻抗且电子设备对于较高输出电压需要较少的线箍。

优选地，由印刷电路板（PCB）走线来制造发生器线圈 35。发生器电路可以有利地位于同一个 PCB 上。将软磁板设置在发生器线圈后面是有利的。这将在固定机构后面的装置和人与磁场屏蔽，并改善了与接收器设备的磁耦合。如此构成的用于电磁能量传递的装置包括接触面 36，从而将发生器线圈 35 的绕组布置为配套于接触面 36 的平面。该装置可以用于对多个电子装置进行充电。在这个具体实施例中只显示了两个这种设备（A、B）。每一个设备都布置为具有拾取电路，分别包括次级线圈 37、38 和负载 A、B。负载可以是任何电子设备或者可充电电池。在图 4 中示意性的显示了能够实现这种无线充电的典型电子设备的电路图。

在图 4 中，次级线圈 51 和电容 52 构成了次级谐振电路，其产生交变电压，它受到交变磁场的影响。交变电压由整流器 53 整流，以形成直流电，随后将直流电提供给可充电电池 54。负载电阻器 55 代表电子设备的电子电路。

图 5 显示了根据本发明的系统的实施例的示意图。系统 40 包括用于根

据本发明进行电磁能量传递的装置 41 以及电子设备 42。提供了该装置的递升视图，以便易于理解其架构。电子设备 42 包括印刷电路板 47，在其上布置了接收器绕组 46。设备 42 优选地包括软磁板 45，其被布置为使磁场与包括接收器电路基板 44 的该设备内部屏蔽，并被布置用于增强磁耦合。再优选地，电子设备 42 可以布置在平面电路板 44 上。将充电固定机构的初级绕组布置在其自身的平面电路板上也是有利的。可以串联电容器 49，以补偿该排列的泄露感应率。由整流器 48 将交变电压整流为 DC 电压，并馈入电池 43 中。优选地，将发生器和接收器线圈的软磁层层叠到印刷电路板，以便简化制造工艺

优选地，电子设备 42 包括多个指示器 a、b、c、d，其被布置为指示电磁能量传递的状态。便利的是，指示器“a”可以被布置为向用户显示可以获得电能，指示器“b”可以被布置为显示充电进行中，指示器“c”可以被布置为显示充电结束，指示器“d”可以被布置为显示充电过程进行了多少。还可以设想在本领域技术人员的技术知识范围内的其它功能。可替换地，指示器可以位于充电固定机构 41 上。

方便的是，将根据本发明的系统 40 的充电固定机构 41 布置在垂直表面的一部分上，特别是在墙壁上。为此，可以便利地为充电固定机构提供安装部件（未示出），如钩子、销钉等。在根据本发明的系统进一步的实施例中，充电固定机构 41 可以被布置为某种设备的一部分，该设备可以是一件家具，例如家具的边缘、垂直桌面的一部分、或者医学设备（例如 X 光机）的适合部分。

尽管已经在附图和前文描述中详细显示并说明了本发明，但这种显示和说明应认为是说明性或示范性的，不是限制性的；本发明不限于公开的实施例。

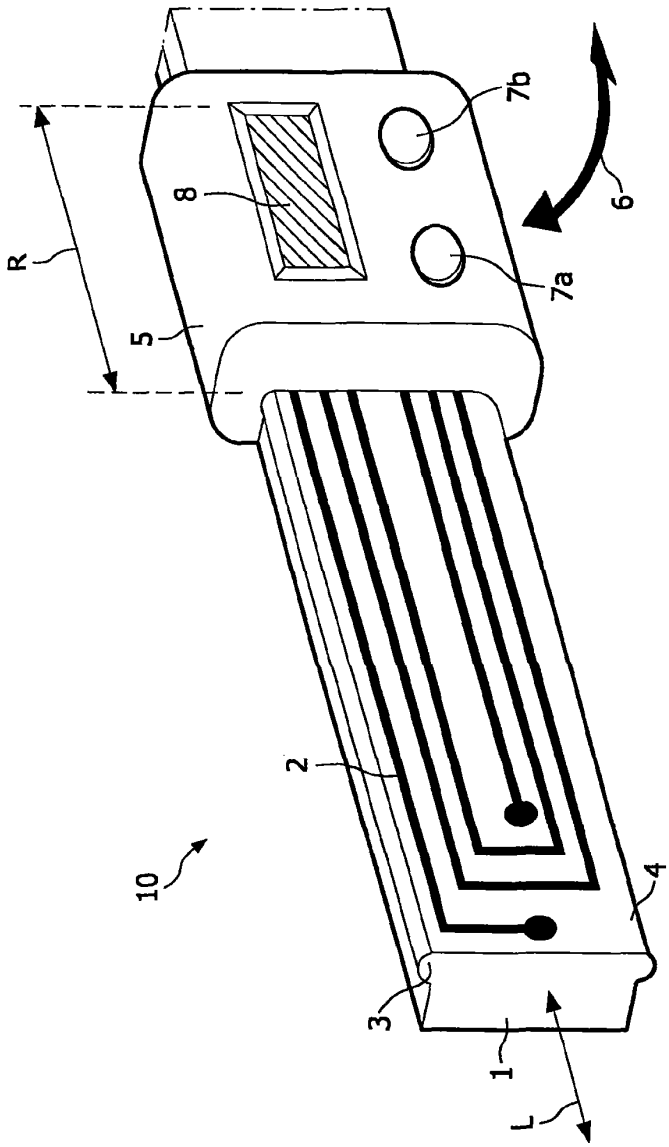


图1

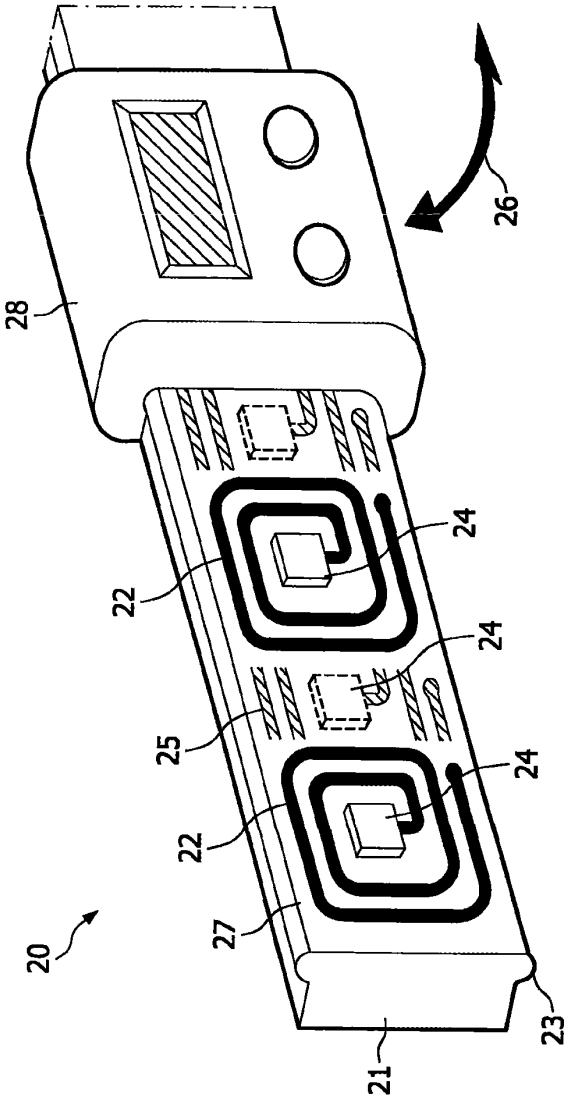


图2

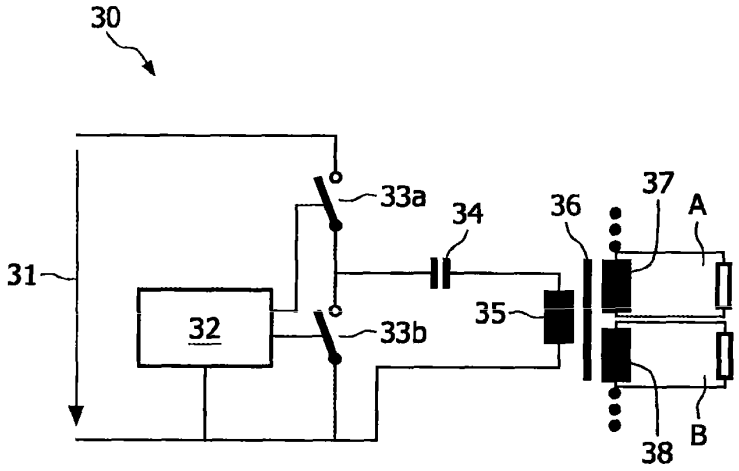


图3

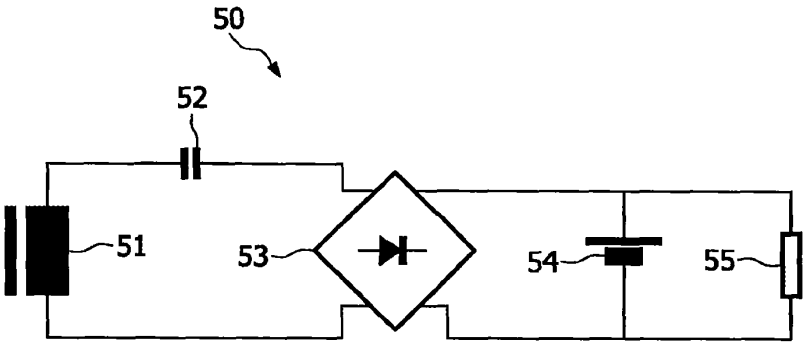


图4

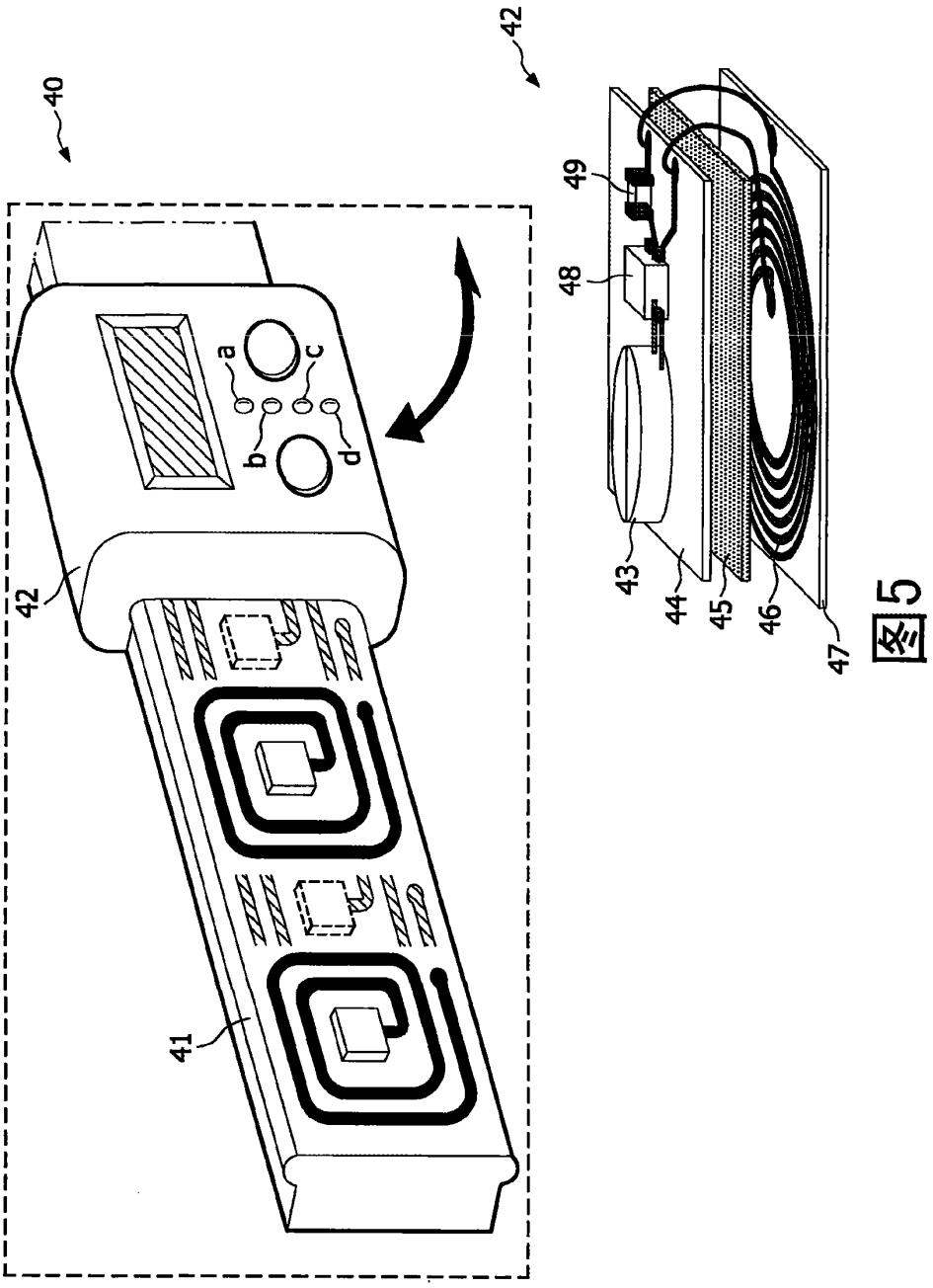


图5

Espacenet

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Coil unit, method of manufacturing the same, and electronic instrument

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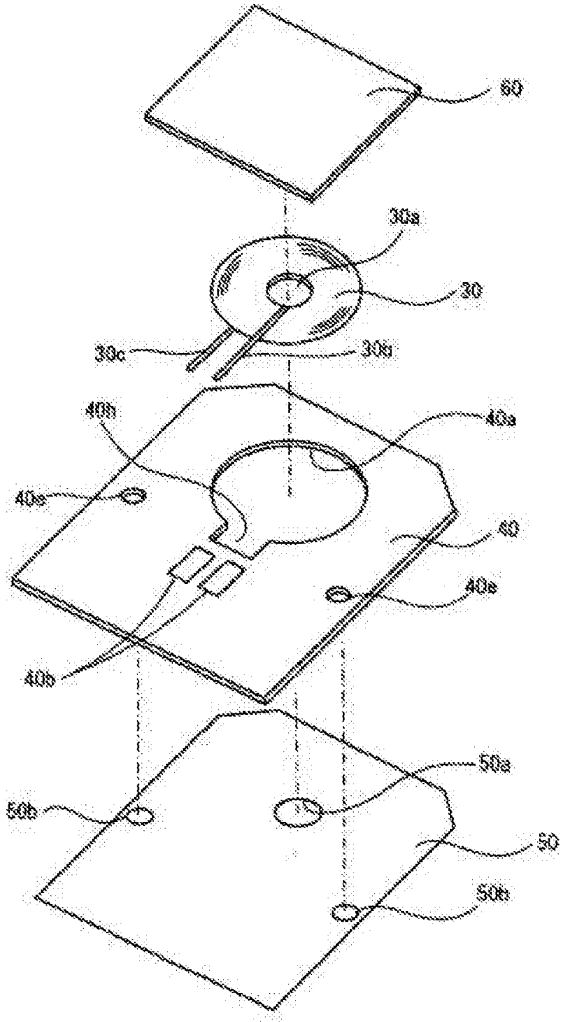
Also published as: CN101286411 (B) JP2008205214 (A) JP2009105434 (A) JP2009200504 (A) JP4760916 (B2) more

Abstract of CN101286411 (A)

The present invention provides a coil unit capable of thinning and manufacturing method thereof as well as electric device. The coil unit includes a planar coil, a printed circuit board that includes a planar coil placement section that receives the planar coil, a protective sheet that is provided on a transmission side of the planar coil and protects the planar coil, and a magnetic sheet that is provided on a non-transmission side of the planar coil. The planar coil is placed in the planar coil placement section and is electrically connected to the printed circuit board. The planar coil placement section has a shape that corresponds to an external shape of the planar coil.


60
30a
30
30c
30b
40h
40a
40c
40
40e
40b
50a
50b
50
50h

[19] 中华人民共和国国家知识产权局

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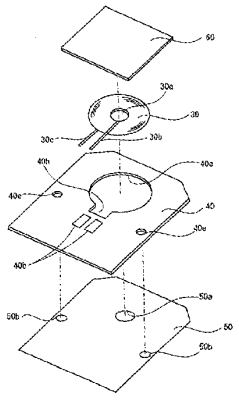
[74] 专利代理机构 北京康信知识产权代理有限责任公司
代理人 余 刚 尚志峰
权利要求书 4 页 说明书 15 页 附图 10 页

[54] 发明名称

线圈单元和其制造方法以及电子设备

[57] 摘要

本发明提供一种能够进行薄型化的线圈单元和其制造方法以及电子设备。线圈单元(22)具有：平面状线圈(30)；配线印刷基板(40)，包括容纳上述平面状线圈(30)的平面状线圈容纳部(40a)；保护片(50)，设置于上述平面状线圈(30)的传送面侧，用于保护平面状线圈(30)；和磁性片(60)，设置于平面状线圈(30)的非传送面侧。上述平面状线圈(30)容纳于平面状线圈容纳部(40a)，与上述配线印刷基板(40)电连接。上述平面状线圈容纳部(40a)具有对应上述平面状线圈(30)的外形的形状。



1. 一种线圈单元，其特征在于，包括：

平面状线圈；

配线印刷基板，包括容纳所述平面状线圈的平面状线圈容纳部；

保护片，设置于所述平面状线圈的传送面侧，用于保护所述平面状线圈；以及

磁性片，设置于所述平面状线圈的非传送面侧，

所述平面状线圈容纳于所述平面状线圈容纳部，与所述配线印刷基板电连接，

所述平面状线圈容纳部具有对应所述平面状线圈的外形的孔形状。

2. 根据权利要求 1 所述的线圈单元，其特征在于，

所述平面状线圈是具有空芯部的平面状线圈，

所述平面状线圈的内侧端子具有从所述平面状线圈的非传送面侧引出的线圈内端引出线。

3. 根据权利要求 2 所述的线圈单元，其特征在于，

所述保护片具有在对应所述平面状线圈的所述空芯部的位置上设置的第一定位孔。

4. 根据权利要求 1~3 中任一项所述的线圈单元，其特征在于，

所述保护片为热传导率 1W/mK 以上的散热片。

5. 根据权利要求 1~4 中任一项所述的线圈单元，其特征在于，

所述配线印刷基板具有容纳所述平面状线圈的两端子的引出线的引出线容纳部，

所述引出线容纳部与所述平面状线圈容纳部连接。

6. 根据权利要求 1~5 中任一项所述的线圈单元，其特征在于，

所述配线印刷基板具有第二定位孔，

所述保护片在与所述第二定位孔对应的位置上具有第三定位孔。

7. 根据权利要求 1~6 中任一项所述的线圈单元，其特征在于，

在所述配线印刷基板的非传送面侧搭载安装电路。

8. 根据权利要求 7 所述的线圈单元，其特征在于，

在所述配线印刷基板的传送面侧，设置有与所述安装电路电连接的共通接地电极面。

9. 一种电子设备，其特征在于，包括权利要求 1~8 中任一项所述的线圈单元。

10. 一种线圈单元的制造方法，是包括平面状线圈的线圈单元的制造方法，其特征在于，包括:

工序 A，在装配夹具上搭载保护片；

工序 B，在所述保护片上，搭载设置有具有对应于所述平面状线圈的外形的形状的平面状线圈容纳部的配线印刷基板；

工序 C，在所述平面状线圈容纳部内容纳所述平面状线圈；以及

工序 D，在所述配线印刷基板和所述平面状线圈上搭载磁性片。

11. 根据权利要求 10 所述的线圈单元的制造方法，其特征在于，

在所述工序 C 和所述工序 D 之间，包括使所述平面状线圈的两端子的引出线与所述配线印刷基板的配线电连接的工序。

12. 根据权利要求 10 所述的线圈单元的制造方法，其特征在于，

在所述工序 D 之后，包括使所述平面状线圈的两端子的引出线与所述配线印刷基板的配线电连接的工序。

13. 根据权利要求 10~12 中任一项所述的线圈单元的制造方法，其特征在于，

所述平面状线圈为空芯状的平面状线圈，

所述保护片具有在对应于所述平面状线圈的空芯部的位置设置的第一定位孔，

所述装配夹具设置有第一定位突出部，

所述工序 A 将所述第一定位突出部插通于所述第一定位孔，相对所述装配夹具进行所述保护片的定位，

所述工序 C 将所述第一定位突出部插通于所述空芯部，相对所述装配夹具进行所述平面状线圈的定位。

14. 根据权利要求 13 所述的线圈单元的制造方法，其特征在于，

所述平面状线圈的内侧端子的引出线被设置于所述平面状线圈与所述保护片重合面的相反的面上。

15. 根据权利要求 13 或 14 所述的线圈单元的制造方法，其特征在于，

所述第一定位突出部在突出方向被施力、以能够进退的方式保持于所述装配夹具。

16. 根据权利要求 10~15 中任一项所述的线圈单元的制造方法，其特征在于，

所述配线印刷基板具有第二定位孔，

所述保护片在对应所述第二定位孔的位置具有第三定位孔，

所述装配夹具具有第二定位突出部，

所述工序 B 将所述第二定位突出部插通于所述第二定位孔，相对所述装配夹具进行所述配线印刷基板的定位，

所述工序 C 将所述第二定位突出部插通于所述第三定位孔，相对所述装配夹具进行所述保护片的定位。

线圈单元和其制造方法以及电子设备

技术领域

本发明涉及使用线圈的无接点电力传送相关的线圈单元和其制造方法以及电子设备。

背景技术

已知利用电磁感应，即使没有金属部分的接点也能够进行电力发送的无接点电力传送。作为该无接点电力传送的应用例，提出携带电话的充电、家庭用设备（例如电话机的子机）的充电等方案。

近年来，不断要求携带电话的小型化。随之，必须进行电力传送的线圈单元的进一步小型化，特别是薄型化。作为关于小型化的技术，有公开于日本专利文献1~专利文献3的技术。

在专利文献1中，公开了通过将无接点电力传送模块的线圈部分从现在使用的铁氧体置换为软磁性片，使线圈部分薄型化的相关发明。但是，虽然磁体本身的薄型化是有用的，却并没有涉及其他的线圈单元的部分的薄型化，所以残留有课题。

专利文献2是在非接触IC卡的使用环境下，通过采用难以受周围金属的影响的结构，实现小型化的发明。具体而言，在非接触IC卡的读取、写入时，天线·磁性材料的内侧放置两块金属板，通过对天线进行调谐（tuning），不被周围的金属影响地进行稳定的读取、写入。但是，在将该技术应用于无接点电力传送的情况下，相

比于非接触 IC 卡，存在产生金属板的发热的问题。此外，因为必须对天线一个一个地进行调谐，所以存在高成本、量产性低的问题。

专利文献 3 通过以软性配线印刷基板（FPC）制作非接触电力传送模块，实现非接触电力传送模块的小型化。在该文献中公开了以将线圈部和基板部分开、在中间对折的方式形成，以将它们插入罐型磁芯的方式对折，并安装软性配线印刷基板的技术。但是，虽然在使用铁氧体材料作为磁芯的情况下是有用的，但在使用片状的磁性材料时，存在不能以嵌入的形状制作线圈的问题。而且，在以线圈卷线、基板进行制作的情况下，难以应用。

【专利文献 1】日本特开平 8-148360 号公报

【专利文献 2】日本特开 2005-26743 号公报

【专利文献 3】日本特开 2005-260112 号公报

发明内容

本发明的目的是提供一种能够进行薄型化的线圈单元和其制造方法以及电子设备。

本发明的一个方面的线圈单元包括：平面状线圈；配线印刷基板，包括容纳上述平面状线圈的平面状线圈容纳部；保护片，设置于上述平面状线圈的传送面侧，用于保护上述平面状线圈和上述配线印刷基板；和磁性片，设置于上述平面状线圈的非传送面侧，上述平面状线圈容纳于上述平面状线圈容纳部，与上述配线印刷基板电连接，上述平面状线圈容纳部具有对应上述平面状线圈的外形的形状。

根据该发明，因为平面状线圈容纳于上述配线印刷基板的平面状线圈的容纳部，所以线圈单元本身的厚度能够以平面状线圈的被容纳的平面状线圈的厚度的量变薄。此外，根据该结构，容易使平面状线圈的传送面和其周围的面成为一个平面。进一步，因为只要将平面状线圈容纳于平面状线圈容纳部，即可在配线印刷基板上进行平面状线圈的定位，所以定位容易。

在本发明的一个方面中，上述平面状线圈具有空芯部，上述平面状线圈的内侧端子具有从上述平面状线圈的非传送面侧引出的线圈内端引出线。

通过这样做，虽然当线圈内端引出线存在于传送面时，在传送面产生凹凸，但是在本实施方式中能够拉平传送面，并且能够提高传送效率。

在本发明的一个方面中，上述保护片能够具有在对应上述平面状线圈的上述空芯部的位置上设置的第一定位孔。

通过使保护片在对应平面状线圈的空芯部的位置上具有第一定位孔，容易进行平面状线圈和保护片之间的定位。

本发明的一个方式中，上述保护片能够是热传导率 1W/mK 以上的散热片。

在无接点电力传送中，如何抑制发热成为问题，特别是，使来自线圈的发热向何处释放成为重要的问题。当保护片是玻璃的热传导率 1W/mK 以上的散热片时，能够对来自线圈的散热通过与线圈密接的保护片（散热片）进行散热。特别是，因为传送面与制品外包装壳体密接，所以作为通过密接于线圈的传送面侧的保护片（散热片）的散热通路，能够减少向外包装壳体的热阻抗。相反的，因

为非传送面为受到电池、水晶等温度上升的影响的部件，所以以传送面侧作为主要的散热通路。

而且，通过将平面状线圈的内侧端子从非传送面侧引出，拉平传送面，能够达到提高平面状线圈和保护片（散热片）的密接性，减少接触热阻抗，容易散热的效果。

本发明的一个方面能够是，上述配线印刷基板具有容纳上述平面状线圈的两端子的引出线的引出线容纳部，上述引出线容纳部与上述平面状线圈容纳部连接。

因为存在引出线容纳部，所以能够缓和引出线登上配线印刷基板时的引出线的弯曲，并且，能够在平面状线圈的附近，以引出线的厚度的量进行薄型化。

本发明的一个方面能够是，上述配线印刷基板具有第二定位孔，上述保护片在与上述第二定位孔对应的位置具有第三定位孔。

通过使保护片在与配线印刷基板的第二定位孔对应的位置上具有第三定位孔，能够容易地进行配线印刷基板和保护片间的定位。

本发明的一个方面中，能够在上述配线印刷基板的非传送面上搭载安装电路。通过这样在非传送面侧搭载安装电路，能够防止在传送面产生凹凸。

在本发明的一个方面中，在上述配线印刷基板的传送面，能够设置与上述安装电路电连接的共通接地电极面。由此，通过在传送面侧设置共通接地电极，能够有效利用配线印刷基板的传送面侧的空间，确保宽广面积的接地面，使接地电位稳定。此外，通过使配线印刷基板的传送面侧为接地电极面，能够使其平坦。而且，配线

印刷基板的传送面和非传送面的接地电极彼此之间能够通过通孔电连接。

本发明的一个方面的电子设备包括上述记载的线圈单元。根据该电子设备，因为采用线圈单元本身容易薄型化、小型化的结构，所以具有使电子设备本身也容易小型化的优点。此外，因为平面状线圈设置于线圈单元内，所以容易进行平面状线圈向电子设备的组装。

本发明的一个方面的线圈单元的制造方法是包括平面状线圈的线圈单元的制造方法，包括：在装配夹具上搭载保护片的工序 A；在上述保护片上，搭载设置有具有对应于上述平面状线圈的外形的形状的平面状线圈容纳部的配线印刷基板的工序 B；在上述平面状线圈容纳部内容纳上述平面状线圈的工序 C；和在上述配线印刷基板和上述平面状线圈上搭载磁性片的工序 D。

根据本发明，因为使用装配夹具依次叠层线圈单元的构成部件，将平面状线圈容纳于平面状线圈容纳部，并搭载于配线印刷基板上，所以能够容易地制造线圈单元。

本发明的一个方面，线圈端子的引出线与配线印刷基板的配线电连接，可以在工序 C 和工序 D 之间进行，或者也可以在工序 D 之后进行。

在本发明的一个方面中，上述平面状线圈为空芯状的平面状线圈，上述保护片具有在对应于上述平面状线圈的空芯部的位置设置的第一定位孔，上述装配夹具设置有第一定位突出部，上述工序 A 将上述第一定位突出部插通于上述第一定位孔，相对上述装配夹具进行上述保护片的定位，上述工序 C 将上述第一定位突出部插通于上述空芯部，相对上述装配夹具进行上述平面状线圈的定位。

根据该发明，因为将装配夹具的第一定位突出部贯入保护片和平面状线圈的定位孔，相对装配夹具进行其定位，所以定位容易。

本发明的一个方面中，上述平面状线圈的内侧端子的引出线被设置于上述平面状线圈的相反于其和上述保护片的重合面的面。由此，能够制造薄型化的线圈单元。

本发明的一个方面中，上述第一定位突出部能够以在突出方向被施力则能够进退的方式保持于上述装配夹具。由此，能够在搭载时，确保第一定位突出部的高度，容易进行保护片、配线印刷基板和平面状线圈的定位，并且通过保护片的贴附，能够使第一定位突出部下降，提高组装性。

本发明的一个方面能够是，上述配线印刷基板具有第二定位孔，上述保护片在对应上述第二定位孔的位置具有第三定位孔，上述装配夹具具有第二定位突出部，上述工序 B 将上述第二定位突出部插通于上述第二定位孔，相对上述装配夹具进行上述配线印刷基板的定位，上述工序 C 将上述第二定位突出部插通于上述第三定位孔，相对上述装配夹具进行上述保护片的定位。

根据该发明，将装配夹具的第二定位突出部插通于保护片和配线印刷基板的各定位孔，相对装配夹具进行它们的定位，因此定位容易。

附图说明

图 1 是示意性地表示充电器、和在该充电器上被充电的电子设备例如携带电话机 20 的图；

图 2 是示意性地表示线圈单元的图；

图 3 是示意性地表示线圈单元的分解立体图；

图 4 是示意性地表示平面状线圈和配线印刷基板的图；

图 5 是线圈单元的截面图；

图 6 是放大线圈的引出线连接区域 0 的图；

图 7 是示意性地表示沿图 6 的 VIII-VIII 线的截面图；

图 8 是用于说明配线印刷基板的安装电路区域的图；

图 9 是用于说明配线印刷基板的共通电极的图；

图 10 是示意性地表示配线印刷基板的接触部的截面图；

图 11 是示意性地表示线圈单元的制造工序的图；

图 12 是示意性地表示线圈单元的制造工序的图；以及

图 13 是示意性地表示线圈单元的制造工序的图。

符号说明

10 充电器；10a 壳体；12 线圈单元；20 电子设备（携带电话机）；20a 壳体；22 线圈单元；30 平面状线圈；30a 空芯部；30b 线圈内端引出线；30c 线圈外端引出线；30d 弯曲部；40 配线印刷基板；40a 平面状线圈容纳部；40b 接触电极；40c 共通接地电极；40d 接触部；40e 第二定位孔；40g 焊接部 40h 引出线容纳部；40i 安装部件；40j 安装电路区域；50 保护片；50a 第一定位孔；50b 第三定位孔；60 磁性片；70 装

配夹具；70a 第一定位突出部；70b 第二定位突出部；70c 施力部件（弹簧）；100 充电系统

具体实施方式

以下对本发明的适宜的实施方式进行详细说明。而且，以下说明的本实施方式不对专利请求范围内记载的本发明的内容进行不当的限定，本实施方式说明的全部结构并非是作为本发明的解决方法所必需的。

1. 充电系统

图 1 是示意性地表示充电器 **10**、和在该充电器 **10** 上被充电的电子设备例如携带电话机 **20** 的图。图 1 表示置于充电器 **10** 旁的携带电话机 **20**。从充电器 **10** 向携带电话机 **20** 的充电，是利用充电器 **10** 的线圈单元 **12** 的线圈和携带电话机 **20** 的线圈单元 **22** 的线圈之间产生的电磁感应作用，通过无接点电力传送进行的。

充电器 **10** 和携带电话机 **20** 能够分别具有定位结构。例如，能够在充电器 **10** 上设置比其壳体的外表面更向外方突出的定位突出部，另一方面，在携带电话机 **20** 上设置形成于其壳体的外表面的定位凹部。通过该定位，携带电话机 **20** 的线圈单元 **22** 至少配置于和充电器 **10** 的线圈单元 **12** 相对的位置。

2. 线圈单元

图 2 是示意性地表示线圈单元 **22** 的图。图 3 是示意性地表示线圈单元 **22** 的分解立体图。而且，图 2 和图 3 是从图 1 中的线圈单元 **22** 的与线圈单元相对的传送面的相反侧的非传送面侧，看线圈单元 **22** 的图。此处，传送面意味着图 1 所示的两个线圈单元 **12**、**22** 彼此相对时的相对面侧。图 4 是示意性地表示从非传送面侧看平

面状线圈 **30** 和配线印刷基板 **40** 的图。非传送面意味着线圈单元 **12**、**22** 的传送面的相反侧的面。图 5 是线圈单元 **22** 的截面图。图 6 是放大线圈的引出线连接区域 **0** 的图。图 7 是示意性地表示沿图 6 的 VIII-VIII 线的截面图。

线圈单元 **22** 能够包括平面状线圈 **30**、配线印刷基板 **40**、保护片 **50** 和磁性片 **60**。如图 4 所示，平面状线圈 **30** 容纳于设置在配线印刷基板 **40** 上的平面状线圈容纳部 **40a**。该平面状线圈容纳部 **40a** 由在配线印刷基板 **40** 的厚度方向上贯通的孔构成。在配线印刷基板 **40** 的传送面侧，设置有用于保护平面状线圈 **30** 和配线印刷基板 **40** 的保护片 **50**。在平面状线圈 **30** 的非传送面侧设置有磁性片 **60**。

以下具体说明各构成要素。

平面状线圈 **30** 并不特别限定于平面的线圈，例如，也能够应用在平面上卷绕单芯或多芯的铠装线圈线的空芯线圈。以下，以具有空芯部 **30a**（参照图 3、图 4）的平面状线圈 **30** 为例，说明实施方式的线圈单元。

如上所述，平面状线圈 **30** 容纳于设置在配线印刷基板 **40** 上的平面状线圈容纳部 **40a**。通过这样在平面状线圈容纳部 **40a** 中容纳平面状线圈 **30**，能够使仅容纳于平面线圈容纳部 **40a** 的平面状线圈的厚度的线圈单元变薄。此外，通过将平面状线圈 **30** 容纳于平面状线圈容纳部 **40a**，平面状线圈 **30** 的传送面和其周围的面容易成为一个平面。事实上，在本实施方式中在保护片 **50** 上不会产生凹凸。此外，平面状线圈容纳部 **40a** 具有对应平面状线圈 **30** 的外形的形状。由此，如果将平面状线圈 **30** 容纳于平面状线圈容纳部 **40a**，则能够将平面线圈 **30** 定位于配线印刷基板 **40**，所以定位容易。

平面状线圈 **30** 具有引出线圈内端的线圈内端引出线 **30b** 和引出线圈外端的线圈外端引出线 **30c**。如图 3 和图 4 所示，线圈内端引出线 **30b** 优选从平面状线圈 **30** 的非传送面侧引出。通过从非传送面侧引出线圈内端引出线 **30b**，能够防止传送面由于线圈内端引出线 **30b** 而产生凸部，因此能够拉平传送面，并且能够提高传送效率。

配线印刷基板 **40** 设置有用于驱动线圈的各种安装部件，和对它们进行电连接的配线。配线印刷基板 **40** 相比于软质基板，优选能够确保平面状线圈容纳部 **40a** 为一定深度的硬质基板。

配线印刷基板 **40** 上设置有与平面状线圈容纳部 **40a** 连接的引出线容纳部 **40h**（参照图 3）。如图 6 和图 7 所示，引出线容纳部 **40h** 容纳平面状线圈 **30** 的线圈内端引出线 **30b** 和线圈外端引出线 **30c**。通过具有引出线容纳部 **40h**，能够将引出线 **30b**、**30c** 容纳于其中，因此能够在该区域以引出线 **30b**、**30c** 的厚度的量进行薄型化。此外，如图 7 所示，引出线 **30b**、**30c**（图 7 中仅图示了引出线 **30c**）在引出线容纳部 **40h** 较缓和地弯曲，并登上配线电路基板 **40**，因此能够减少断线。

如图 2 和图 5 所示，线圈内端引出线 **30b** 和线圈外端引出线 **30c** 引出至接触电极 **40b**，通过焊接部 **40g** 与配线印刷基板 **40** 上的图案进行电连接。接触电极 **40b** 设置于配线印刷基板 **40** 的非传送面侧（在图 2 和图 5 中为较靠前的一侧）。如上所述，如图 7 所示，线圈内端引出线 **30b** 和线圈外端引出线 **30c** 容纳于配线印刷基板 **40** 的引出线容纳部 **40a**，但以登上配线印刷基板 **40** 的方式设置有弯曲部 **30d**。

如从非传送面则看配线电路基板 **40** 的图 8 所示，存在接触电极 **40b** 的区域成为安装电路区域 **40j**。通过这样不将安装电路区域

40j 设置于平面状线圈容纳部 **40a** 的附近，能够防止对传送特性造成影响。安装电路区域 **40j** 设置于非传送面侧，由此，能够防止在传送面产生凹凸。该安装电路区域 **40j** 由驱动平面状线圈 **30** 的安装部件 **40i** 等构成。如从传送面侧看配线电路基板 **40** 的图 9 所示，安装电路区域 **40j** 的安装电路与共通接地电极面 **40c** 电连接。通过在传送面侧设置共通接地电极面 **40c**，能够有效利用配线印刷基板 **40** 的传送面侧的空间，能够确保接地面积，使接地电位稳定。此外，因为在共通接地电极面 **40c** 上没有安装部件，所以能够使配线印刷基板 **40** 的传送面侧平坦。而且，对于共通接地电极面 **40c** 的形成范围，通过以与安装电路区域 **40j** 相同的理由，形成于与安装电路区域 **40j** 相同的范围，能够减少对传送特性的影响。

如图 10 所示，共通接地电极面 **40c** 通过设置于通孔 **40f** 的接触部 **40d**，和连接于安装部件 **40i** 的配线电连接。

其中，实施方式的模块，因为电路规模较小，所以配线印刷基板 **40** 的传送面侧的图案仅为接地，如电路规模变大，则也可以形成接地以外的图案。

配线印刷基板 **40** 设置有用于和保护片 **50** 进行定位的多个、例如两个定位孔（第二定位孔）**40e**。安装电路区域 **40j** 也可以设置在容纳平面状线圈 **30** 的配线印刷基板 **40** 之外的别的基板上。

保护片 **50** 是用于至少保护平面状线圈 **30** 的片，本实施方式中，以覆盖配线印刷基板 **40** 和平面状线圈 **30** 的传送面侧整体的方式形成。保护片 **50** 首要的是具有绝缘性，此外并没有特别限定。如图 3 所示，保护片 **50** 具有在对应平面状线圈 **30** 的空芯部 **30a** 的位置设置的定位孔（第一定位孔）**50a**。通过在对应空芯部 **30a** 的位置具有定位孔 **50a**，容易在平面状线圈 **30** 和保护片 **50** 之间进行定位。此外，如图 3 所示，保护片 **50** 在对应配线印刷基板 **40** 的定位孔 **40e**

的位置上，设置有定位孔（第三定位孔）**50b**。通过该定位孔 **40e**、**50b**，容易在配线印刷基板 **40** 和保护片 **50** 之间进行定位。

此处，保护片 **50** 优选为以具有作为玻璃的热传导率 1W/mK 以上的材质形成的散热片。例如，在 Panasonic 制 PGS 石墨片（PGS graphite sheet）中，热传导率为 600W/mK，是铜的 2 ~4 倍、铝的 3~6 倍的优异的热传导率。当使用该种材质时，能够利用保护片 **50** 作为散热片，能够对来自平面状线圈 **30** 的散热通过密接于线圈 **30** 的保护片 **50** 进行散热。特别是，因为传送面与制品外包装壳体密接，所以作为通过密接于线圈 **30** 的传送面侧的保护片 **50** 的散热通路，能够减少向外包装壳体的热阻抗。相反的，因为非传送面为受到电池、水晶等温度上升的影响的部件，所以以传送面侧作为主要的散热通路。

在使用电力传送系统的情况下，配置于非传送面侧的电池通常使用二次电池。近年来多用于携带电话、MP3 播放器等中的锂离子二次电池、锂聚合物二次电池中，根据物质特性的特征，规定充电时的温度为约 45℃以下。以这之上的温度进行充电时，在电池内部产生气体，电池劣化，最坏的情况会引起破裂存在危险性。因此，抑制充电时的发热是必需的，在本实施方式中使用保护片 **50** 作为散热通路，能够抑制非传送面侧的温度上升。

此外，通过将平面状线圈 **30** 的内侧端子从非传送面侧引出，能够拉平传送面，从而能够达到提高平面状线圈 **30** 和保护片（散热片）**50** 的密接性，减少接触热阻抗，容易散热的效果。

而且，在本实施方式中，虽保护片 **50** 为与配线印刷基板 **40** 一致的外形，但并不限定于此。也能够以使线圈单元的传送面侧接触的外包装壳体的内部形状（面积）和接触面积为最大的方式形成保护片 **50** 的形状（面积）。这样，能够进一步提高散热效果。

磁性片 **60** 接受来自平面状线圈 **30** 的磁通，并进行工作，具有提高平面状线圈 **30** 的电感的功能。作为磁性片的材质，优选软磁性材料，能够应用铁氧体软磁性材料、金属软磁性材料。

此外，在携带电话机 **20** 的线圈单元 **22** 中，磁性片 **60** 能够在面对平面状空芯线圈 **30** 的一侧的相反侧，根据需要设置磁通泄漏防止部件（未图示）。磁通泄漏防止部件具有吸收磁性片 **60** 未捕捉到的磁通、从磁性片 **60** 的周围泄漏的磁通的作用。由此，能够避免磁通对携带电话机 **20** 内的部件的不良影响。只要是能够吸收磁通的材质，磁通泄漏防止部件的材质并无特别限定，非磁性体例如能够举出铝。传送特性受到以与磁性片 **60** 之下接触的状态形成的部件的影响。因此，根据要求的传送特性，优选规定磁通泄漏防止部件的材质和大小。

上述配线印刷基板 **40** 及平面状线圈 **30** 和保护片 **50** 的贴合，以及配线印刷基板 **40** 及平面状线圈 **30** 和磁性片 **60** 的贴合，例如能够通过双面胶带等进行。

3. 线圈单元的制造方法

接着说明线圈单元的制造方法。图 11~图 13 是用于说明线圈单元的制造方法的图。

首先，准备装配夹具 **70**。安装夹具 **70** 具有多个例如两个第一定位突出部 **70a** 和第二定位突出部 **70b**。

接着，在装配夹具 **70** 上搭载保护片 **50**。使装配夹具 **70** 的第一定位突出部 **70a**、**70b** 插通于定位孔 **50b**、**50a**，进行相对装配夹具 **70** 的保护片 **50** 的定位。

接着，在装配夹具 **70** 上搭载配线印刷基板 **40**。使装配夹具 **70** 的第一定位突出部 **70a** 插通于配线印刷基板 **40** 的定位孔 **40e**，进行相对装配夹具 **70** 的配线印刷基板 **40** 的定位。

接着，在装配夹具 **70** 上搭载平面状线圈 **30**。平面状线圈 **30** 以容纳于配线印刷基板 **40** 的平面状线圈容纳部 **40a** 的方式进行搭载。因为平面状线圈容纳部 **40a** 具有对应平面状线圈 **30** 的外形的形状，所以具有作为平面状线圈 **30** 的定位部的功能。进一步，使装配夹具 **70** 的第二定位突出部 **70b** 插通于平面状线圈 **30** 的空芯部 **30a**，相对装配夹具 **70** 进行平面状线圈 **30** 的定位。

接着，在平面状线圈 **30** 和配线印刷基板 **40** 之上搭载磁性片 **60**，从磁性片 **60** 一侧施加力，进行保护片 **50** 及配线印刷基板 **40** 和平面状线圈 **30** 的贴合，以及磁性片 **60** 及配线印刷基板 **40** 和平面状线圈 **30** 的贴合，形成线圈单元 **22**。而且，贴合时的粘接，例如能够通过在保护片 **50** 和配线印刷基板 40 之间、平面状线圈 **30** 和磁性片 **60** 之间插入有双面胶带（未图示）而进行。

在该贴合时，如图 12 和图 13 所示，优选第二定位突出部 **70b** 通过盘簧 **70c** 等被突出施力，从而以能够相对装配夹具 **70** 进退的方式被保持。由此，在组装时，能够确保第二定位突出部 **70b** 的高度，容易进行保护片 **50** 和线圈 **30** 的定位，并且能够通过磁性片 **60** 的贴附时的压力使第二定位突出部 **70b** 下降（参照图 13）。

接着，平面状线圈 **30** 的端子引出线 **30b**、**30c** 通过焊接等与配线印刷基板 **40** 的接触电极 **40b** 电连接。该焊接的工序也可以在搭载磁性片 **60** 之前进行。

（电子设备的应用例）

本实施方式能够应用于进行电力传送、信号传送的所有电子设备，例如手表、电动牙刷、电动剃须刀、无绳电话、低功率移动电话（personal handy phone）、移动个人电脑、PDA（Personal Digital Assistants：个人数字助理）、电动自行车等具有二次电池的被充电设备和充电设备。根据本实施方式的电子设备，因为线圈单元本身成为容易小型化的结构，所以具有电子设备本身也容易小型化的优点。此外，因为平面状线圈设置于线圈单元内，所以平面线圈向电子设备的安装容易。

上述对本实施方式进行了详细说明，但是本行业的从业者能够容易地理解，能够不实质上脱离本发明的新内容和效果地进行很多变形。因此，这样的变形例均包括于本发明的范围内。例如，在说明书或附图中，至少一次，与更广义或同义的不同的用语共同记载的用语，在说明书或附图的任何位置中，均能够置换为该不同的用语。

本实施方式涉及无接点电力传送，但也同样能够应用于使用电磁感应原理的无接点信号传送。

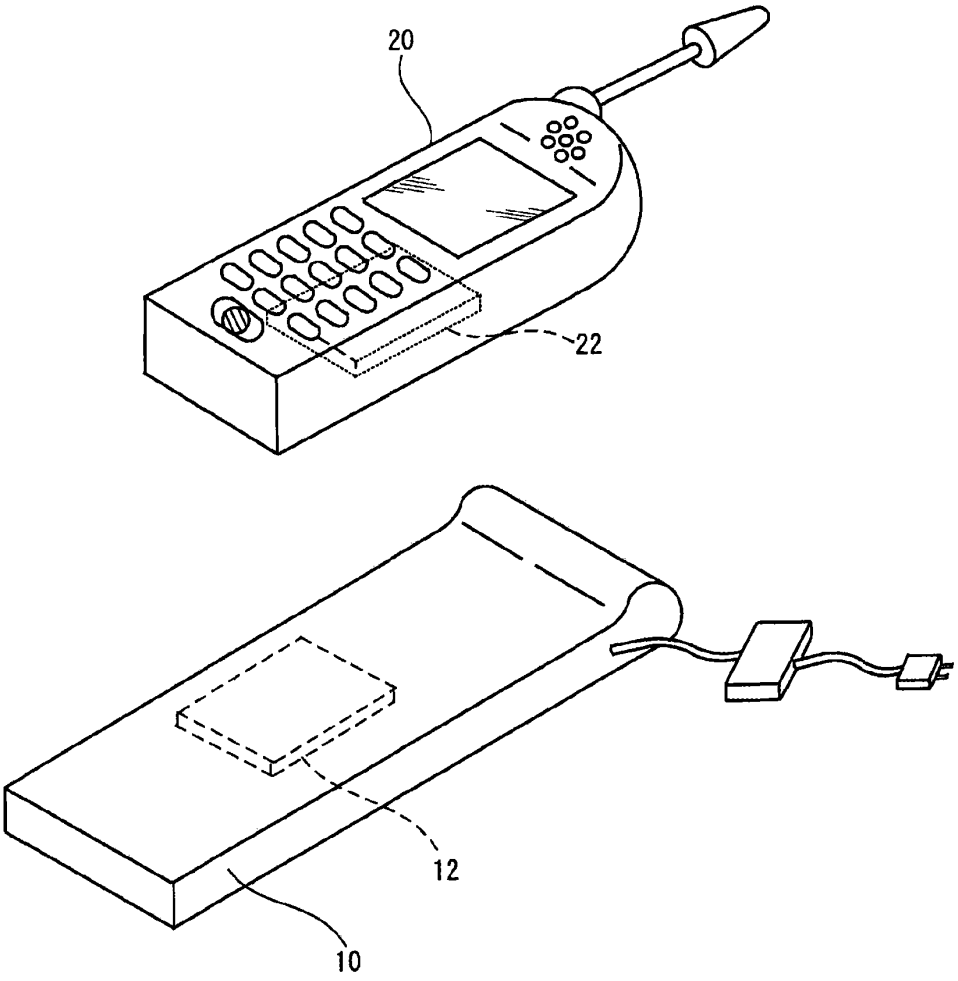


图 1

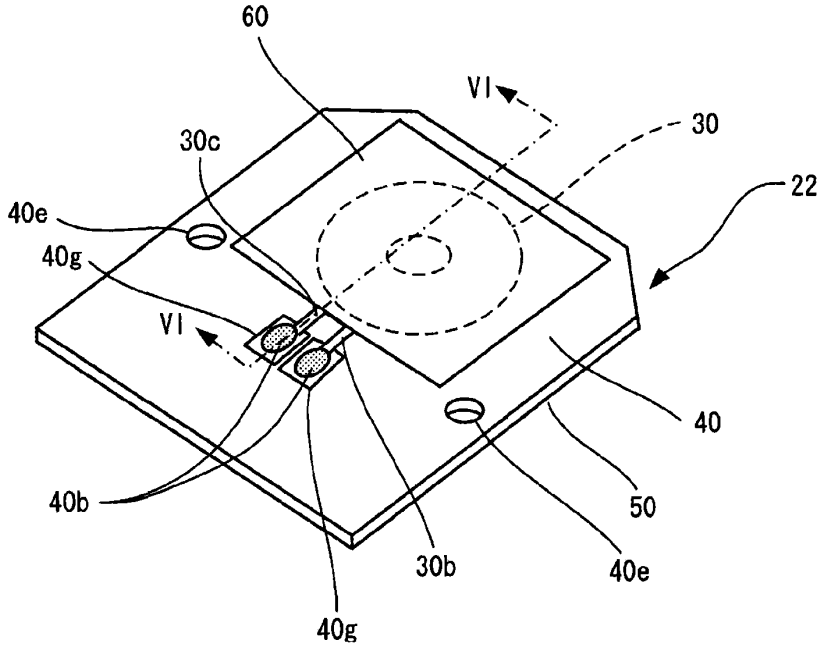


图 2

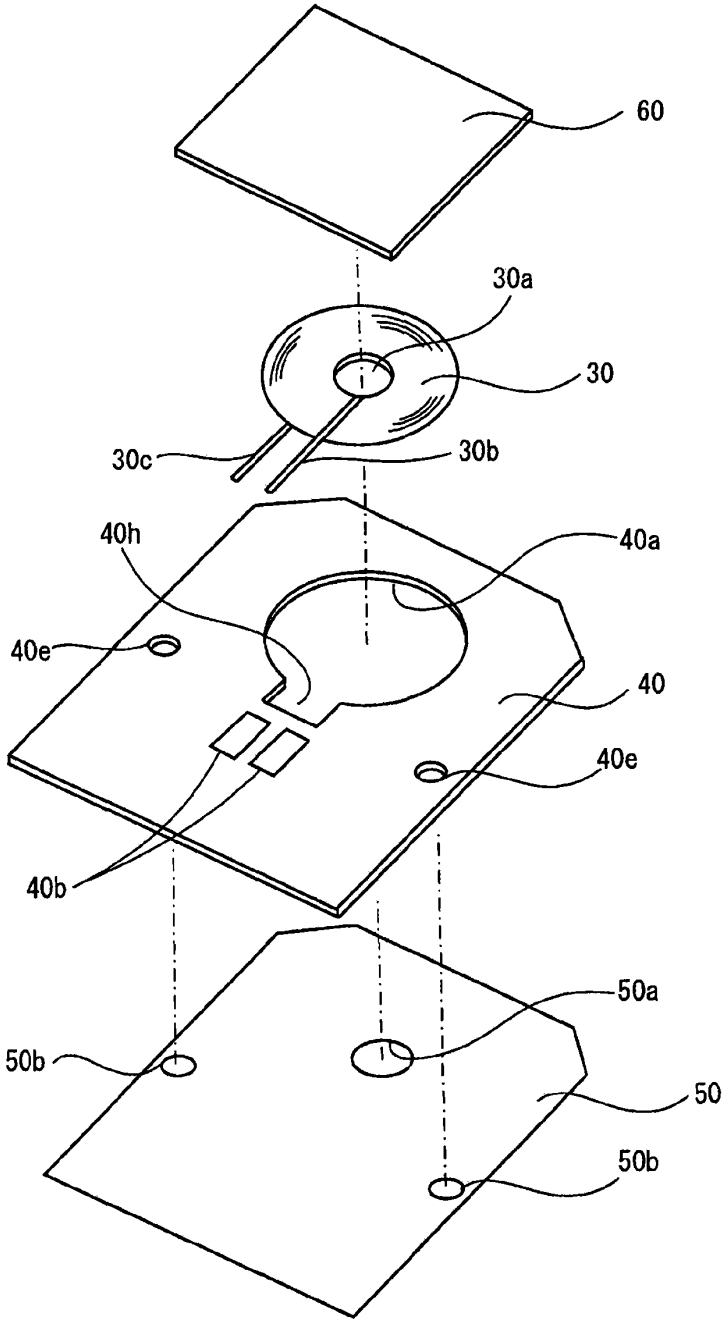


图 3

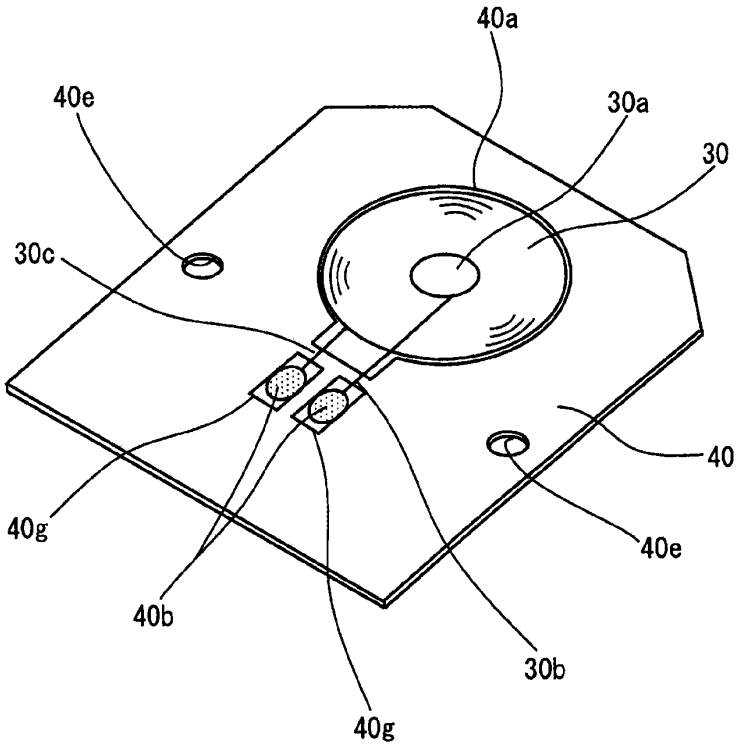


图 4

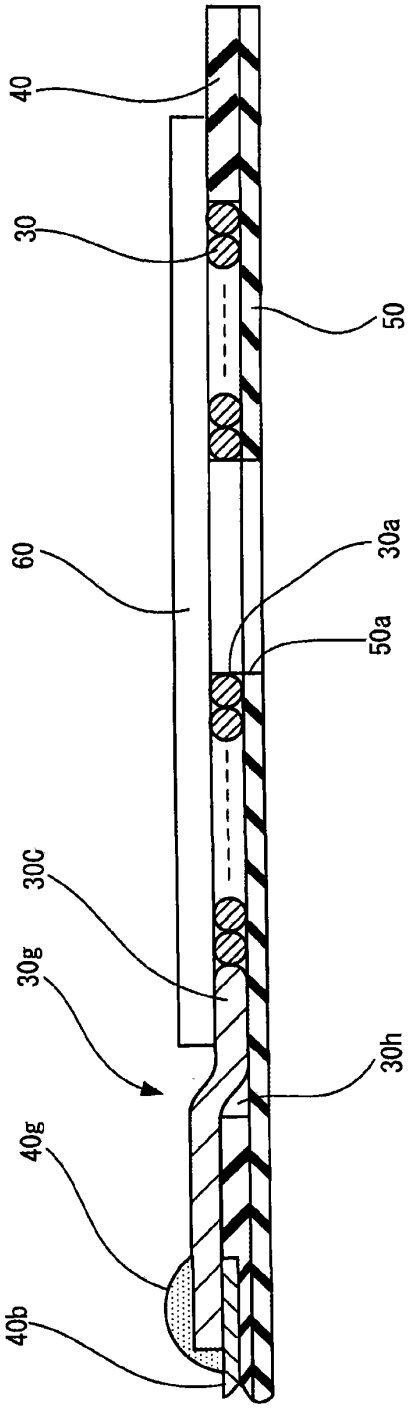


图 5

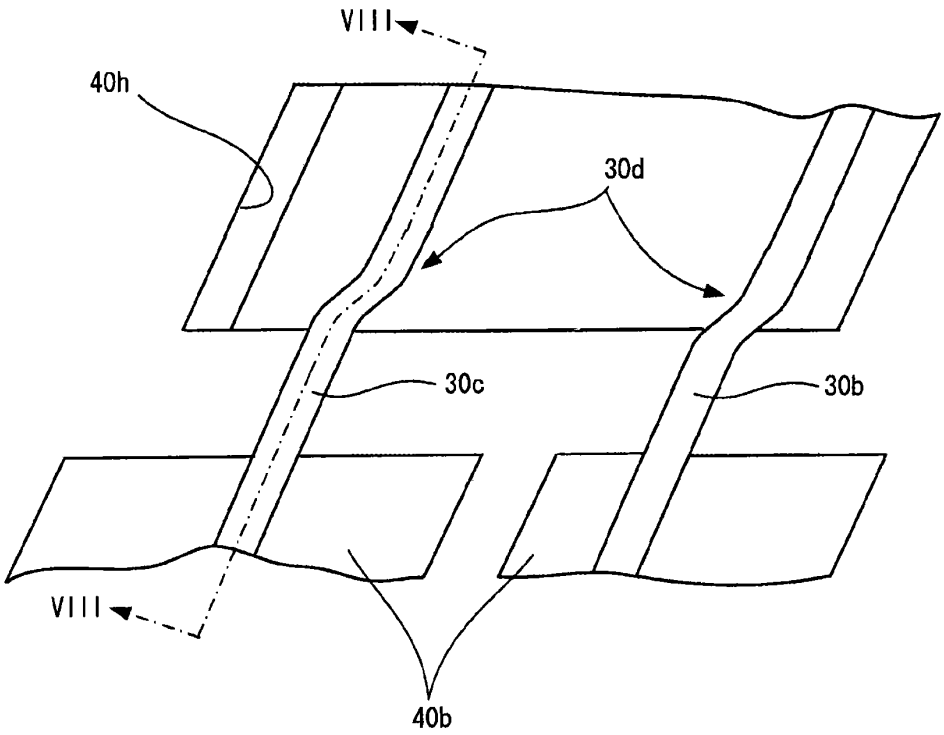


图 6

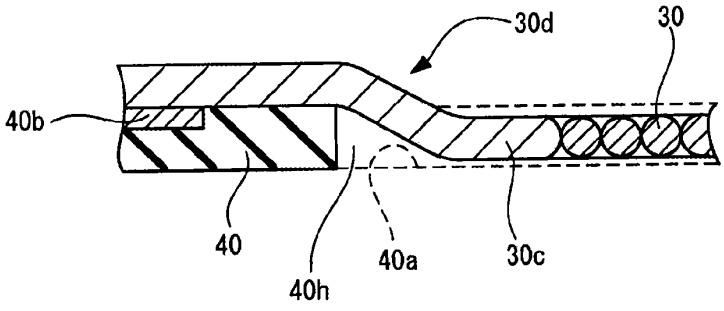


图 7

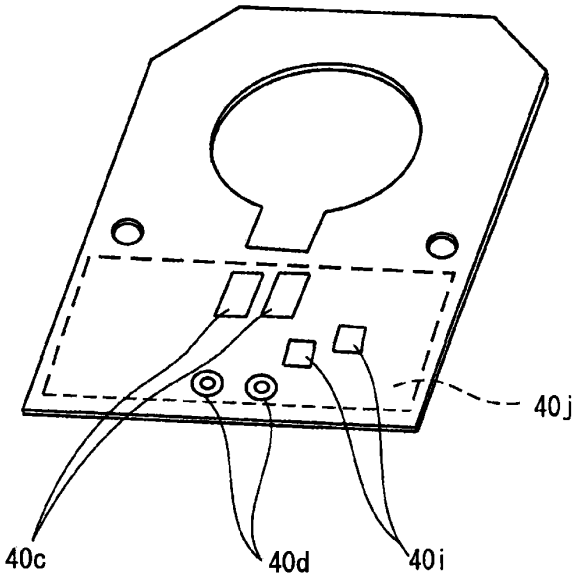


图 8

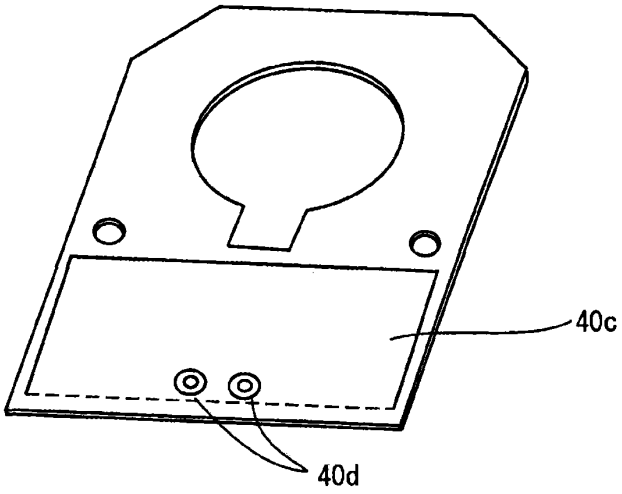


图 9

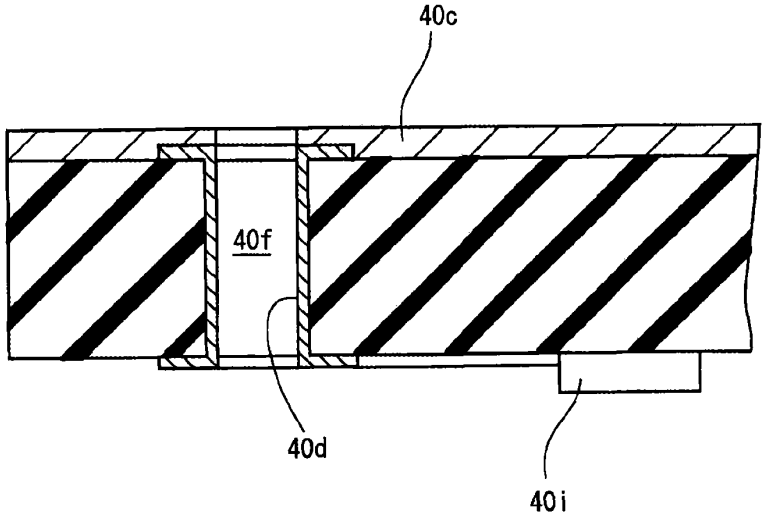


图 10

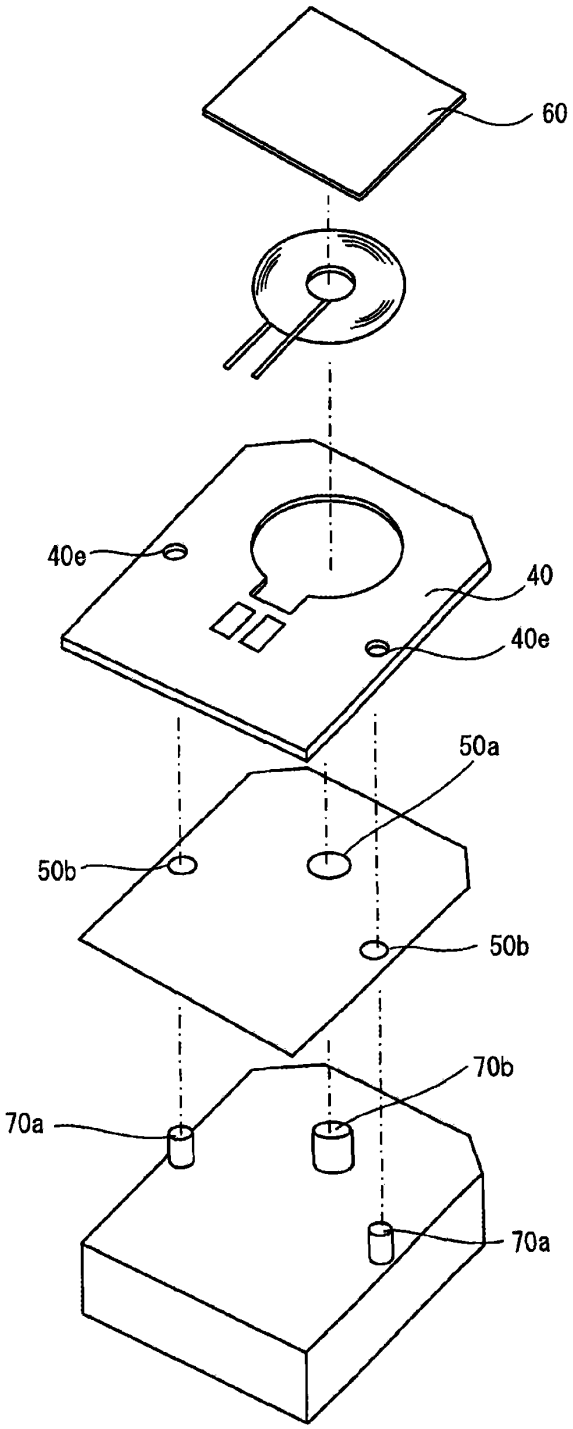


图 11

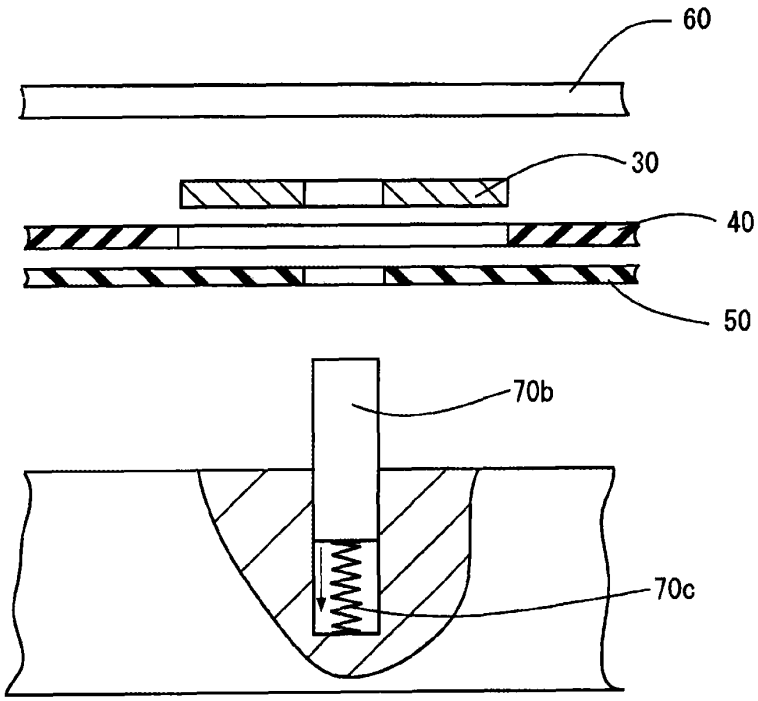


图 12

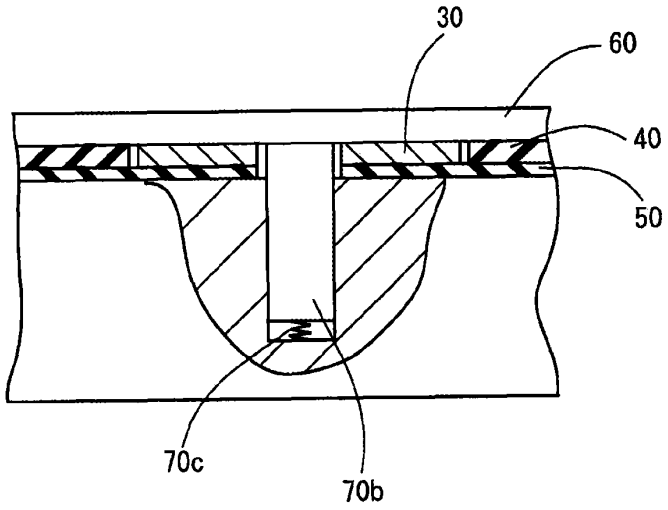


图 13

Electronic Acknowledgement Receipt

EFS ID:	31768006
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Jeff Lloyd/Megan Kuchenthal
Filer Authorized By:	Jeff Lloyd
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	12-FEB-2018
Filing Date:	10-AUG-2017
Time Stamp:	17:03:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SIDS2.pdf	245508 a703bbd6b5ec5622d99c406478fd50690378049c	yes	3

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Warnings:					
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

I hereby certify that this correspondence is being electronically filed in the United States Patent and Trademark Office on February 12, 2018.

Jeff Lloyd, Patent Attorney, Reg. No. 35,589

SUPPLEMENTAL INFORMATION
DISCLOSURE STATEMENT
UNDER 37 C.F.R §§ 1.97 AND 1.98
Examining Group 2836
Patent Application
Docket No. SUN.LGI.417D2
Serial No. 15/673,763

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner	:	Fritz M. Fleming
Art Unit	:	2836
Applicants	:	Ki Min Lee, Jung Oh Lee
Serial No.	:	15/673,763
Filed	:	August 10, 2017
Conf. No.	:	7725
For	:	WIRELESS POWER RECEIVER AND CONTROL METHOD THEREOF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 AND 1.98

Sir:

In accordance with 37 C.F.R. § 1.56, the references listed on the attached form PTO/SB/08 are being brought to the attention of the Examiner for consideration in connection with the examination of the patent application identified above. Copies of the cited references are attached. Applicants have not submitted a copy of the U.S. Patent cited on attached Form PTO/SB/08 pursuant to 37 CFR 1.98(a)(2)(ii).

Applicants note that U.S. Publication Nos. 2011/0025265, 2011/0025265, 2009/0237194, and 2008/0197960 were cited as U15, U15, U18, and U17, respectively, in the Information Disclosure Statement filed on August 10, 2017, are patent family members of F2, F3, F4, and F5, respectively, and are believed to be the English language equivalents thereof. Applicants respectfully request that the references be made of record and considered in the examination of the subject application.

J:\SUN\LGI\417D2\IDS-Refs\2-12-2018\SIDS2.doc/mrk

The undersigned hereby certifies that each item of information contained in this Supplemental Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. Applicants are attaching copies of the Korean and Chinese Office Actions.

The undersigned hereby certifies that each item of information contained in this Supplemental Information Disclosure Statement was first cited in a communication from a related application not more than three months prior to the filing of this Information Disclosure Statement. Applicants are attaching a copy of the U.S. Office Action.

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the attached form PTO/SB/08 with initials or other appropriate marks.

Applicants respectfully assert that the substantive provisions of 37 C.F.R. §§ 1.56, 1.97, and 1.98 are met by the foregoing statements.

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 or 1.17 as required by this paper to Deposit Account 19-0065.

Respectfully submitted,

Jeff Lloyd
Patent Attorney
Registration No. 35,589
Phone No.: 352-375-8100
Fax No.: 352-372-5800
Address: Saliwanchik, Lloyd & Eisenschenk
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P.O. Box 142950
Gainesville, FL 32614-2950

JL/mrk

Attachments: Form PTO/SB/08; copies of references cited.

J:\SUN\LGI\417D2\IDS-Refs\2-12-2018\SIDS2.doc/mrk

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2	7725

23557 7590 01/10/2018
SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614

EXAMINER	
FLEMING, FRITZ M	

ART UNIT	PAPER NUMBER
2836	

NOTIFICATION DATE	DELIVERY MODE
01/10/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

euspto@slepatents.com

Office Action Summary	Application No. 15/673,763	Applicant(s) LEE ET AL.	
	Examiner FRITZ M. FLEMING	Art Unit 2836	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-29* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-29* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☒ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *8/10/17* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *8/10/17,10/31/17*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

2. This application repeats a substantial portion of prior Application No.13/658,116, filed 10/23/12, and adds disclosure not presented in the prior application. Because this application names the inventor or at least one joint inventor named in the prior application, it may constitute a continuation-in-part of the prior application. Should applicant desire to claim the benefit of the filing date of the prior application, attention is directed to 35 U.S.C. 120, 37 CFR 1.78, and MPEP § 211 *et seq.*

The area of concern is the claims which seem to recite subject matter not found in the originally filed disclosure. In other words, the claims are directed to an embodiment not previously disclosed in the chain of continuity and seem to represent new matter. This new matter of the claims would be considered the CIP portion, and any support added to the disclosure would then also be new matter and form the basis of a CIP. More discussion will be presented below.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the configuration of claim 1 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended

replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

More discussion will be presented below.

Specification

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: the words "layer" and "separation distance" are missing from the originally filed disclosure. Additionally, the disclosure simply does not describe what is claimed. More details will be provided below.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it

> is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-29 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention. See the details presented below.

7. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-29 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

9. Regarding the “new matter” rejection of claims 1-29, the examiner has carefully considered the claims and reviewed the disclosure multiple times and simply is at a loss

to find where the claimed configuration can be found. A text search of the specification shows that the word "layer" is missing and does not appear a single time. The word "separation" also cannot be found in the specification, and the word “distance” appears just once in [0002] in the phrase “long-distance” making the phrase “separation distance” non-existent in the specification. Since the word “layer” is missing and non-existent, the only illustrated and described configurations remotely related to what is claimed are found in Figures 9 and 10. The problem with these figures is that the discussion of Figure 9 [0083] spans two lines, comprises one sentence, and describes that the short range communication antenna (340) has been disposed on the printed circuit board (301) and the shielding unit (380) may be attached to one side of the printed circuit board (301) with an adhesive. The discussion of Figure 10 [0084] spans 8 lines and describes how the short range communication antenna (340) or receiving coil (310-not shown in Figure 10) is disposed in the printed circuit board (301) and the shielding unit (380) may be inserted into the printed circuit board (301). As noted already, the word "layer" is missing and the descriptions noted do not lend themselves to readily interpret what a "layer" may be considered to be in Figures 9 and 10. It is also to be noted with extreme importance that “or” was used when it comes to disposing the short range communication antenna (340) “or” receiving coil (310-not shown in Fig. 10) does not provide support for a configuration with both (340) and (310) present between different “layers.” Matters are further complicated when it comes to the “shielding unit" (380) as this can either be attached to one side of the printed circuit board (301; Figure 9) or inserted into the printed circuit board (301; Figure 10). It is simply nowhere to be

found where the configuration of claim 1 where each of the wireless receiving coil, the short range communication coil, and the shielding unit are "disposed" in the board while at the same time being disposed between the plurality of layers. At best, only one of (and not both) the wireless receiving coil and the short range communication coil has multiple elements between multiple portions of the circuit board with the shielding unit being either on or in the bottom portion of the circuit board. In the configuration of Figures 9 and 10, the shielding unit is not "disposed on" the wireless receiving coil and the short range communication coil either. Therefore, the various locations of the shielding unit, short range communication coil, and the wireless receiving coil of the dependent claims are also not disclosed or supported. Various dependent claims recite the term "a separation distance" which also does not exist in the specification. Since the "separation distance" is referenced to “layers” (which also does not exist in the specification), the overall claimed configuration does not exist in the specification. There also does not seem to be support for a first and second wireless receiving coil or a first and second short range communication coil. Figures 9 and 10 are not clear if the multiple occurrences of (340) indicate plural coils or plural parts of a single coil. The whole situation and configuration is further confused by [0058] which indicates that the "short range communication antenna 340 may be embedded in the printed circuit board 301" because an “embedded” does not appear to be the same thing as something that is in between separate layers. Therefore claims 1-29 are rejected as “new matter.”

10. Given the above "new matter" and lack of description of the claimed configuration in the specification, claims 1-29 are being rejected as being vague and indefinite

because the specification does not provide adequate notice or instruction to those of ordinary skill in the art as to how to interpret the claims with needed clarity. The lack of what should be a “layer” and how something can be disposed in a board of a plurality of layers and at the same time be disposed between the plurality of layers. Given the fact that the word "layer" does not exist in the specification, and nor does the term "separation distance" one of ordinary skill is not given proper notice or instruction as to how this is to be understood. These deficiencies are further compounded by a lack of a disclosed embodiment with all of the coils and shielding unit together between layers and disposed in the board.

11. The discussion above provides further details as to the claimed subject matter not shown and the lack of antecedent basis of the claims in the specification.

12. Applicant is respectfully requested to either amend the claims to conform to what is disclosed or to provide a detailed response as to where each and every claim element can be found in the configurations disclosed. Depending on the course of action applicants take, the priority status may be a CIP, as noted above. The examiner is available for an interview if applicant thinks such could move prosecution forward.

Allowable Subject Matter

13. Claims 1-29 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), 2nd paragraph and also 1st paragraph set forth in this Office action.

14. The following is a statement of reasons for the indication of allowable subject matter: The claimed configuration is not shown or suggested in the art of record. The

claimed configuration is also patentably distinct form the two parent applications, and the patent that resulted from the initial filing.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mochida et al. (2011/0025265) show a combined non-contact communication and charging coil configuration in Figure 8 in which proximity communication antenna coil (21) surrounds the power receiving secondary coil. Hasegawa (2008/0197960) shows a PCB (40) and a planar coil (30) and a shielding unit (60).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRITZ M. FLEMING whose telephone number is (571)272-4145. The examiner can normally be reached on M-F, 0900-1730.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rexford N. Barnie can be reached on 571-272-7492. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FRITZ M FLEMING
Primary Examiner
Art Unit 2836

/FRITZ M FLEMING/
Primary Examiner, Art Unit 2836

Notice of References Cited	Application/Control No. 15/673,763	Applicant(s)/Patent Under Reexamination LEE ET AL.	
	Examiner FRITZ M. FLEMING	Art Unit 2836	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2011/0025265 A1	02-2011	Mochida; Norihito	G06K19/0701	320/108
*	B	US-2008/0197960 A1	08-2008	Hasegawa; Minoru	H01F27/2871	336/110
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	Art Unit
	FRITZ M FLEMING	2836

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/28/2017								
	1	✓								
	2	✓								
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PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	15/673,763
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	2683
Examiner Name	Not Assigned Yet
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U1	7,719,399-B2	05-18-2010	Iwasaki	ALL
	U2	8,922,160-B2	12-30-2014	Inoue	ALL
	U3	2008/0198560-A1	08-21-2008	FUJIWARA *et al.*	ALL

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Foreign Patent Document Country Code [3] - Number [4] - Kind Code [5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	T[6]
	F1	JP-06-224043-A (with Machine Translation)	08-12-1994	-	ALL	

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. [1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature	/FRITZ M FLEMING/	Date Considered	12/27/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

J:\SUN\LGI\417D2\IDS-Refs\10-31-2017\PTO-SB-08(2).doc/mrk

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.M.F/

Bibliographic Data

Application No: 15673763

Foreign Priority claimed: (●) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No | [ ] Met After Allowance

Verified and Acknowledged: /FRITZ M FLEMING/ | [ ]

Examiner's Signature | Initials

Title: Wireless Power Receiver and Control Method Thereof

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
08/10/2017	307	2836	SUN.LGI.417D2
RULE			

APPLICANTS

LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF

INVENTORS

Ki Min Lee, Seoul, KOREA, REPUBLIC OF

Jung Oh Lee, Seoul, KOREA, REPUBLIC OF

CONTINUING DATA

15195390 is a CON of 13658116 10/23/2012PAT 9461364

15673763 is a CON of 15195390 06/28/2016

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF 10-2011-0114721 11/04/2011

IF REQUIRED, FOREIGN LICENSE GRANTED**

08/16/2017

STATE OR COUNTRY

KOREA, REPUBLIC OF

ADDRESS

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UNITED STATES

FILING FEE RECEIVED

$6,460

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	5606	h02j50/70.cpc. or h02j50/70.ipc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/12/28 07:51
L4	1006	L3 and layer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 07:51
L5	38275	h02j50/05,10,12,80.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:21
L6	0	h02j50/05,10,12,80.ipc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:21
L7	1980	5 and nfc	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:21
L8	339	5 and nfc and (layer or sheet) and (shield or shielding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:22
L9	13248	h04b5/0037.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:43
L10	1519	h04b5/0087.cpc.	US-PGPUB;	OR	ON	2017/12/28

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			09:43
L11	593	9 and (layer or sheet) and (shield or shielding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:43
L12	700	9 and (layer or sheet or board) and (shield or shielding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/28 09:50
L13	1	("20150054455").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/12/28 10:12
S1	0	"2011025265"	USPAT	OR	OFF	2015/09/23 19:36
S2	0	"2011025265"	US-PGPUB; USPAT	OR	OFF	2015/09/23 19:36
S3	2	"20110025265"	US-PGPUB; USPAT	OR	OFF	2015/09/23 19:36
S4	13	("20090309550" | "20090096413" | "20100146308" | "20100191306" | "20110018358" | "20110025265" | "20120205989" | "20110227420" | "20080211455" | "20040130915" | "20110115303" | "5430618" | "20110316475").PN.	US-PGPUB; USPAT	OR	OFF	2015/09/23 19:57
S5	1	("20130113422").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/09/23 20:10
S6	6657	h04b5/0037.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/23 20:12
S7	32	S6 and (rectifier same shield$)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:25
S8	8244	h02j17/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:26

S9	394	S8 and nfc	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:26
S10	13278	S6 or S8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:37
S11	77	S10 and ((shield or shielding) same (coil or antenna) same rectifier)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:38
S12	19	S10 and (("printed circuit board") same (coil or antenna) same rectifier)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:41
S13	25	S10 and (("printed circuit board") same (coil or antenna) same (shield or shielding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:45
S14	504	S10 and ((coil or antenna) same (shield or shielding))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/23 23:46
S15	293	(US-20110096823-$).did. or (US-4897662-$ or US-6098175-$ or US-4984291-$ or US-4989261-$ or US-5025486-$ or US-6038452-$ or US-4967108-$ or US-5524044-$ or US-5619531-$ or US-5686847-$ or US-5726636-$ or US-5727020-$ or US-5767791-$ or US-5917854-$ or US-5942946-$ or US-5964701-$ or US-6223295-$ or US-4563626-$ or US-4567557-$ or US-4955038-$ or US-5189839-$ or US-5216838-$ or US-5239779-$ or US-5278892-$ or US-5389920-$ or US-5396195-$).did. or (US-5504864-$ or US-5546051-$ or US-5565893-$ or US-5657317-$ or US-5684470-$ or US-5684828-$ or US-5689142-$ or US-5721783-$ or US-5728963-$ or US-5764693-$ or US-5822683-$ or US-5845204-$ or US-	US-PGPUB; USPAT	OR	OFF	2015/09/25 23:19

		5861822-$ or US-5870389-$ or US-5887255-$ or US-5889273-$ or US-5895985-$ or US-5898904-$ or US-5926747-$ or US-5943618-$ or US-5943325-$ or US-5945936-$ or US-5949776-$ or US-5978674-$ or US-5995492-$ or US-6006116-$ or US-6009148-$).did. or (US-6023460-$ or US-6023621-$ or US-6028857-$ or US-6034999-$ or US-6049702-$ or US-6057733-$ or US-6072990-$ or US-6088600-$ or US-6097704-$ or US-6104761-$ or US-6150882-$ or US-6188718-$ or US-6188875-$ or US-6233464-$ or US-4386422-$ or US-4473905-$ or US-4502150-$ or US-4509201-$ or US-4550427-$ or US-4617002-$ or US-4630035-$ or US-4755792-$ or US-4757224-$ or US-4848823-$ or US-4852147-$ or US-4898562-$ or US-4902262-$).did. or (US-4973958-$ or US-4983892-$ or US-5014017-$ or US-5017837-$ or US-5212478-$ or US-5218356-$ or US-5289501-$ or US-5402413-$ or US-5420536-$ or US-5424859-$ or US-5426641-$ or US-5434396-$ or US-5465418-$ or US-5488737-$ or US-5490172-$ or US-5491457-$ or US-5503483-$ or US-5504780-$ or US-5511090-$ or US-5513379-$ or US-5525993-$ or US-5532470-$ or US-5539393-$ or US-5541604-$ or US-5548250-$ or US-5553101-$ or US-5563483-$).did. or (US-5579201-$ or US-5581617-$ or US-5587573-$ or US-5589859-$ or US-5592257-$ or US-5594385-$ or US-5596261-$ or US-5604462-$ or US-5608171-$ or US-5616888-$ or US-5640674-$ or US-5644172-$ or US-5678172-$ or US-5680633-$ or US-5687734-$ or US-5691691-$ or US-5692647-$ or US-5701583-$ or US-5707262-$ or US-5711480-$ or US-5715523-$ or US-5721500-$ or US-5722051-$ or US-5734984-$ or US-5737707-$ or US-5745852-$ or US-5748104-$).did. or (US-5748813-$ or US-5750939-$ or US-5751693-$ or US-5768695-$ or US-5770970-$ or US-5774018-$ or US-5774043-$ or US-5781543-$ or US-5781069-$ or US-5790936-$ or US-5790536-$ or US-5793174-$ or US-5802470-$ or US-5808557-$ or US-5812012-$ or US-5815086-$ or US-5815811-$ or US-5822373-$ or US-5828367-$ or US-5832044-$ or US-5832390-$ or US-5832364-$ or US-5831593-$ or US-5842037-$ or US-5844789-$ or US-5850600-$ or US-5854793-$).did. or (US-5854592-$ or US-5859838-$ or US-5878335-$ or US-5878084-$ or US-5880633-$ or US-					

		5883549-$ or US-5887031-$ or US-5886497-$ or US-5892758-$ or US-5896261-$ or US-5901345-$ or US-5905473-$ or US-5912919-$ or US-5912963-$ or US-5920270-$ or US-5920816-$ or US-5922650-$ or US-5926760-$ or US-5933263-$ or US-5933774-$ or US-5942981-$ or US-5946346-$ or US-5949766-$ or US-5949484-$ or US-5949309-$ or US-5953688-$ or US-5956656-$).did. or (US-5974034-$ or US-5974376-$ or US-5987338-$ or US-5987037-$ or US-5990646-$ or US-5990826-$ or US-5994985-$ or US-6002715-$ or US-6002918-$ or US-6006069-$ or US-6005840-$ or US-6005856-$ or US-6008749-$ or US-6014705-$ or US-6018232-$ or US-6023612-$ or US-6028454-$ or US-6028631-$ or US-6041241-$ or US-6046698-$ or US-6047165-$ or US-6047200-$ or US-6052509-$ or US-6052033-$ or US-6055418-$ or US-6057658-$ or US-6061389-$).did. or (US-6067297-$ or US-6067053-$ or US-6069881-$ or US-6069526-$ or US-6072784-$ or US-6073033-$ or US-6075510-$ or US-6078824-$ or US-6078222-$ or US-6085114-$ or US-6085074-$ or US-6084904-$ or US-6091296-$ or US-6092117-$ or US-6097243-$ or US-6098048-$ or US-6101174-$ or US-6104937-$ or US-6104914-$ or US-6108523-$ or US-6108367-$ or US-6111248-$ or US-6112165-$ or US-6112056-$ or US-6119009-$ or US-6118806-$ or US-6118567-$).did. or (US-6122312-$ or US-6124764-$ or US-6134437-$ or US-6141538-$ or US-6141763-$ or US-6144840-$ or US-6151308-$ or US-6151483-$ or US-6154488-$ or US-6154637-$ or US-6154663-$ or US-6163581-$ or US-6163679-$ or US-6167238-$ or US-6169339-$ or US-6169884-$ or US-6173352-$ or US-6175302-$ or US-6181089-$ or US-6181916-$ or US-6184950-$ or US-6188353-$ or US-6192230-$ or US-6201372-$ or US-6212398-$ or US-6215358-$ or US-6215827-$).did. or (US-6216019-$ or US-6236866-$ or US-6243870-$ or US-6249685-$ or US-7865209-$ or US-7945282-$ or US-8582683-$ or US-3614760-$ or US-3659280-$ or US-3641540-$ or US-3641425-$ or US-3911415-$ or US-3842403-$ or US-4024502-$ or US-4025912-$ or US-4058678-$ or US-4132378-$ or US-4151407-$ or US-4078747-$ or US-4088999-$ or US-4249162-$ or US-4259743-$ or US-4272687-$).did.				
S16	255888	(communication or nfc) same (wireless	US-PGPUB;	OR	ON	2015/09/25

		or contactless or inductive) same power	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			23:26
S17	4879	(nfc) same (wireless or contactless or inductive) same power	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/25 23:26
S18	33	(nfc) same (wireless or contactless or inductive) same power same (shield or shielding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/25 23:27
S19	2	("20110050164" | "20120146576").PN. OR ("8922162").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/09/25 23:29
S20	1420	(nfc) same (wireless or contactless or inductive) same power same (coil or antenna or winding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/25 23:33
S21	4118	(nfc) same power same data	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/25 23:55
S22	1052	(nfc) same power same data same (coil or winding or antenna)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/25 23:56
S23	6667	h04b5/0037.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/26 00:12
S24	8256	h02j17/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 00:12
S25	1625	S23 and S24	US-PGPUB; USPAT; USOCR;	OR	ON	2015/09/26 00:12

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S26	3663	(307/104).CCLS.	US-PGPUB; USPAT	OR	OFF	2015/09/26 00:27
S27	2493	(320/108).CCLS.	US-PGPUB; USPAT	OR	OFF	2015/09/26 00:27
S28	5795	S26 or S27	US-PGPUB; USPAT	OR	OFF	2015/09/26 00:27
S29	548	S28 and nfc	US-PGPUB; USPAT	OR	OFF	2015/09/26 00:27
S30	14905	h02j7/025.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/26 00:56
S31	735	S30 and nfc	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/26 00:56
S32	50969	communication same (wireless or contactless or inductive) same power same (coil or antenna or winding)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 01:08
S33	3352	communication same (wireless or contactless or inductive) same power same (coil or antenna or winding) same transfer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 01:09
S34	141	communication same (wireless or contactless or inductive) same power same (coil or antenna or winding) same transfer same (pplane ir planar)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 01:09
S35	78	communication same (wireless or contactless or inductive) same power same (coil or antenna or winding) same transfer same (plane or planar)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 01:09
S36	30	nfc same (antenna or winding or coil) same (shield or shielding) same (pcb or "printed circuit board")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2015/09/26 10:36

			IBM_TDB			
S37	3663	(307/104).CCLS.	US-PGPUB; USPAT	OR	OFF	2015/09/26 11:41
S38	2493	(320/108).CCLS.	US-PGPUB; USPAT	OR	OFF	2015/09/26 11:41
S39	5795	S37 or S38	US-PGPUB; USPAT	OR	OFF	2015/09/26 11:42
S40	216	S39 and ((shield or shielding) same (pcb or "printed circuit board"))	US-PGPUB; USPAT	OR	ON	2015/09/26 11:42
S41	1333	S39 and embedded	US-PGPUB; USPAT	OR	OFF	2015/09/26 12:08
S42	176	S39 and zener	US-PGPUB; USPAT	OR	OFF	2015/09/26 12:29
S43	7	S39 and (groove same (pcb or "printed circuit board"))	US-PGPUB; USPAT	OR	ON	2015/09/26 12:53
S44	21	S39 and young and fritz	US-PGPUB; USPAT	OR	ON	2015/09/26 12:53
S45	341	nfc same (antenna or winding or coil) same (pcb or "printed circuit board")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/26 13:00
S46	532	S39 and ((antenna or coil or winding) same (pcb or "printed circuit board"))	US-PGPUB; USPAT	OR	ON	2015/09/26 13:06
S47	417	"printed circuit board coil"	US-PGPUB; USPAT	OR	ON	2015/09/26 13:46
S48	2	nfc same (shield or shielding) same rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:02
S49	3476	through same (shield or shielding) same rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:04
S50	64	phone same (shield or shielding) same rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:04
S51	69	charger same (shield or shielding) same rectifier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:05
S52	103	charger same (shield or shielding) same ((non adj contact) or noncontact or	US-PGPUB; USPAT;	OR	ON	2015/09/26 14:09

		contactless)	FPRS; EPO; JPO; DERWENT; IBM_TDB			
S53	31	rectifier same (shield or shielding) same ((non adj contact) or noncontact or contactless)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:17
S54	0	rectifier same (shield or shielding) same "pronted circuit board"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:20
S55	70	rectifier same (shield or shielding) same "printed circuit board"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:20
S56	126	S39 and (rectifier same (shield or shielding))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:25
S57	6677	h04b5/0037.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/26 14:29
S58	8269	h02j17/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:29
S59	14926	h02j7/025.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/26 14:29
S60	23176	S57 or S58 or S59	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/09/26 14:29
S61	246	S60 and ((shield or shielding) same (pcb or "printed circuit board"))	US-PGPUB; USPAT	OR	ON	2015/09/26 14:30
S62	256	S60 and ((shield or shielding) same (pcb or "printed circuit board"))	US-PGPUB; USPAT; USOCR;	OR	ON	2015/09/26 14:30

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S63	7860	h04b5/0037.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/22 13:33
S64	10103	h02j17/00.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/22 13:44
S65	4003	(307/104).CCLS.	US-PGPUB; USPAT	OR	OFF	2016/02/22 13:58
S66	2678	(320/108).CCLS.	US-PGPUB; USPAT	OR	OFF	2016/02/22 13:58
S67	6291	S65 or S66	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/02/22 13:58
S68	4203	(307/104).CCLS.	US-PGPUB; USPAT	OR	OFF	2016/05/17 12:51
S69	2811	(320/108).CCLS.	US-PGPUB; USPAT	OR	OFF	2016/05/17 12:51
S70	6604	S68 or S69	US-PGPUB; USPAT	OR	OFF	2016/05/17 12:51
S71	2984	h02j17/00.cpc.	US-PGPUB; USPAT	OR	OFF	2016/05/17 13:29
S72	7577	h02j17/00.cpc.	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/17 13:32
S73	5655	h04b5/0037.cpc.	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/17 14:28
S74	8167	h04b5/0037.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/05/17 14:28
S75	288	h02j50/00,10.cpc. or h02j50/00,10.ipc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/05/17 14:42

S77	1	("9461364").PN.	USPAT; USOCR	OR	OFF	2017/12/27 08:19
S78	1	("9461364").PN.	USPAT; USOCR	OR	OFF	2017/12/27 10:47
S79	0	S78 and layer	USPAT	OR	ON	2017/12/27 10:47
S80	293	(US-20110096823-$ or US-20170078971-$).did. or (US-4897662-$ or US-6098175-$ or US-4984291-$ or US-4989261-$ or US-5025486-$ or US-6038452-$ or US-4967108-$ or US-5524044-$ or US-5619531-$ or US-5686847-$ or US-5726636-$ or US-5727020-$ or US-5767791-$ or US-5917854-$ or US-5942946-$ or US-5964701-$ or US-6223295-$ or US-4563626-$ or US-4567557-$ or US-4955038-$ or US-5189839-$ or US-5216838-$ or US-5239779-$ or US-5278892-$ or US-5389920-$ or US-5396195-$).did. or (US-5504864-$ or US-5546051-$ or US-5565893-$ or US-5657317-$ or US-5684470-$ or US-5684828-$ or US-5689142-$ or US-5721783-$ or US-5728963-$ or US-5764693-$ or US-5822683-$ or US-5845204-$ or US-5861822-$ or US-5870389-$ or US-5887255-$ or US-5889273-$ or US-5895985-$ or US-5898904-$ or US-5926747-$ or US-5943618-$ or US-5943325-$ or US-5945936-$ or US-5949776-$ or US-5978674-$ or US-5995492-$ or US-6006116-$ or US-6009148-$).did. or (US-6023460-$ or US-6023621-$ or US-6028857-$ or US-6034999-$ or US-6049702-$ or US-6057733-$ or US-6072990-$ or US-6088600-$ or US-6097704-$ or US-6104761-$ or US-6150882-$ or US-6188718-$ or US-6188875-$ or US-6233464-$ or US-4386422-$ or US-4473905-$ or US-4502150-$ or US-4509201-$ or US-4550427-$ or US-4617002-$ or US-4630035-$ or US-4755792-$ or US-4757224-$ or US-4848823-$ or US-4852147-$ or US-4898562-$ or US-4902262-$).did. or (US-4973958-$ or US-4983892-$ or US-5014017-$ or US-5017837-$ or US-5212478-$ or US-5218356-$ or US-5289501-$ or US-5402413-$ or US-5420536-$ or US-5424859-$ or US-5426641-$ or US-5434396-$ or US-5465418-$ or US-5488737-$ or US-5490172-$ or US-5491457-$ or US-5503483-$ or US-5504780-$ or US-5511090-$ or US-5513379-$ or US-5525993-$ or US-5532470-$ or US-5539393-$ or US-5541604-$ or US-5548250-$ or US-5553101-$ or US-5563483-$).did. or (US-5579201-$ or US-5581617-$ or US-5587573-$ or US-5589859-$ or US-	US-PGPUB; USPAT	OR	OFF	2017/12/27 21:08

		5592257-$ or US-5594385-$ or US-5596261-$ or US-5604462-$ or US-5608171-$ or US-5616888-$ or US-5640674-$ or US-5644172-$ or US-5678172-$ or US-5680633-$ or US-5687734-$ or US-5691691-$ or US-5692647-$ or US-5701583-$ or US-5707262-$ or US-5711480-$ or US-5715523-$ or US-5721500-$ or US-5722051-$ or US-5734984-$ or US-5737707-$ or US-5745852-$ or US-5748104-$).did. or (US-5748813-$ or US-5750939-$ or US-5751693-$ or US-5768695-$ or US-5770970-$ or US-5774018-$ or US-5774043-$ or US-5781543-$ or US-5781069-$ or US-5790936-$ or US-5790536-$ or US-5793174-$ or US-5802470-$ or US-5808557-$ or US-5812012-$ or US-5815086-$ or US-5815811-$ or US-5822373-$ or US-5828367-$ or US-5832044-$ or US-5832390-$ or US-5832364-$ or US-5831593-$ or US-5842037-$ or US-5844789-$ or US-5850600-$ or US-5854793-$).did. or (US-5854592-$ or US-5859838-$ or US-5878335-$ or US-5878084-$ or US-5880633-$ or US-5883549-$ or US-5887031-$ or US-5886497-$ or US-5892758-$ or US-5896261-$ or US-5901345-$ or US-5905473-$ or US-5912919-$ or US-5912963-$ or US-5920270-$ or US-5920816-$ or US-5922650-$ or US-5926760-$ or US-5933263-$ or US-5933774-$ or US-5942981-$ or US-5946346-$ or US-5949766-$ or US-5949484-$ or US-5949309-$ or US-5953688-$ or US-5956656-$).did. or (US-5974034-$ or US-5974376-$ or US-5987338-$ or US-5987037-$ or US-5990646-$ or US-5990826-$ or US-5994985-$ or US-6002715-$ or US-6002918-$ or US-6006069-$ or US-6005840-$ or US-6005856-$ or US-6008749-$ or US-6014705-$ or US-6018232-$ or US-6023612-$ or US-6028454-$ or US-6028631-$ or US-6041241-$ or US-6046698-$ or US-6047165-$ or US-6047200-$ or US-6052509-$ or US-6052033-$ or US-6055418-$ or US-6057658-$ or US-6061389-$).did. or (US-6067297-$ or US-6067053-$ or US-6069881-$ or US-6069526-$ or US-6072784-$ or US-6073033-$ or US-6075510-$ or US-6078824-$ or US-6078222-$ or US-6085114-$ or US-6085074-$ or US-6084904-$ or US-6091296-$ or US-6092117-$ or US-6097243-$ or US-6098048-$ or US-6101174-$ or US-6104937-$ or US-6104914-$ or US-6108523-$ or US-6108367-$ or US-6111248-$ or US-6112165-$ or US-				

		6119009-$ or US-6118806-$ or US-6118567-$).did. or (US-6122312-$ or US-6124764-$ or US-6134437-$ or US-6141538-$ or US-6141763-$ or US-6144840-$ or US-6151308-$ or US-6151483-$ or US-6154488-$ or US-6154637-$ or US-6154663-$ or US-6163581-$ or US-6163679-$ or US-6167238-$ or US-6169339-$ or US-6169884-$ or US-6173352-$ or US-6175302-$ or US-6181089-$ or US-6181916-$ or US-6184950-$ or US-6188353-$ or US-6192230-$ or US-6201372-$ or US-6212398-$ or US-6215358-$ or US-6215827-$).did. or (US-6216019-$ or US-6236866-$ or US-6243870-$ or US-6249685-$ or US-7865209-$ or US-7945282-$ or US-8582683-$ or US-3614760-$ or US-3659280-$ or US-3641540-$ or US-3641425-$ or US-3911415-$ or US-3842403-$ or US-4024502-$ or US-4025912-$ or US-4058678-$ or US-4132378-$ or US-4151407-$ or US-4078747-$ or US-4088999-$ or US-4249162-$ or US-4259743-$).did.				
S81	293	(US-20110096823-$ or US-20170078971-$).did. or (US-4897662-$ or US-6098175-$ or US-4984291-$ or US-4989261-$ or US-5025486-$ or US-6038452-$ or US-4967108-$ or US-5524044-$ or US-5619531-$ or US-5686847-$ or US-5726636-$ or US-5727020-$ or US-5767791-$ or US-5917854-$ or US-5942946-$ or US-5964701-$ or US-6223295-$ or US-4563626-$ or US-4567557-$ or US-4955038-$ or US-5189839-$ or US-5216838-$ or US-5239779-$ or US-5278892-$ or US-5389920-$ or US-5396195-$).did. or (US-5504864-$ or US-5546051-$ or US-5565893-$ or US-5657317-$ or US-5684470-$ or US-5684828-$ or US-5689142-$ or US-5721783-$ or US-5728963-$ or US-5764693-$ or US-5822683-$ or US-5845204-$ or US-5861822-$ or US-5870389-$ or US-5887255-$ or US-5889273-$ or US-5895985-$ or US-5898904-$ or US-5926747-$ or US-5943618-$ or US-5943325-$ or US-5945936-$ or US-5949776-$ or US-5978674-$ or US-5995492-$ or US-6006116-$ or US-6009148-$).did. or (US-6023460-$ or US-6023621-$ or US-6028857-$ or US-6034999-$ or US-6049702-$ or US-6057733-$ or US-6072990-$ or US-6088600-$ or US-6097704-$ or US-6104761-$ or US-6150882-$ or US-6188718-$ or US-6188875-$ or US-6233464-$ or US-4386422-$ or US-4473905-$ or US-4502150-$ or US-4509201-$ or US-4550427-$ or US-4617002-$ or US-	US-PGPUB; USPAT	OR	OFF	2017/12/27 21:08

		4630035-$ or US-4755792-$ or US-4757224-$ or US-4848823-$ or US-4852147-$ or US-4898562-$ or US-4902262-$).did. or (US-4973958-$ or US-4983892-$ or US-5014017-$ or US-5017837-$ or US-5212478-$ or US-5218356-$ or US-5289501-$ or US-5402413-$ or US-5420536-$ or US-5424859-$ or US-5426641-$ or US-5434396-$ or US-5465418-$ or US-5488737-$ or US-5490172-$ or US-5491457-$ or US-5503483-$ or US-5504780-$ or US-5511090-$ or US-5513379-$ or US-5525993-$ or US-5532470-$ or US-5539393-$ or US-5541604-$ or US-5548250-$ or US-5553101-$ or US-5563483-$).did. or (US-5579201-$ or US-5581617-$ or US-5587573-$ or US-5589859-$ or US-5592257-$ or US-5594385-$ or US-5596261-$ or US-5604462-$ or US-5608171-$ or US-5616888-$ or US-5640674-$ or US-5644172-$ or US-5678172-$ or US-5680633-$ or US-5687734-$ or US-5691691-$ or US-5692647-$ or US-5701583-$ or US-5707262-$ or US-5711480-$ or US-5715523-$ or US-5721500-$ or US-5722051-$ or US-5734984-$ or US-5737707-$ or US-5745852-$ or US-5748104-$).did. or (US-5748813-$ or US-5750939-$ or US-5751693-$ or US-5768695-$ or US-5770970-$ or US-5774018-$ or US-5774043-$ or US-5781543-$ or US-5781069-$ or US-5790936-$ or US-5790536-$ or US-5793174-$ or US-5802470-$ or US-5808557-$ or US-5812012-$ or US-5815086-$ or US-5815811-$ or US-5822373-$ or US-5828367-$ or US-5832044-$ or US-5832390-$ or US-5832364-$ or US-5831593-$ or US-5842037-$ or US-5844789-$ or US-5850600-$ or US-5854793-$).did. or (US-5854592-$ or US-5859838-$ or US-5878335-$ or US-5878084-$ or US-5880633-$ or US-5883549-$ or US-5887031-$ or US-5886497-$ or US-5892758-$ or US-5896261-$ or US-5901345-$ or US-5905473-$ or US-5912919-$ or US-5912963-$ or US-5920270-$ or US-5920816-$ or US-5922650-$ or US-5926760-$ or US-5933263-$ or US-5933774-$ or US-5942981-$ or US-5946346-$ or US-5949766-$ or US-5949484-$ or US-5949309-$ or US-5953688-$ or US-5956656-$).did. or (US-5974034-$ or US-5974376-$ or US-5987338-$ or US-5987037-$ or US-5990646-$ or US-5990826-$ or US-5994985-$ or US-6002715-$ or US-6002918-$ or US-6006069-$ or US-6005840-$ or US-6005856-$ or US-6008749-$ or US-					

		6014705-$ or US-6018232-$ or US-6023612-$ or US-6028454-$ or US-6028631-$ or US-6041241-$ or US-6046698-$ or US-6047165-$ or US-6047200-$ or US-6052509-$ or US-6052033-$ or US-6055418-$ or US-6057658-$ or US-6061389-$).did. or (US-6067297-$ or US-6067053-$ or US-6069881-$ or US-6069526-$ or US-6072784-$ or US-6073033-$ or US-6075510-$ or US-6078824-$ or US-6078222-$ or US-6085114-$ or US-6085074-$ or US-6084904-$ or US-6091296-$ or US-6092117-$ or US-6097243-$ or US-6098048-$ or US-6101174-$ or US-6104937-$ or US-6104914-$ or US-6108523-$ or US-6108367-$ or US-6111248-$ or US-6112165-$ or US-6112056-$ or US-6119009-$ or US-6118806-$ or US-6118567-$).did. or (US-6122312-$ or US-6124764-$ or US-6134437-$ or US-6141538-$ or US-6141763-$ or US-6144840-$ or US-6151308-$ or US-6151483-$ or US-6154488-$ or US-6154637-$ or US-6154663-$ or US-6163581-$ or US-6163679-$ or US-6167238-$ or US-6169339-$ or US-6169884-$ or US-6173352-$ or US-6175302-$ or US-6181089-$ or US-6181916-$ or US-6184950-$ or US-6188353-$ or US-6192230-$ or US-6201372-$ or US-6212398-$ or US-6215358-$ or US-6215827-$).did. or (US-6216019-$ or US-6236866-$ or US-6243870-$ or US-6249685-$ or US-7865209-$ or US-7945282-$ or US-8582683-$ or US-3614760-$ or US-3659280-$ or US-3641540-$ or US-3641425-$ or US-3911415-$ or US-3842403-$ or US-4024502-$ or US-4025912-$ or US-4058678-$ or US-4132378-$ or US-4151407-$ or US-4078747-$ or US-4088999-$ or US-4249162-$ or US-4259743-$).did.				
S82	293	S80 or S81	US-PGPUB; USPAT	OR	OFF	2017/12/27 21:09
S83	5606	h02j50/70.cpc. or h02j50/70.ipc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/12/27 22:27
S84	5385	h02j50/70.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/12/27 22:27
S85	367	h02j50/70.ipc.	US-PGPUB; USPAT;	OR	OFF	2017/12/27 22:27

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S86	312	S83 and nfc	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/12/27 22:27
S87	173	S83 and nfc and layer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/12/27 22:32
S88	178	S83 and nfc and layer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/27 22:32

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S76	3	(communication same (wireless or contactless or inductive) same power same (coil or antenna or winding) same transfer same (plane or planar)).clm.	US-PGPUB; USPAT	OR	ON	2016/05/17 14:35

12/28/2017 10:14:45 AM
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PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 5

Complete if Known	
Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code [2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U1	2012/0205989-A1	08-16-2012	Baarman	ALL
	U2	2009/0284082-A1	11-19-2009	Mohammadian	ALL
	U3	2013/0038278-A1	02-14-2013	Park *et al.*	ALL
	U4	2013/0113422-A1	05-09-2013	Lee *et al.*	ALL
	U5	2009/0096413-A1	04-16-2009	Partovi *et al.*	ALL
	U6	2011/0018358-A1	01-27-2011	Osamu Kozakai	ALL
	U7	2011/0227420-A1	09-22-2011	Takashi Urano	ALL
	U8	2004/0130915-A1	07-08-2004	David W. Baarman	ALL
	U9	2009/0309550-A1	12-17-2009	Chih-Min Liu	ALL
	U10	2011/0115303-A1	05-19-2011	Baarman *et al.*	ALL
	U11	5,430,618-A	07-04-1995	George Y. Huang	ALL
	U12	2011/0316475-A1	12-29-2011	Jung *et al.*	ALL
	U13	2010/0146308-A1	06-10-2010	Gioscia *et al.*	ALL
	U14	2008/0211455 -A1	09-04-2008	Park *et al.*	ALL
	U15	2011/0025265-A1	02-03-2011	Mochida *et al.*	ALL
	U16	2010/0191306-A1	07-29-2010	Stevenson *et al.*	ALL
	U17	2008/0197960-A1	08-21-2008	Hasegawa *et al.*	ALL
	U18	2009/0237194-A1	09-24-2009	Waffenschmidt *et al.*	ALL
	U19	2007/0182367-A1	08-09-2007	Afshin Partovi	ALL
	U20	2010/0066304-A1	03-18-2010	Masanori Oshimi	ALL

Examiner Signature	/FRITZ M FLEMING/	Date Considered	12/27/2017

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.M.F/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 2 of 5

Complete if Known	
Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U21	2012/0282857-A1	11-08-2012	Andrew Zhang	ALL
	U22	9,240,824-B2	01-19-2016	Hillan *et al.*	ALL
	U23	2011/0217927-A1	09-08-2011	Ben-Shalom *et al.*	ALL
	U24	2011/0127953-A1	06-02-2011	Walley *et al.*	ALL

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] - Number[4] - Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	F1	KR-10-2005-0105200-A	11-03-2005	Access Business Group International LLC	ALL	
	F2	KR-10-2010-0112400-A	10-19-2010	LG Innotek Co., Ltd.	ALL	
	F3	KR-10-2008-0095643-A	10-29-2008	LS Cable Ltd.	ALL	
	F4	WO-2010/047850-A1	04-29-2010	Qualcomm Inc.	ALL	
	F5	KR-10-2013-0016588-A	02-18-2013	Samsung Electronics Co., Ltd.	ALL	
	F6	KR-10-2013-0049608-A	05-14-2013	LG Innotek Co., Ltd.	ALL	
	F7	KR-10-2013-0072181-A	07-01-2013	Amosense Co., Ltd.	ALL	
	F8	KR-10-2013-0049781-A	05-14-2013	LG Innotek Co., Ltd.	ALL	
	F9	KR-10-2013-0015244-A	02-13-2013	LG Electronics Inc.	ALL	
	F10	KR-10-1298660-B1	08-14-2013	Seoul Electronics & Telecom	ALL	
	F11	KR-10-2011-0120122-A	11-03-2011	Jong Ho Kim	ALL	
	F12	KR-10-2011-0033836-A	03-31-2011	Min Sun Cho	ALL	

Examiner Signature	/FRITZ M FLEMING/	Date Considered	12/27/2017

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PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet	3	of	5

Complete if Known	
Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

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	F13	KR-10-2008-0074640-A	08-13-2008	Anyquitous Co., Ltd.	ALL	
	F14	CN-10-1971453-A	02-09-2011	Mojo Mobility Inc.	ALL	
	F15	CN-10-1964678-A	02-02-2011	Sony Corp.	ALL	
	F16	CN-20-1749754-U	02-16-2011	Beijing MXH Device Ltd.	ALL	
	F17	CN-2012-15827-Y	04-01-2009	Inventec Shanghai Electronics Co., Ltd.	ALL	
	F18	CN-20-1663492-U	12-01-2010	Fudatong Technology Corp.	ALL	
	F19	JP-2010-073976-A	04-02-2010	Yazaki Corp.	ALL	
	F20	JP-2006-302567-A	11-02-2006	Nec Tokin Corp., *et al.*	ALL	
	F21	CN-10-2195366-A	09-21-2011	TDK Corp.	ALL	
	F22	CN-1768462-A	05-03-2006	Access Business Group Int., LLC.	ALL	
	F23	TW-2009-52303-A	12-16-2009	KYE Systems Corp.	ALL	
	F24	EP-2367262-A2	09-21-2011	Hanrim Postech Co., Ltd.	ALL	
	F25	WO-2007/015599-A1	02-08-2007	LS Cable Ltd.	ALL	
	F26	TW-201132014-A	09-16-2011	Qualcomm Incorporated	ALL	
	F27	KR-10-2011-0056334-A	05-26-2011	Powermat Ltd.	ALL	
	F28	JP-2011-523336-A	08-04-2011	N/A	ALL	

Examiner Signature	/FRITZ M FLEMING/	Date Considered	12/27/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard T.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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J:\SUN\LGI\417D2\IDS-Refs\8-9-17\PTO-SB-08.doc/njs

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.M.F/

PTO/SB/08A (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 4 of 5

Complete if Known	
Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	R1	Office Action dated December 26, 2012 in Korean Application No. 10-2011-0114721, filed November 4, 2011.	
	R2	Office Action dated July 22, 2013 in Korean Application No. 10-2011-0114721, filed November 4, 2011.	
	R3	Notice of Allowance dated October 23, 2013 in Korean Application No. 10-2011-0114721, filed November 4, 2011.	
	R4	Search Report dated September 3, 2013 in Korean Application No. 10-2013-0100314, filed August 23, 2013.	
	R5	Office Action dated January 6, 2014 in Korean Application No. 10-2013-0100314.	
	R6	Office Action dated June 26, 2014 in Chinese Application No. 201210432152.X.	

Examiner Signature	/FRITZ M FLEMING/	Date Considered	12/27/2017

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PTO/SB/08A (08-03)
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 5 of 5

Complete if Known	
Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. [1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T [2]
	R7	Office Action dated July 17, 2014 in Korean Application No. 10-2013-0018321.	
	R8	Office Action dated August 6, 2014 in Taiwanese Application No. 101139085.	
	R9	European Search Report dated February 18, 2015 in European Application No. 12189931.4.	
	R10	European Search Report dated February 17, 2015 in European Application No. 14167637.9.	
	R11	Office Action dated April 19, 2017 in Taiwanese Application No. 105133529.	
	R12	Office Action dated May 15, 2017 in Korean Application No. 10-2014-0081260.	

Examiner Signature	/FRITZ M FLEMING/	Date Considered	12/27/2017

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /F.M.F/

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15673763	LEE ET AL.
	Examiner	Art Unit
	FRITZ M FLEMING	2836

CPC- SEARCHED		
Symbol	Date	Examiner
H02J50/5,10,12,70,80	12/28/2017	FMF
H04B5/0037,0087	12/28/2017	FMF

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST, PLUS, reviwed parent applications/patent.	12/28/2017	FMF

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/FRITZ M FLEMING/ Primary Examiner.Art Unit 2836

PLUS Search Results for S/N 15673763, Searched Thu Dec 07 10:30:06 EST 2017

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/673,763	08/10/2017	Ki Min Lee	SUN.LGI.417D2

CONFIRMATION NO. 7725

23557
SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614

PUBLICATION NOTICE

Title: Wireless Power Receiver and Control Method Thereof

Publication No.US-2017-0338697-A1
Publication Date:11/23/2017

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

대 한 민 국 특 허 청
KOREAN INTELLECTUAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Intellectual Property Office.

출 원 번 호 : 10-2011-0114721
Application Number

출 원 년 월 일 : 2011년 11월 04일
Filing Date NOV. 04, 2011

출 원 인 : 엘지이노텍 주식회사
Applicant(s) LG INNOTEK CO., LTD.

2017년 11월 20일

특 허 청
COMMISSIONER

제출 일자 : 2011-11-04

【서지사항】

【서류명】 특허출원서

【참조번호】 P2011C3185KR

【출원구분】 특허출원

【출원인】

【명칭】 엘지이노텍 주식회사

【특허고객번호】 1-1998-000285-5

【대리인】

【성명】 서교준

【대리인번호】 9-2004-000236-3

【포괄위임등록번호】 2009-020964-8

【발명의 국문명칭】 무선전력 수신장치 및 그 제어 방법

【발명의 영문명칭】 APPARATUS FOR RECEIVING WIRELESS POWER AND METHOD FOR CONTROLLING THEREOF

【발명자】

【성명】 이정오

【성명의 영문표기】 LEE, JUNG OH

【주민등록번호】 770427-1XXXXXX

【우편번호】 100-095

【주소】 서울특별시 중구 남대문로5가 541번지 서울스퀘어

【국적】 KR

【발명자】

【성명】 이기민

【성명의 영문표기】 LEE, KI MIN

【주민등록번호】 750112-1XXXXXX

【우편번호】 100-095

제출 일자 : 2011-11-04

【주소】 서울특별시 중구 남대문로5가 541번지 서울스퀘어

【국적】 KR

【심사청구】 청구

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 서교준 (서명 또는 인)

【수수료】

【출원료】	0	면	38,000 원
【가산출원료】	30	면	0 원
【우선권주장료】	0	건	0 원
【심사청구료】	24	항	1,090,000 원
【합계】	1,128,000 원		

【발명의 설명】

【발명의 명칭】

무선전력 수신장치 및 그 제어 방법{APPARATUS FOR RECEIVING WIRELESS POWER AND METHOD FOR CONTROLLING THEREOF}

【기술분야】

<1> 본 발명은 무선전력 수신장치 및 그 제어 방법에 관한 것이다.

【배경기술】

<2> 무선으로 전기 에너지를 원하는 기기로 전달하는 무선전력전송 기술(wireless power transmission 또는 wireless energy transfer)은 이미 1800년대에 전자기유도 원리를 이용한 전기 모터나 변압기가 사용되기 시작했고, 그 후로는 라디오파나 레이저와 같은 전자파를 방사해서 전기에너지를 전송하는 방법도 시도되었다. 우리가 흔히 사용하는 전동칫솔이나 일부 무선면도기도 실상은 전자기유도 원리로 충전된다. 현재까지 무선 방식에 의한 에너지 전달 방식은 전자기 유도, 자기 공진 및 단파장 무선 주파수를 이용한 원거리 송신 기술 등이 있다.

<3> 최근에는 이와 같은 무선 전력 전송 기술 중 전자기 유도 에너지 전달 방식이 많이 사용되고 있다.

<4> 전자기 유도를 이용한 무선전력 전송 시스템은 송신측과 수신측에 형성된 전기신호가 코일을 통해 무선으로 전달되기 때문에 사용자는 휴대용 기기와 같은 전자기기를 손쉽게 충전할 수 있다.

<5> 그러나, 수신 측의 구성을 이루는 수신 코일, 근거리 통신안테나 및 인쇄회로기판 각각의 두께로 인해 전자기기의 전체적인 사이즈가 커지고, 전자기기에 내장하는 것이 쉽지 않았다. 특히, 수신 코일 및 근거리 통신안테나 각각의 두께만큼 사이즈가 증가하고, 근거리 통신안테나 및 인쇄회로기판 각각의 두께만큼 사이즈가 증가하는 문제가 있다.

<6> 또한, 근거리 통신안테나의 내부에 과전류가 흐르는 경우에 효과적으로 대처할 수 없었다.

<7> 또한, 수신 코일에 형성된 자기장은 전자기기 내부에 영향을 주어 오작동을 일으키는 문제가 있다.

【발명의 내용】

【해결하려는 과제】

<8> 본 발명은 수신 코일, 근거리 통신안테나 및 인쇄회로기판의 적절한 배치를 통해 무선전력 수신장치의 두께를 최소화하는 무선전력 수신장치의 제공을 목적으로 한다.

<9> 본 발명은 근거리 통신안테나를 인쇄회로기판 내부에 포함시켜 두께를 감소시키는 무선전력 수신장치의 제공을 목적으로 한다.

<10> 본 발명은 보호부를 통해 과전류가 흐르는 것을 방지하는 무선전력 수신장치 제어방법의 제공을 목적으로 한다.

【과제의 해결 수단】

<11> 본 발명의 실시예에 따른 외부의 무선전력 송신장치로부터 무선으로 전력을 수신하는 무선전력 수신장치는 일정 영역에 수용공간이 있는 인쇄회로 기판; 상기 인쇄회로기판의 수용공간 내부에 배치되어, 상기 무선전력 송신장치로부터 전력을 수신하기 위한 수신 코일; 및 상기 인쇄회로 기판에 상기 수신 코일을 감싸는 형태로 배치된 근거리 통신 안테나를 포함한다.

<12> 본 발명의 실시예에 따른 외부의 무선전력 송신장치로부터 무선으로 전력을 수신하는 무선전력 수신장치는 근거리 통신을 수행하기 위한 근거리 통신 안테나; 상기 무선전력 송신장치로부터 무선으로 전력을 수신하기 위한 수신코일; 상기 전력의 수신여부에 따라 상기 근거리 통신안테나의 통전상태를 변경하는 스위치; 및 상기 전력의 수신여부에 따라 상기 스위치를 개방 또는 단락시키는 제어부를 포함한다.

<13> 본 발명의 실 시예에 따른 외부와 통신하는 근거리 통신안테나를 포함한 무선전력 수신장치의 제어 방법은 송신 유도 코일로부터 전자기 유도에 의한 전력의 수신여부를 판단하는 단계; 상기 판단결과, 상기 전력을 수신하는 경우, 상기 근거리 통신안테나의 통전상태를 변경하는 스위치를 개방시키는 단계; 상기 수신한 전력의 양이 임계수치 이상인지 판단하는 단계; 및 상기 판단결과, 상기 전력의 양이 임계수치 이상인 경우, 상기 스위치를 단락시키는 단계를 포함한다.

【발명의 효과】

<14> 본 발명의 실시예에 따르면, 다음과 같은 효과가 있다.

<15> 첫째, 수신 코일, 근거리 통신안테나 및 인쇄회로기판의 적절한 배치를 통해 무선전력 수신장치의 두께를 최소화할 수 있다.

<16> 둘째, 내부에 과도한 전류가 흐르는 것을 차단하여 무선전력 수신장치의 파손을 막을 수 있고, 자기장을 차단하여 기기의 오작동을 방지할 수 있는 등의 효과가 있다.

【도면의 간단한 설명】

<17> 도 1은 본 발명의 일 실시예에 따른 무선 전력 전송 시스템을 나타낸다.

도 2는 본 발명의 일 실시예에 따른, 송신 유도 코일의 등가 회로도이다.

도 3은 본 발명의 일 실시예에 따른, 무선전력 전송 시스템의 등가회로이다.

도 4는 본 발명의 일 실시예에 따른 무선전력 수신장치의 블록도이다.

도 5는 본 발명의 일 실시예에 따른 무선전력 수신장치의 구성 예 이다.

도 6은 본 발명의 일 실시예에 따른 무선전력 수신장치의 구성형태를 도시한 도면이다.

도 7은 본 발명의 일 실시예에 따른 무선전력 수신장치의 구성요소가 배치된 상태의 단면도이다.

도 8의 (a)는 본 발명의 일 실시예에 따른 무선전력 수신장치의 하면을 도시한 도면이고, 도 8의 (b)는 무선전력 수신장치의 상면을 도시한 도면이다.

도 9는 본 발명의 일 실시예에 따른 무선전력 수신장치에 포함된 차폐부의 부착 예이다.

도 10은 본 발명의 일 실시예에 따른 무선전력 수신장치에 포함된 차폐부의 삽입 예이다.

도 11은 본 발명의 일 실시예에 따른 무선전력 수신장치의 제어방법을 나타낸 흐름도이다.

【발명을 실시하기 위한 구체적인 내용】

<18> 이하에서는, 첨부된 도면을 참조하여 본 발명의 바람직한 실시예에 대하여 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자가 용이하게 실시할 수 있도록 상세히 설명한다.

<19> 도 1은 본 발명의 일 실시예에 따른 무선 전력 전송 시스템을 나타낸다.

<20> 전력 소스(100)에서 생성된 전력은 무선전력 송신장치(200)로 전달되고, 전달된 전력은 다시 전자기 유도 현상에 의해 무선전력 송신장치(200)로 전달된다.

<21> 보다 구체적으로 살펴보면, 전력 소스(100)는 소정 주파수의 교류 전력을 제공하는 교류 전력 소스이다.

<22> 무선전력 송신장치(200)는 송신 유도 코일(210)로 구성된다. 송신 유도 코일(210)은 전력 소스(100)와 연결되며, 교류 전류가 흐른다. 송신 유도 코일(210)에 교류 전류가 흐르면, 전자기 유도에 의해 물리적으로 이격되어 있는 수신 공진 코일(310)에도 교류 전류가 유도되어 무선전력 수신장치(300)로 전력이 전달된다.

<23> 임피던스가 매칭된 2개의 LC 회로 사이는 전자기 유도에 의해 전력이 전송될 수 있다. 이와 전자기 유도에 의한 전력 전송은 높은 효율로 전력 전달이 가능하게 한다.

<24> 무선전력 수신장치(300)는 수신 코일(310), 정류회로(320) 및 부하(330)로 구성된다. 송신 유도 코일(210)에 의해 송신된 전력은 전자기 유도에 의해 수신 코일(310)에 수신된다. 수신 코일(310)로 전달된 전력은 정류 회로(320)를 통해 정류되어 부하(330)로 전달된다.

<25> 도 2는 본 발명의 일 실시예에 따른, 송신 유도 코일(210)의 등가 회로도이다. 도 2에 도시된 바와 같이 송신 유도 코일(210)은 인덕터(L1)와 캐패시터(C1)로 구성될 수 있으며, 이들에 의해 적절한 인덕턴스와 캐패시턴스 값을 갖는 회로를 구성하게 된다. 캐패시터(C1)는 가변 캐패시터일 수 있으며, 가변 캐패시터를 조절하여 임피던스 매칭을 수행할 수 있다. 수신 코일(310)의 등가 회로도 도 2에 도시된 것과 동일할 수 있다.

<26> 도 3은 본 발명의 일 실시예에 따른, 무선전력 전송 시스템의 등가회로이다. 도 3에 도시된 바와 같이, 송신 유도 코일(210)과 소정 인덕턴스 값과 캐패시턴스 값을 갖는 인덕터(L1)와 캐패시터(C1)로 구성될 수 있다.

<27> 또한, 도 3에 도시된 바와 같이 수신 코일(310)은 소정 인덕턴스 값과 캐패

시턴스 값을 갖는 인덕터(L2)와 캐패시터(C2)로 구성될 수 있다. 평활 회로(320)는 다이오드(D1)와 평활 캐패시터(C3)로 구성될 수 있으며, 교류 전력을 직류 전력을 변환하여 출력한다. 부하(330)는 직류 전원으로 표시되어 있으나, 직류 전력을 필요로 하는 임의의 충전지 또는 장치일 수 있다.

<28> 도 4는 본 발명의 일 실시예에 따른 무선전력 수신장치의 블록도이다.

<29> 무선전력 수신장치(300)는 수신 코일(310), 근거리 통신안테나(340), 스위치(350), 보호부(360), 근거리 통신모듈(370), 차폐부(380), 제어부(390)를 포함한다.

<30> 수신 코일(310)은 무선전력 송신장치(200)의 송신 유도 코일(210)과 전자기 유도에 의해 전력을 수신한다. 즉, 송신 유도 코일(210)에 교류전류가 흘러 자기장이 발생하면, 발생된 자기장에 의해 인접한 수신 코일(310)에 전압이 유도되어 교류 전류가 흐른다. 일 실시예에서 수신 코일(310)은 인쇄회로기판(301)의 중앙에 배치될 수 있으나, 이에 한정되지 않는다.

<31> 수신 코일(310)은 하나 이상의 도선이 감겨진 형태로 구성되며, 사각형 또는 원형의 나선 형태로 감겨져 구성될 수 있으나, 이에 한정되지 않는다.

<32> 근거리 통신안테나(340)는 근거리 무선통신이 가능한 리더기와 통신을 수행한다. 근거리 통신안테나(340)는 상기 리더기와 정보를 송수신하는 안테나의 역할을 수행할 수 있다. 일 실시예에서 근거리 통신안테나(340)는 수신 코일(310)의 외

각에 배치될 수 있다. 일 실시예에서 수신 코일(310)이 인쇄회로기판(301)의 중앙에 배치된 경우, 근거리 통신안테나(340)는 수신 코일(310)을 감싸도록 배치될 수 있다. 이러한 배치를 통해, 무선전력 수신장치(300)의 두께를 최소화할 수 있다.

<33> 근거리 통신안테나(340)와 수신 코일(310)은 후술할 인쇄회로기판(301)에 형성될 수 있다. 일 실시예에서 근거리 통신안테나(340)만이 인쇄회로기판(301)에 형성될 수 있고, 근거리 통신안테나(340)와 수신 코일(310)이 인쇄회로기판(301)에 같이 형성될 수도 있다.

<34> 근거리 통신안테나(340) 및 후술할 근거리 통신모듈(370)에서 사용되는 근거리 통신규격은 다양한 기술이 사용될 수 있으나, NFC(Near Field Communication)을 이용함이 바람직하다. NFC(Near Field Communication)는 13.56MHz의 대역을 가지며,가까운 거리의 무선통신을 하기 위한 기술이다.

<35> 스위치(350)는 근거리 통신안테나(340)와 연결되고, 후술할 제어부(390)로부터 개방 또는 단락신호를 수신하여 근거리 통신안테나(340)의 통전상태를 변경할 수 있다. 제어부(390)는 수신 코일(310)이 송신 유도 코일(210)로부터 전자기 유도에 의한 전력을 수신하는 것으로 판단한 경우, 스위치(350)에 개방신호를 전송하여 근거리 통신안테나(340)에 흐르는 전류를 차단한다.

<36> 보호부(360)는 임계전류 값 이상의 전류가 흐르는 경우에 동작하여, 근거리 통신모듈(370)에 상기 임계전류 값 이상의 전류가 전달되지 않도록 한다.

<37> 일 실시예로 보호부(360)는 적어도 하나 이상의 제너 다이오드를 포함할 수

있다. 제너 다이오드는 회로에 임계 전류 값 이하만을 흐르게 할 수 있는 다이오드이다. 여기서, 임계전류 값은 설정에 따라 변경될 수 있는 값이고, 근거리 통신모듈(370)이 정상적으로 동작할 수 있는 한계 값일 수 있다.

<38> 보호부(360)는 근거리 통신안테나(340)에서 전달되는 전류가 임계 전류 값 이상인 경우, 전류의 이동방향 또는 흐름을 바꾸어 근거리 통신모듈(370)에 과도한 전류가 흐르지 않게 한다. 과도한 전류는 제너 다이오드를 통해 흘러 열에너지 형태로 방출된다. 보호부(360)는 근거리 통신모듈(370)에 과도한 전류가 흐르는 것을 차단하여 근거리 통신모듈(370)의 파손을 막을 수 있다.

<39> 근거리 통신모듈(370)은 근거리 통신안테나(340)로부터 전류를 제공받을 수 있다. 근거리 통신모듈(370)은 다양한 형태의 근거리 통신 기술이 적용될 수 있으나, NFC(NEAR FIELD COMMUNICATION) 통신규격을 이용함이 바람직하다.

<40> 차폐부(380)는 수신 코일(310)에 형성되는 자기장을 차단할 수 있다. 이는 수신 코일(310)에 형성된 자기장이 전자기기의 다른 부품에 영향을 미쳐 오작동을 방지하기 위함이다.

<41> 차폐부(380)는 페라이트를 포함하여 구성될 수 있으나, 이에 한정되지 않는다.

<42> 차폐부(380)는 후술할 인쇄회로기판(301) 내부에 삽입될 수 있다. 일 실시예에서 차폐부(380)는 인쇄회로기판(301)이 제작되는 공정에서 삽입되어 차폐부(380)를 부착하는 추가적인 단계가 생략될 수 있다. 이로 인해, 무선전력 수신장치

(300)의 제조공정을 단순화시킬 수 있다. 또한, 양면접착제를 사용하여 인쇄회로기판(301)에 부착되는 것이 아니므로, 양면접착제의 두께만큼 무선전력 수신장치(300)의 두께를 감소시킬 수 있고, 가격이 절감된다.

<43> 제어부(390)는 무선전력 수신장치(300)의 전반적인 동작을 제어할 수 있다.

<44> 제어부(390)는 스위치(350)를 개방 또는 단락시켜 근거리 통신안테나(340)의 통전상태를 변경할 수 있다. 스위치(350)가 단락된 상태에서 수신 코일(310)에 전류가 유도되면, 제어부(390)는 스위치(350)를 개방시켜 근거리 통신안테나(340)에 흐르는 전류를 차단시킨다. 스위치(350)가 개방된 상태에서, 수신 코일(310)에 전류가 유도되지 않으면, 제어부(390)는 스위치(350)를 단락시킨다.

<45> 제어부(390)는 무선전력 수신장치(300)가 수신한 전력의 양이 임계수치 이상인 경우, 스위치(350)를 단락시킬 수 있다. 일 실시예에서 임계수치는 사용자의 설정에 따라 변경 가능한 수치일 수 있다.

<46> 도 5는 본 발명의 일 실시예에 따른 무선전력 수신장치의 구성 예이다.

<47> 도 5를 참조하면, 인쇄회로기판(301)에 수신 코일(310)과 근거리 통신안테나(340)가 형성되어 있다. 수신 코일(310)은 인쇄회로기판(301)의 중앙에 배치되어 있고, 근거리 통신안테나(340)은 인쇄회로기판(301)의 외곽에 배치되어 수신 코일(310)을 감싸는 형태로 배치되어 있다.

<48> 스위치(350)가 단락되어 있는 경우, 근거리 통신안테나(340)는 근거리 통신

모듈(370)에 전류를 전송하여 근거리 통신모듈(370)이 동작 가능한 상태에 있도록 만든다. 만약, 외부의 영향에 의해 근거리 통신안테나(340)에 흐르는 전류가 임계 전류 값 이상이 된다면, 보호부(360)가 동작한다. 일 실시예에서 보호부(360)가 하나 이상의 제너 다이오드를 포함하여 구성되는 경우, 임계 전류 값 이상의 전류가 제너 다이오드를 통해 흐르게 된다. 도 5를 참조하면, A 방향으로 흐르는 전류가 임계 전류 값 이상인 경우, 보호부(360)의 위쪽에 위치한 제너 다이오드로 임계전류 값 이상의 전류가 흐른다. 제너 다이오드를 통해 흐르는 과도한 전류는 열 에너지의 형태로 방출된다. 이 경우, 보호부(360)는 근거리 통신모듈(370)에 과도한 전류가 흐르는 것을 방지하여 근거리 통신모듈(370)의 파손을 방지할 수 있다.

<49> 도 5를 참조하면, B 방향으로 흐르는 전류가 임계 전류 값 이상인 경우도 위와 같은 과정을 따른다.

<50> 도 6은 본 발명의 일 실시예에 따른 무선전력 수신장치의 구성형태를 도시한 도면이다.

<51> 도 6을 참조하면, 일 실시예로 케이스(302)가 휴대용 단말기의 케이스인 경우를 들어 설명한다. 무선전력 수신장치(300)의 개략적인 구성요소는 케이스(302), 인쇄회로기판(301), 수신 코일(310), 근거리 통신안테나(340), 차폐부(380)를 포함한다.

<52> 도 7은 본 발명의 일 실시예에 따른 무선전력 수신장치의 구성요소가 배치된 상태의 단면도이다.

<53> 인쇄회로기판(301)은 일정영역에 수용공간을 가지고 있다. 일 실시예에서 일정영역은 인쇄회로기판(301)의 중앙영역을 의미할 수 있다. 일 실시예에서 일정영역은 인쇄회로기판(301)의 중앙영역을 의미할 수 있고, 상기 중앙영역은 사각형, 원형을 포함한 다각형의 형태로 수용공간을 가질 수 있다.

<54> 수신 코일(310)은 인쇄회로기판(301)의 수용공간 내부에 배치되고, 송신 유도 코일(210)로부터 전자기 유도에 의해 전력을 수신한다. 일 실시예에서 수신 코일(310)의 두께와 인쇄회로기판(301)의 두께는 동일하도록 제작되거나 수신 코일(310)의 두께가 인쇄회로기판(301)의 두께보다 작도록 제작될 수 있다. 이 경우, 기존에 수신 코일(310)과 근거리 통신안테나(340) 각각에 대한 두께로 인해 무선전력 수신장치(300)의 두께가 증가하는 것을 방지하여, 휴대용 단말기의 케이스에 장착시 내장이 용이한 장점이 있다.

<55> 일 실시예에서 수신 코일(310)은 인쇄회로기판(310)의 수용공간의 형태와 일치되도록 형성될 수 있다. 예를 들어, 인쇄회로기판(301)의 수용공간 형태가 사각형인 경우, 수신 코일(310) 또한, 도선이 사각형으로 감겨진 형태일 수 있고, 인쇄회로기판(301)의 수용공간 형태가 원형인 경우, 수신 코일(310) 또한, 도선이 원형으로 감겨진 형태일 수 있는 등 다양한 형태를 가질 수 있다.

<56> 근거리 통신안테나(340)는 인쇄회로기판(301) 내부에 포함되고, 수신 코일

(310)을 감싸는 형태로 구성될 수 있다. 일 실시예에서 근거리 통신안테나(340)는 인쇄회로기판(301) 내부에 매립되어 제작될 수 있고, 수신 코일(310)을 원형 또는 사각형 등 다양한 형태로 수신 코일(310)의 외각을 감싸는 형태로 구성될 수 있다. 이 경우, 기존에 인쇄회로기판(301)과 근거리 통신안테나(340) 각각에 대한 두께로 인해 무선전력 수신장치(300)의 두께가 증가하는 것을 방지하여, 휴대용 단말기의 케이스에 장착시 내장이 용이한 장점이 있다.

<57> 무선전력 수신장치(300)는 수신 코일(310)에 형성되는 자기장을 차단하는 차폐부(380)를 더 포함할 수 있다. 일 실시예에서 차폐부(380)는 수신 코일(310)이 차지하는 면적에 대응되도록 수신 코일(310)의 상면에 배치될 수 있다. 일 실시예에서 차폐부(380)는 수신 코일(310) 및 근거리 통신안테나(340)이 차지하는 면적에 대응되도록 수신 코일(310) 및 근거리 통신안테나(340)의 상면에 배치될 수 있다.

<58> 일 실시예에서 차폐부(380)는 일정영역에 수용공간을 가질 수 있다. 차폐부(380)의 수용공간에는 인쇄회로기판(301)의 상면에 위치한 무선충전회로(375)가 배치될 수 있다. 무선충전회로(375)는 교류 전력을 직류전력으로 변환하는 정류회로, 노이즈 신호를 제거하는 커패시터, 무선전력 수신에 대한 전반적인 동작을 수행하는 메인IC칩 등을 포함할 수 있다.

<59> 일 실시예에서 차폐부(380)의 두께와 무선충전회로(375)의 두께는 동일하도록 제작되거나, 무선충전회로(375)의 두께가 차폐부(380)보다 작도록 제작될 수 있다. 이 경우, 기존에 차폐부(380)와 무선충전회로(375) 각각에 대한 두께로 인해 무선전력 수신장치(300)의 두께가 증가하는 것을 방지하여, 휴대용 단말기의 케이

스에 장착시 내장이 용이한 장점이 있다.

<60> 도 8의 (a)는 본 발명의 일 실시예에 따른 무선전력 수신장치의 하면을 도시한 도면이고, 도 8의 (b)는 무선전력 수신장치의 상면을 도시한 도면이다.

<61> 도 8의 (a)를 참조하면, 인쇄회로기판(301), 수신 코일(310), 근거리 통신안테나(340)의 배치에 대한 일 실시예가 도시되어 있다. 인쇄회로기판(301)은 중앙영역 부분에 수용공간을 가지고, 수용공간에는 사각형 형태의 수신 코일(310)이 배치되어 있다. 근거리 통신안테나(340)는 인쇄회로기판(301)의 내부에 매립되어 있는 형태에 있다. 이 경우, 기존에 인쇄회로기판(301)과 근거리 통신안테나(340) 각각에 대한 두께로 인해 무선전력 수신장치(300)의 두께가 증가하는 것을 방지하여, 휴대용 단말기의 케이스에 장착시 내장이 용이한 장점이 있다.

<62> 또한, 수신 코일(310)의 두께와 인쇄회로기판(301)의 두께는 동일하도록 제작되거나 수신 코일(310)의 두께가 인쇄회로기판(301)의 두께보다 작도록 제작될 수 있다. 이 경우, 기존에 수신 코일(310)과 근거리 통신안테나(340) 각각에 대한 두께로 인해 무선전력 수신장치(300)의 두께가 증가하는 것을 방지하여, 휴대용 단말기의 케이스에 장착시 내장이 용이한 장점이 있다.

<63> 도 8의 (b)를 참조하면, 무선충전회로(375), 차폐부(380)의 배치에 대한 일 실시예가 도시되어 있다. 차폐부(380)는 일정영역에 수용공간을 가지고, 차폐부(380)의 수용공간에는 무선충전회로(375)가 배치될 수 있다.

<64> 일 실시예에서 차폐부(380)의 두께와 무선충전회로(375)의 두께는 동일하도록 제작되거나, 무선충전회로(375)의 두께가 차폐부(380)의 두께보다 작도록 제작될 수 있다. 이 경우, 기존에 차폐부(380)와 무선충전회로(375) 각각에 대한 두께로 인해 무선전력 수신장치(300)의 두께가 증가하는 것을 방지하여, 휴대용 단말기의 케이스에 장착시 내장이 용이한 장점이 있다.

<65> 도 9는 본 발명의 일 실시예에 따른 무선전력 수신장치에 포함된 차폐부의 부착 예이다.

<66> 도 9을 참조하면, 무선전력 수신장치(300)를 측면에서 바라 본 구성 예가 도시되어 있다. 차폐부(380)는 인쇄회로기판(301)에 근거리 통신안테나(340) 또는 도시하지는 않았지만, 수신 코일(310)을 형성한 후, 인쇄회로기판(301)의 밑부분에 양면접착제(303)를 이용하여 차폐부(380)를 부착한다. 그러나, 이 방법은 인쇄회로기판(301)의 제작 후 별도의 차폐부(380) 부착 공정이 필요해 비용이 증가하는 문제와 무선전력 수신장치(300)의 두께가 높아지는 문제가 있다.

<67> 도 10은 본 발명의 일 실시예에 따른 무선전력 수신장치에 포함된 차폐부의 삽입 예이다.

<68> 도 10을 참조하면, 무선전력 수신장치(300)를 측면에서 바라 본 구성 예가 도시되어 있다. 이 방법은 인쇄회로기판(301)에 근거리 통신안테나(340) 또는 도시

하지는 않았지만, 수신 코일(310)을 형성한 후, 인쇄회로기판(301)의 사이에 차폐부(380)를 삽입한다. 차폐부(380)를 인쇄회로기판(301) 내부에 삽입하면, 양면접착제의 두께만큼 무선전력 수신장치(300)의 두께를 감소시킬 수 있고, 별도의 차폐부(380)부착 공정이 필요없게 되므로 비용절감의 효과가 있다.

<69> 도 11은 본 발명의 일 실시예에 따른 무선전력 수신장치의 제어방법을 나타낸 흐름도이다.

<70> 제어부(390)는 수신 코일(310)이 송신 유도 코일(210)로부터 전자기 유도에 의한 전력을 수신 받는지 여부에 대한 판단을 할 수 있다(S101). 일 실시예로 무선전력 수신장치(300)는 별도의 자기장 검출수단(미도시)을 두어 전력의 수신여부를 판단할 수 있다.

<71> 상기 판단결과, 수신 코일(310)이 송신 유도 코일(210)로부터 전자기 유도에 의한 전력을 수신 받는 것으로 판단된 경우, 근거리 통신안테나(340)의 통전상태를 변경하는 스위치(350)를 개방시킬 수 있다(S103). 즉, 제어부(390)는 스위치(350)에 개방신호를 전송하여 근거리 통신안테나(340)에 흐르는 전류를 차단할 수 있다. 일 실시예에서 수신 코일(310)이 송신 유도 코일(210)로부터 전자기 유도에 의한 전력을 수신 받는 것으로 판단된 경우는 무선전력 수신장치(300)가 충전되는 상태를 의미할 수 있다.

<72> 그 후, 제어부(390)는 무선전력 수신장치(300)가 수신한 전력의 양이 임계수

치 이상인지 판단할 수 있다(S105). 일 실시예에서 임계수치는 사용자의 설정에 따라 변경 가능한 수치일 수 있다. 일 실시예에서 임계수치는 무선전력 수신장치(300)가 100% 충전된 상태를 의미할 수 있다.

<73> 그 후, 제어부(390)는 상기 전력의 양이 임계수치 이상인 경우, 상기 스위치를 단락시킨다(S107). 일 실시예에서 이 경우 무선전력 수신장치(300)는 충전모드를 종료하고, 통신모드로 동작되는 상태를 의미할 수 있다.

<74> 상기와 같은 제어를 통해 무선전력 수신장치(300)가 충전모드 또는 통신모드 중 어느 하나로 동작할 수 있다.

<75> 그 후, 제어부(390)는 근거리 통신안테나(340)에 흐르는 전류가 임계 전류 값 이상인지 판단할 수 있다(S109). 근거리 통신안테나(340)에 흐르는 전류가 임계 전류 값 이상인 경우, 상기 전류의 이동방향을 변경할 수 있다(S111). 일 실시예에서 임계 전류 값이란, 근거리 통신모듈(370)이 정상적으로 동작할 수 한계 값을 의미할 수 있다. 일 실시예에서 임계 전류 값은 설계자의 설정에 따라 변경될 수 있는 값을 의미할 수 있다. 일 실시예에서 전류의 이동방향 변경은 제너 다이오드를 이용할 수 있다. 제너 다이오드를 통해 흐르는 임계 전류 값 이상의 전류는 열에너지의 형태로 방출된다. 이 경우, 근거리 통신모듈(370)에 과도한 전류가 흐르는 것을 방지하여 근거리 통신모듈(370)의 파손을 방지할 수 있다.

<76> 본 발명은 전자기 유도를 이용한 무선전력 수신장치를 예로 들어 설명하였으

나, 자기 공진을 이용하는 무선전력 수신장치에도 그대로 적용 가능하며, 이러한 경우 수신 코일(310)에 전력을 전달하기 위한 수신공진코일을 추가적으로 구비할 수 있다. 이러한 수신공진코일 역시 인쇄회로기판(301)의 수용공간 내에 배치될 경우 동일한 두께 감소 효과를 발휘할 수 있다.

<77> 또한, 이상에서는 본 발명의 바람직한 실시예에 대하여 도시하고 설명하였지만, 본 발명은 상술한 특정의 실시예에 한정되지 아니하며, 청구범위에서 청구하는 본 발명의 요지를 벗어남이 없이 당해 발명이 속하는 기술분야에서 통상의 지식을 가진 자에 의해 다양한 변형 실시가 가능한 것은 물론이고, 이러한 변형 실시들은 본 발명의 기술적 사상이나 전망으로부터 개별적으로 이해 되어서는 안될 것이다.

【부호의 설명】

<78> 100: 전력 소스

200: 무선전력 송신장치

210: 송신 유도 코일

300: 무선전력 수신장치

301: 인쇄회로기판

302: 케이스

303: 양면 접착제

310: 수신 코일

320: 평활회로

330: 부하

340: 근거리 통신안테나

350: 스위치

360: 보호부

370: 근거리 통신모듈

375: 무선충전회로

380: 차폐부

390: 제어부

【특허청구범위】

【청구항 1】

외부의 무선전력 송신장치로부터 무선으로 전력을 수신하는 무선전력 수신장치로서,

일정 영역에 수용공간이 있는 인쇄회로 기판;

상기 인쇄회로기판의 수용공간 내부에 배치되어, 상기 무선전력 송신장치로부터 전력을 수신하기 위한 수신 코일; 및

상기 인쇄회로 기판에 상기 수신 코일을 감싸는 형태로 배치된 근거리 통신 안테나를 포함하는 무선전력 수신장치.

【청구항 2】

제1항에 있어서,

상기 수신 코일의 두께는 상기 인쇄회로기판의 두께 이하인 것을 특징으로 하는 무선전력 수신장치.

【청구항 3】

제1항에 있어서,

상기 인쇄회로기판의 수용공간 형태와 상기 수신 코일의 형태는 일치하도록 제작된 무선전력 수신장치.

【청구항 4】

제1항에 있어서,

상기 수신 코일에서 형성되는 자기장을 차단하는 차폐부를 더 포함하는 무선전력 수신장치.

【청구항 5】

제4항에 있어서, 상기 차폐부는,

상기 수신 코일이 차지하는 면적에 대응되도록 상기 수신 코일의 상면에 배치되는 무선전력 수신장치.

【청구항 6】

제4항에 있어서,

상기 차폐부의 일정영역에 수용공간을 가지고, 상기 차폐부의 수용공간에 무선충전회로를 더 포함하는 무선전력 수신장치.

【청구항 7】

제6항에 있어서,

상기 무선충전회로의 두께는 상기 차폐부의 두께 이하인 것을 특징으로 하는 무선전력 수신장치.

【청구항 8】

제1항에 있어서, 상기 근거리 통신안테나는

상기 인쇄회로기판 내부에 배치된 것을 특징으로 하는 무선전력 수신장치.

【청구항 9】

제1항에 있어서, 상기 근거리 통신안테나는

NFC(NEAR FIELD COMMUNICATION) 안테나인 것을 특징으로 하는 무선전력 수신장치.

【청구항 10】

외부의 무선전력 송신장치로부터 무선으로 전력을 수신하는 무선전력 수신장치로서,

근거리 통신을 수행하기 위한 근거리 통신 안테나;

상기 무선전력 송신장치로부터 무선으로 전력을 수신하기 위한 수신코일;

상기 전력의 수신여부에 따라 상기 근거리 통신안테나의 통전상태를 변경하는 스위치; 및

상기 전력의 수신여부에 따라 상기 스위치를 개방 또는 단락시키는 제어부를 포함하는 수신장치.

【청구항 11】

제10항에 있어서,

상기 근거리 통신안테나는 상기 수신 코일을 둘러싸는 감싸는 형태로 배치된 무선전력 수신장치.

【청구항 12】

제10항에 있어서, 상기 제어부는

상기 전력이 수신된 경우, 상기 스위치를 개방시키는 무선전력 수신장치.

【청구항 13】

제12항에 있어서, 상기 제어부는

상기 무선전력 수신장치가 수신한 전력의 양이 임계수치 이상인 경우, 상기 스위치를 단락시키는 무선전력 수신장치.

【청구항 14】

제10항에 있어서, 상기 근거리 통신안테나는

NFC(NEAR FIELD COMMUNICATION) 안테나인 것을 특징으로 하는 무선전력 수신장치.

【청구항 15】

제10항에 있어서,

상기 근거리 통신안테나로부터 전류를 공급받는 근거리 통신모듈을 더 포함하는 무선전력 수신장치.

【청구항 16】

제10항에 있어서,

상기 근거리 통신안테나에 흐르는 전류가 임계전류 값 이상인 경우, 상기 전류의 이동방향을 변경하는 보호부를 더 포함하는 무선전력 수신장치.

【청구항 17】

제10항에 있어서,

상기 수신 코일에서 형성되는 자기장을 차단하는 차폐부를 더 포함하는 무선

전력 수신장치.

【청구항 18】

제17항에 있어서, 상기 차폐부는,

상기 인쇄회로기판 내부에 삽입되는 무선전력 수신장치.

【청구항 19】

제18항에 있어서, 상기 차폐부는

페라이트를 포함한 무선전력 수신장치.

【청구항 20】

제 10항에 있어서,

일정 영역에 수용공간이 있는 인쇄회로 기판을 더 포함하고,

상기 수신 코일은 상기 인쇄회로기판의 수용공간 내부에 배치되며,

상기 근거리 통신안테나는 상기 수신 코일을 감싸는 형태로 상기 인쇄회로기판에 배치된 것을 특징으로 하는 무선전력 수신장치.

【청구항 21】

외부와 통신하는 근거리 통신안테나를 포함한 무선전력 수신장치의 제어 방법에 있어서,

송신 유도 코일로부터 전자기 유도에 의한 전력의 수신여부를 판단하는 단계;

상기 판단결과, 상기 전력을 수신하는 경우, 상기 근거리 통신안테나의 통전

상태를 변경하는 스위치를 개방시키는 단계;

상기 수신한 전력의 양이 임계수치 이상인지 판단하는 단계; 및

상기 판단결과, 상기 전력의 양이 임계수치 이상인 경우, 상기 스위치를 단락시키는 단계를 포함하는 무선전력 수신장치의 제어 방법.

【청구항 22】

제21항에 있어서, 상기 임계수치는,

사용자의 설정에 따라 변경 가능한 수치인 무선전력 수신장치의 제어 방법.

【청구항 23】

제21항에 있어서,

상기 근거리 통신안테나에 흐르는 전류가 임계전류 값 이상인 경우, 상기 전류의 이동방향을 변경하는 단계를 더 포함하는 무선전력 수신장치의 제어 방법.

【청구항 24】

제23항에 있어서, 상기 근거리 통신안테나에 흐르는 전류가 임계전류 값 이상인 경우, 상기 전류의 이동방향을 변경하는 단계는,

제너 다이오드를 이용하여 상기 전류의 이동방향을 변경하는 단계를 포함하는 무선전력 수신장치의 제어 방법.

제출 일자 : 2011-11-04

【요약서】

【요약】

본 발명의 실시예에 따른 외부의 무선전력 송신장치로부터 무선으로 전력을 수신하는 무선전력 수신장치는 일정 영역에 수용공간이 있는 인쇄회로 기판; 상기 인쇄회로기판의 수용공간 내부에 배치되어, 상기 무선전력 송신장치로부터 전력을 수신하기 위한 수신 코일; 및 상기 인쇄회로 기판에 상기 수신 코일을 감싸는 형태로 배치된 근거리 통신 안테나를 포함한다.

【대표도】

도 7

【도면】

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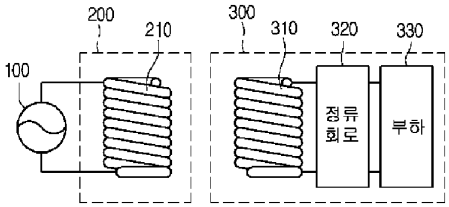
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정류회로
부하

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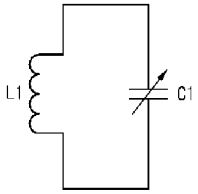
L1
C1

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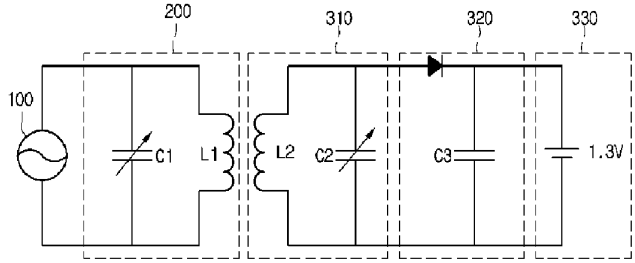
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C2
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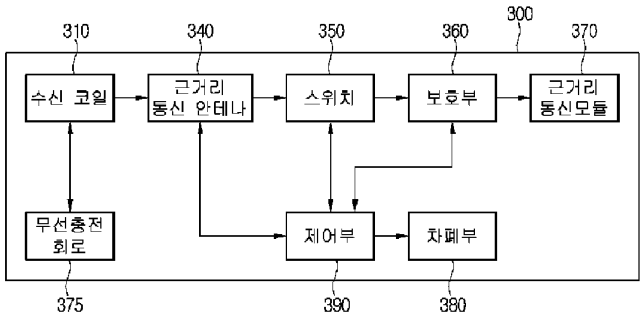
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스위치
보호부
근거리 통신모듈
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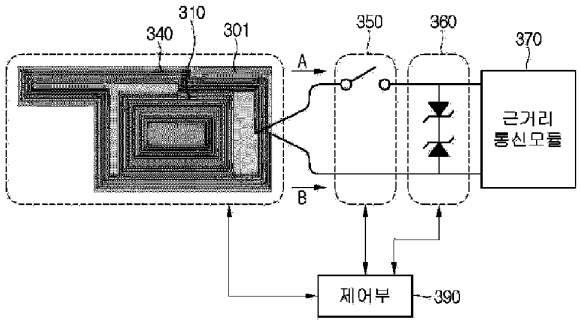
제어부
차폐부
375
390
380

【도 5】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제어부
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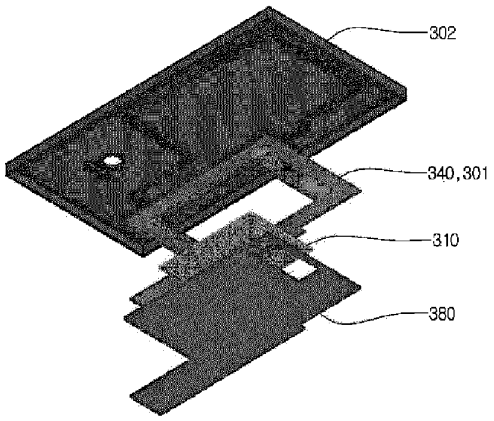
【도 6】



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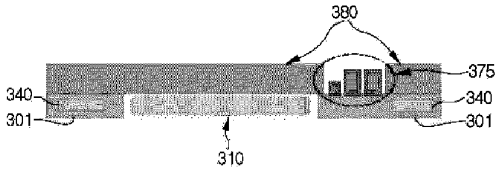

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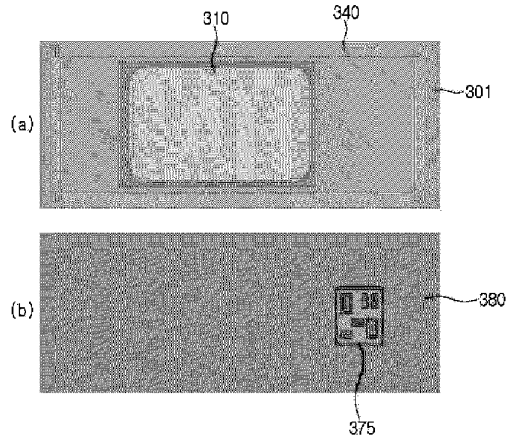

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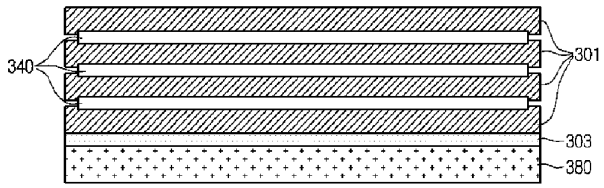

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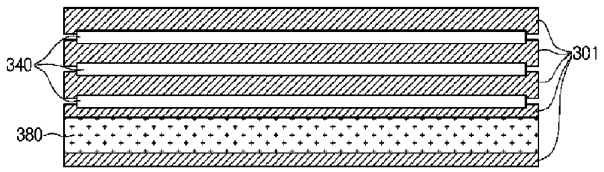

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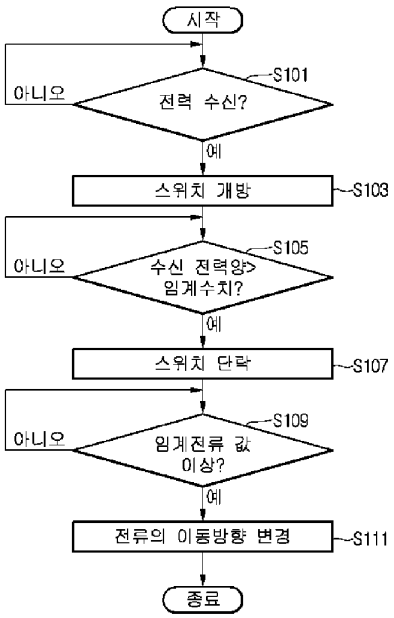
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수신 전력양>
임계수치?
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S107
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이상?
예
전류의 이동방향 변경
S111
종료

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
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First Named Inventor	Ki Min Lee
Art Unit	2683
Examiner Name	Not Assigned Yet
Attorney Docket Number	SUN.LGI.417D2

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Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U1	7,719,399-B2	05-18-2010	Iwasaki	ALL
	U2	8,922,160-B2	12-30-2014	Inoue	ALL
	U3	2008/0198560-A1	08-21-2008	FUJIWARA *et al.*	ALL

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Examiner Initials*	Cite No. [1]	Foreign Patent Document Country Code [3] - Number [4] - Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
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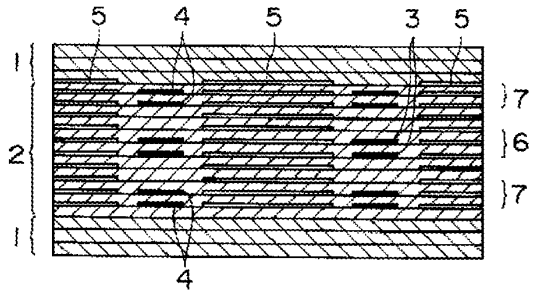
(54)【発明の名称】　積層チップトランスとその製造方法

(57)【要約】

【目的】　１次コイルと２次コイルとの電磁誘導結合係数を大きくしながら、両コイル間の絶縁耐圧を高くし、かつ結合浮遊容量を小さくでき、コイルを形成するコイル導体パターン間に発生する並列浮遊容量をも低減して高周波特性を良好にした積層チップトランスとその製造方法の提供。

【構成】　低透磁率磁性体グリーンシート２上に１次側のコイル導体パターン３および２次側のコイル導体パターン４を印刷するとともに、該導体パターン以外の部分に高透磁率磁性体ペースト５を印刷し、これら導体印刷部を有するシートを用いて中央部に１次コイル６、１次コイルの上下に分割して２次コイル７を配置し、１次コイルと２次コイルとの間および導体印刷部の最上層とカバーシートとの間には、同様に高透磁率のペースト５のみを印刷した低透磁率磁性体グリーンシート２を介在させる。



【特許請求の範囲】
【請求項１】　磁性体からなるチップ素体の内部に、該磁性体の一部を薄層状に介在させて積層的に埋設された複数のコイル導体が含まれてなり、これらコイル導体の端末が、該チップ素体の端面に導出され、素体の端面に形成された外部端子電極に接続されている積層チップトランスであって、前記コイル導体の周囲部分と、前記薄層状介在部分が低透磁率磁性体で構成されていることを特徴とする積層チップトランス。
【請求項２】　複数枚重ねたカバーシートの上に、コイル導体パターンを上面に形成した複数の磁性体グリーンシートを所定の構成で積層してスルーホール接続し、この上にコイル導体パターンが形成されていないダミーシートを介在させた後、上記同様にコイル導体パターンを上面に形成した複数の磁性体グリーンシートを積層およびスルーホール接続するという操作を所定回数繰り返した後、最上層に複数枚重ねたカバーシートを積層して圧着し、得られた圧着体を裁断してチップ素体とし、これを焼成した後、外部端子電極を形成することからなる積層チップトランスの製造方法において、積層体の上下部分にそれぞれ配置するカバーシートとして高透磁率磁性体グリーンシートを用い、前記コイル導体パターンを上面に保持する磁性体グリーンシートとして、低透磁率グリーンシートの上面をなす一方の主面に、コイル周回パターン形状に該主面を露出せしめて高透磁率磁性体ペーストを印刷し、かつ該露出部分に、周囲の高透磁率磁性体ペーストと接触せしめずにコイル導体パターンを印刷したシートを用い、前記介在ダミーシートとしては低透磁率グリーンシートの上面をなす一方の主面に、コイル周回パターン形状に主面を露出せしめて高透磁率磁性体ペーストを印刷したシートを用いるとともに、該シートと同様構成の低透磁率磁性体シートを、前記上部配置カバーシートと最上部配置のコイル導体パターン保持シートとの間に配置することを特徴とする積層チップトランスの製造方法。

【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は、積層チップトランスとその製造方法に関する。
【０００２】
【従来の技術】従来、磁性体中に複数のコイル導体を埋設してトランスを構成した積層チップトランスは、例えばＮｉ－Ｚｎ系フェライトのようなフェライト原料から調製した磁性体グリーンシートの表面に、ＡｇやＡｇ－Ｐｄなどを主成分とする電極ペーストを印刷し、積層してスルーホール接続することによってらせん状のコイルが構成されるコイル導体パターンを形成し、このコイル導体パターンが形成された複数枚の磁性体グリーンシートを、それらの上下にそれぞれ配置したコイル導体パターンが形成されていないダミーシートとともに積層し、加圧圧着した後、焼成して一体化し、外部端子電極を形成することにより製造されてきた。
【０００３】上記のような方法で製造される従来の積層チップトランスの構成の一例を、図２の積層体の断面図を用いて以下に示す。図２に示す積層チップトランスを構成する積層体は、磁性体内部に３個のコイルが埋設されてなるものであって、１次側のコイル導体パターン３を２層積層することによって構成された１次コイル６の上下に、２次側のコイル導体パターン４を２層積層することによって構成された２次コイル７が埋設されている。
【０００４】このような積層体からなる積層チップトランスは、図３の等価回路図に示すように、１次コイル６と２次コイル７との間に電磁誘導結合を生じさせたものであり、このようなトランスにおいて、１次コイルと２次コイルとの電磁誘導結合係数を大きくするためには、１次コイル６を構成する１次側のコイル導体パターン３と２次コイル７を構成する２次側のコイル導体パターン４との間の距離ｄを小さくし、併せて各コイル導体パターン間の間隔t_1（１次コイル）、t_2（２次コイル）をそれぞれ小さくすることが有効である。
【０００５】
【発明が解決しようとする課題】しかしながら、１次コイル６と２次コイル７との間の距離ｄを小さくすると該コイル間の絶縁耐圧が低くなり、また結合浮遊容量Ｃｄも増大することになり、同様に各コイル導体パターン間の間隔t_1またはt_2を狭めれば、並列浮遊容量C_1またはC_2を増大させることになり、これら結合浮遊容量や並列浮遊容量が増大するとトランスの高周波特性が劣化するという課題があった。
【０００６】このような課題を解決する手段として、磁性体ペーストと導体ペーストとを交互に印刷して積み重ね、コイルを積層体内に設けるいわゆるスラリービルド法によれば、コイル導体の周囲を低透磁率の磁性体で覆うことが可能となり、並列浮遊容量の低減を計ることができるという提案や、セラミックグリーンシートを予め形成した後、そのセラミックグリーンシート上にコイル導体を印刷して積層するいわゆるシート法においては、１次コイルと２次コイルとの間にコイルと同形の低透磁率層を形成することによって結合浮遊容量を小さくする方法が提案されてはいるが、何れも未だに十分な周波数特性を得るには至っていない。
【０００７】したがって本発明の目的は、１次コイルと２次コイルとの電磁誘導結合係数を大きくしながら、両コイル間の絶縁耐圧を高くし、かつ結合浮遊容量を小さくでき、コイルを形成するコイル導体パターン間に発生する並列浮遊容量をも低減して高周波特性を良好にした積層チップトランスおよびその製造方法を提供することにある。
【０００８】

【課題を解決するための手段】本発明者等は上記目的を達成すべく鋭意研究した結果、低透磁率磁性体シートを用いて、その上にそれぞれ１次コイルおよび２次コイル用のコイル導体パターンを印刷するとともに、コイル導体パターン以外の部分には高透磁率磁性体ペーストを印刷し、さらに１次コイルと２次コイルとの間、ならびにコイル導体パターンを印刷した最上層部の上と同じく最下層部の下に低透磁率磁性体シートを配し、前記コイル導体パターンを印刷したシートと同様に高透磁率磁性体ペーストを印刷し、これら印刷部の上下には複数枚の高透磁率磁性体シートをダミーシートとして積層するようにして積層チップ素体を形成すれば、前記課題を解決した積層チップトランスが得られることを見い出し、本発明に到達した。

【０００９】すなわち、本発明は、磁性体からなるチップ素体の内部に、該磁性体の一部を薄層状に介在させて積層的に埋設された複数のコイル導体が含まれてなり、これらコイル導体の端末が、該チップ素体の端面に導出され、素体の端面に形成された外部端子電極に接続されている積層チップトランスであって、前記コイル導体の周囲部分と、前記薄層状介在部分が低透磁率磁性体で構成されていることを特徴とする積層チップトランス；および複数枚重ねたカバーシートの上に、コイル導体パターンを上面に形成した複数の磁性体グリーンシートを所定の構成で積層してスルーホール接続し、この上にコイル導体パターンが形成されていないダミーシートを介在させた後、上記同様にコイル導体パターンを上面に形成した複数の磁性体グリーンシートを積層およびスルーホール接続するという操作を所定回数繰り返した後、最上層に複数枚重ねたカバーシートを積層して圧着し、得られた圧着体をチップサイズに裁断して積層方向に複数個のコイルが埋設されたチップ素体を得、これを焼成した後、外部端子電極を形成することからなる積層チップトランスの製造方法において、積層体の上下部分にそれぞれ配置するカバーシートとして高透磁率磁性体グリーンシートを用い、前記コイル導体パターンを上面に保持する磁性体グリーンシートとして、低透磁率グリーンシートの上面をなす一方の主面に、コイル周回パターン形状に該主面を露出せしめて高透磁率磁性体ペーストを印刷し、かつ該露出部分に、周囲の高透磁率磁性体ペーストと接触せしめずにコイル導体パターンを印刷したシートを用い（なお、コイル導体パターンにおける外部端子電極との接続用引き出し部は高透磁率の磁性体ペーストと接触しても良い）、前記介在ダミーシートとしては低透磁率グリーンシートの上面をなす一方の主面に、コイル周回パターン形状に主面を露出せしめて高透磁率磁性体ペーストを印刷したシートを用いるとともに、該シートと同様構成の低透磁率磁性体シートを、前記上部配置カバーシートと最上部配置のコイル導体パターン保持シートとの間に配置することを特徴とする積層チップトランスの製造方法を提供するものである。

【００１０】

【作用】本発明の方法によれば、低透磁率の磁性体グリーンシートの一方の主面に、積層してスルーホール接続することによってコイルが構成されるコイル導体パターンを印刷するとともに、該導体パターン以外の前記主面に高透磁率の磁性体ペーストを塗布した後、積層圧着されるので、コイル導体パターンと高透磁率磁性体ペーストとの間は、圧着によって隣接する低透磁率の磁性体グリーンシートによって埋められ、該導体パターンの周囲が低透磁率層で覆われるようになる。そのため、並列浮遊容量が小さくなり、また１次と２次の両コイル間は低透磁率層が介在するので結合浮遊容量も小さくなる。

【００１１】したがって、本発明の積層チップトランスは、上記のように１次コイルおよび２次コイルを構成するコイル導体パターンのまわりが低透磁率磁性体領域となるため、１次コイルもしくは２次コイルで発生した磁束が１次コイルおよび２次コイル自身、あるいは１次コイルと２次コイル間の間隙部から外部へ漏出しにくくなる。すなわち、磁束が１次コイルの端から２次コイルの端まで両コイル内を貫通するようになるため、両コイル間の電磁誘導係数を大きくすることができるようになるのである。

【００１２】

【実施例】本発明の一例を、図１および図４を用いて以下に説明する。なお、図１は本実施例において製造された積層チップトランスを構成する積層体の断面図、図４は図１に示した積層体を構成する各種シートの積層態様を示す積層体の分解斜視図である。

【００１３】まず、Ｎｉ－Ｚｎ系フェライト粉末にバインダーを混合して調製したスラリーを用い、ドクターブレード法によって厚さ約50μｍのシートを形成し、これを一定寸法に打ち抜き、高透磁率磁性体グリーンシート１および低透磁率磁性体グリーンシート２を得た。

【００１４】次に、上記低透磁率磁性体グリーンシート２における一方の主面に、コイルの周回パターン形状に該主面が露出するように高透磁率磁性体ペースト５を塗布した。次いで、このシートにおける低透磁率磁性体グリーンシートの露出部分に、ＡｇもしくはＡｇ－Ｐｄを主成分とする電極ペーストを用いて、１次側のコイル導体パターン３および２次側のコイル導体パターン４を、高透磁率導電ペーストと接触しないように約0.5㎜ の距離を置いて線幅１㎜で15～20μｍの厚さに印刷した。なお、コイル導体パターンにおける外部端子電極との接続用引き出し部は、高透磁率導電ペースト上に重ねて印刷した。

【００１５】次に、高透磁率磁性体グリーンシート１、高透磁率磁性体ペースト５およびコイル導体パターンが印刷された低透磁率磁性体グリーンシート２、ならびに高透磁率磁性体ペースト５のみが印刷された低透磁率磁

性体グリーンシート２を、図４に示すような態様、すなわち中央部に配置されスルーホール８によって接続されてなる１次コイル、および１次コイルの上下に分割配置され、スルーホール８によって接続されてなる２次コイルが構成される態様で積層および圧着して一体化した後、焼成した。

【００１６】なお、積層圧着の際には、各コイル導体パターンと高透磁率磁性体ペーストとの間は圧着によって隣接する低透磁率磁性体グリーンシートが埋めて、該導体パターンの周囲が低透磁率層で覆われる状態となる。

【００１７】次いで、焼成された積層チップ素体の表面をバレル研磨した後、該素体におけるコイル導体末端部が導出している端面に電極ペーストを塗布し、これを焼き付けることにより外部電極を形成し、本発明の積層チップトランスを得た。

【００１８】上記方法で製造された積層チップトランスは、図１の断面図に示すように、中央部の２層からなる１次コイル６に対して、その上下には２分割して２層づつの２次コイル７が配置されており、しかも各コイル導体パターンの回りはすべて低透磁率層であるため、１次コイルおよび２次コイル部での漏れ磁束は低減される。

【００１９】

【発明の効果】以上説明したように、本発明の積層チップトランスは、コイル導体のまわりが低透磁率領域で占められているので、１次コイル部および２次コイル部における漏れ磁束を低減させ、コイル間の電磁誘導結合係数を大きくすることができる上、各コイル部での並列浮遊容量を小さくすることができる。

【００２０】また、該電磁誘導結合係数を大きくしながら絶縁耐圧を高く、かつ両コイル間の結合浮遊容量も小さくでき、良好な高周波特性が得られる。

【図面の簡単な説明】

【図１】本発明の積層チップトランスの一例を構成する積層体の断面図である。

【図２】従来の積層チップトランスの一例を構成する積層体の模式断面図である。

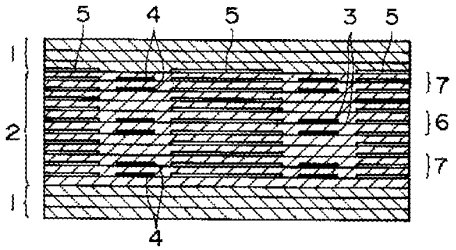
【図３】図２に示した積層体からなる積層チップトランスの等価回路図である。

【図４】本発明の積層チップトランスの製造工程における積層工程を説明するための図であって、本発明の積層チップトランスを構成する積層体の一例の分解斜視図である。

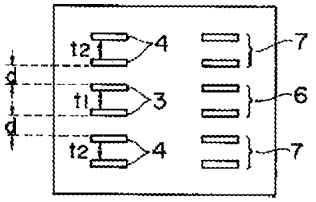
【符号の説明】

1　高透磁率磁性体グリーンシート
2　低透磁率磁性体グリーンシート
3　１次側のコイル導体パターン
4　２次側のコイル導体パターン
5　高透磁率磁性体ペースト
6　１次コイル
7　２次コイル
8　スルーホール
C_1　１次側並列浮遊容量
C_2　２次側並列浮遊容量
Cd　結合浮遊容量
t_1　１次コイルにおけるコイル導体パターン間の距離
t_2　２次コイルにおけるコイル導体パターン間の距離
d　１次側と２次側のコイル導体パターン間の距離

【図１】



【図２】



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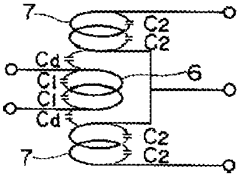

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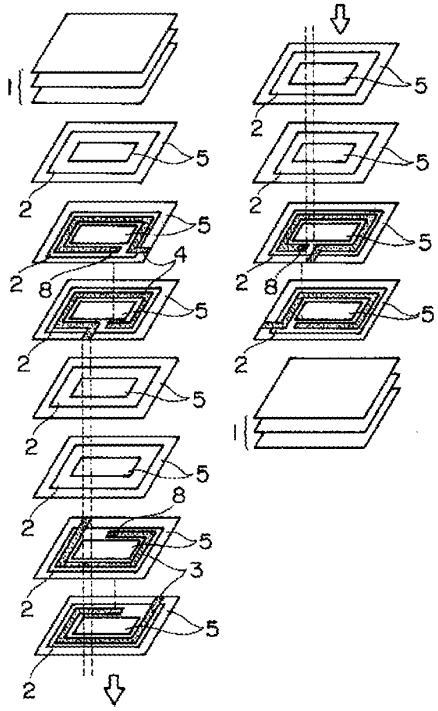

Patent & Utility Model Number Search

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Selected Gazette

JP,06-224043,A

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]The present invention relates to a laminated chip transformer and its manufacturing method.

[0002]

[Description of the Prior Art]Conventionally the laminated chip transformer which embedded a plurality of coil conductors into the magnetic body, and constituted the transformer, On for example, the surface of the magnetic body green sheet prepared from a ferrite raw material like a nickel-Zn system ferrite, Print the electrode paste which mainly comprises Ag, Ag-Pd, etc., and it forms the coil conductor pattern in which it laminates and a spiral-like coil is constituted by making through hole connection, It laminated with the dummy sheet in which the coil conductor pattern arranged, respectively is not formed in those upper and lower sides the magnetic body green sheet of two or more sheets in which this coil conductor pattern was formed was calcinated after carrying out application-of-pressure press-fit, and it unified, and has been manufactured by forming an outer terminal electrode.

[0003]An example of the composition of the conventional laminated chip transformer manufactured by the above methods is shown below using the cross sectional view of the laminated body of Fig.2. The laminated body which constitutes the laminated chip transforme shown in Fig.2, It comes to embed three coils under the inside of a magnetic body, and the secondary coil 7 constituted by carrying out two-layer lamination of the coil conductor pattern of a secondary is embedded under the upper and lower sides of the primary coil 6 constituted by carrying out two-layer lamination of the coil conductor pattern 3 on the primary side.
[0004]Such a laminated chip transformer which consists of a laminated body, In [as shown i the representative circuit schematic of Fig.3, produce electromagnetic induction connection between the primary coil 6 and the secondary coil 7, and] such a transformer, In order to enlarge the electromagnetic-induction-connection coefficient of a primary coil and a secondar coil, Distance d between the coil conductor pattern 3 on the primary side which constitutes th primary coil 6, and the coil conductor pattern 4 of the secondary which constitutes the secondary coil 7 is made small, It is effective to make small collectively interval t_1 (primary co between each coil conductor pattern and t_2 (secondary coil), respectively.
[0005]
[Problem to be solved by the invention]However, if distance d between the primary coil 6 and the secondary coil 7 is made small, the withstand voltage between the coils will become low, the joint stray capacitance Cd will also increase and interval t_1 or t_2 between each coil conductor pattern is narrowed similarly, When parallel stray capacitance C_1 or C_2 was eventually made to increase and these joint stray capacitance and parallel stray capacitance increased, the problem that the high frequency characteristic of a transformer deteriorated occurred.
[0006]what is called a slurry that prints magnetic substance paste and conductive paste alternately, accumulates them as a means to solve such problem, and provides a coil in a laminated body -- building -- according to the method. The proposal that it becomes possible cover the circumference of a coil conductor with the magnetic body of low permeability, and can measure reduction of parallel stray capacitance, In what is called a sheet method that prints and laminates a coil conductor on the ceramic green sheet after forming a ceramic gree sheet preliminarily, Although the method of making joint stray capacitance small by forming a low permeability layer of the same shape as a coil between a primary coil and a secondary co is proposed, neither has come to acquire still sufficient frequency characteristic.
[0007]Therefore, while enlarging the electromagnetic-induction-connection coefficient of a primary coil and a secondary coil, the object of this invention, It is in providing a laminated ch transformer which withstand voltage between both coils was made high, and joint stray capacitance could be made small, also reduced the parallel stray capacitance which occurs between the coil conductor patterns which form a coil, and made the high frequency characteristic good, and a manufacturing method for the same.
[0008]
[Means for solving problem]As a result of the inventor's inquiring intensively that the above-mentioned object should be achieved, while printing the coil conductor pattern for a primary coil and secondary coils on it using a low permeability magnetic substance sheet, respectively A high permeability magnetic substance paste is printed into portions other than a coil conductor pattern, A low permeability magnetic substance sheet is arranged under a bottom-of-the-heap part as well as between a primary [further] coil and secondary coils and the top layer part top which printed the coil conductor pattern, If a laminated chip element assembly

formed as a high permeability magnetic substance paste as well as the sheet which printed th aforementioned coil conductor pattern is printed and the high permeability magnetic substanc sheet of two or more sheets is laminated on the upper and lower sides of these printing parts as a dummy sheet, It found out that the laminated chip transformer which solved the aforementioned problem was obtained, and reached the present invention.

[0009]Namely, in the manufacturing method of a transformer which is characterized by that the present invention comprises the following, As a magnetic body green sheet which holds th aforementioned coil conductor pattern on the top surface, using a high permeability magnetic substance green sheet as a cover sheet arranged into an up-and-down portion of a laminated body, respectively, Make a main surface expose the main surface to coil circumference patter shape, and while making a top surface of a low permeability green sheet prints a high permeability magnetic substance paste to it, And a sheet which printed a coil conductor patte without making the surrounding high permeability magnetic substance paste contact is used f the exposed portion (in addition). A drawer part for connection with an outer terminal electro in a coil conductor pattern may contact magnetic substance paste of high magnetic permeability, While using a sheet in which a main surface was made to expose a main surface to coil circumference pattern shape, and while making a top surface of a low permeability gre sheet as the aforementioned interposition dummy sheet printed a high permeability magnetic substance paste to it, What provides a manufacturing method of a laminated chip transforme arranging a low permeability magnetic substance sheet of composition as well as the sheet between above-mentioned upper arrangement cover sheet and a coil conductor pattern holdi sheet of topmost part arrangement.

It comes to contain a plurality of coil conductors which interposed the some of magnetic bodi to the inside of the chip element assembly which consists of a magnetic body in the shape of thin layer, and were embedded under it in lamination, A terminal of these coil conductors is th laminated chip transformer connected to an outer terminal electrode which was drawn by enc face of the chip element assembly, and was formed in an end face of an element assembly, a it is a surrounding portion of the aforementioned coil conductor.

On the laminated chip transformer;, wherein the aforementioned thin layer-like interposition portion comprises a low permeability magnetic body, and the cover sheet piled up two or mor sheets, Laminate a plurality of magnetic body green sheets which formed a coil conductor pattern in a top surface with predetermined composition, and it makes through hole connection, After interposing a dummy sheet in which a coil conductor pattern besides is not formed, After repeating operation of laminating and through hole connecting a plurality of magnetic body green sheets which formed a coil conductor pattern in a top surface like the above, for a prescribed number of times, After obtaining a chip element assembly which cut c a press-fit object acquired by laminating and press-fitting a cover sheet put on the top layer two or more sheets to a chip size and in which two or more coils were embedded under the lamination direction and calcinating this, an outer terminal electrode is formed.

[0010]

[Function]While printing the coil conductor pattern in which it laminates on one main surface the magnetic body green sheet of low permeability, and a coil is constituted by making throug hole connection according to the method of the present invention, Since lamination compression bonding is carried out after applying the magnetic substance paste of high magnetic permeability to the aforementioned main surfaces other than the conductive patter

between a coil conductor pattern and a high permeability magnetic substance paste, It is buri with the magnetic body green sheet of the low permeability which adjoins by press-fit, and th circumference of the conductive pattern comes to be covered in a low permeability layer. Therefore, parallel stray capacitance becomes small, and between both the primary coils [secondary], since a low permeability layer interposes, joint stray capacitance also becomes small.

[0011]Therefore, the laminated chip transformer of the present invention, Since the surroundings of the coil conductor pattern which constitutes a primary coil and a secondary c as mentioned above serve as a low permeability magnetic body region, It becomes difficult to leak to outside the magnetic flux which occurred with the primary coil or the secondary coil from the interval part between a primary coil and the secondary coil itself or a primary coil, a a secondary coil. That is, in order for magnetic flux to penetrate the inside of both coils from the end of a primary coil to the end of a secondary coil, the electromagnetic coefficient of induction between both coils can be enlarged.

[0012]

[Working example]An example of the present invention is described below using Fig.1 and Fig.4. The cross sectional view of the laminated body which constitutes the laminated chip transformer by which Fig.1 was manufactured in this example, and Fig.4 are the exploded perspective views of a laminated body showing the lamination mode of the various sheets which constitute the laminated body shown in Fig.1.

[0013]First, using the slurry which mixed and prepared the binder to nickel-Zn system ferrite powder, with the doctor blade method, the sheet about 50 micrometers thick was formed, thi was pierced to the constant dimension, and the high permeability magnetic substance green sheet 1 and the low permeability magnetic body green sheet 2 were obtained.

[0014]Next, the high permeability magnetic substance paste 5 was applied so that the main surface might be [in / the above-mentioned low permeability magnetic body green sheet 2] exposed to the circumference pattern shape of a coil in a main surface. To subsequently, the exposed portion of the low permeability magnetic body green sheet in this sheet, Using the electrode paste which mainly comprises Ag or Ag-Pd, about 0.5 mm of distance was kept and printed in thickness of 15-20 micrometers with the line width of 1 mm so that high-magnetic-permeability conductive paste might not be contacted in the coil conductor pattern 3 on the primary side, and the coil conductor pattern 4 of a secondary. The drawer part for connection with the outer terminal electrode in a coil conductor pattern was printed in piles on high-magnetic-permeability conductive paste.

[0015]Next, a mode as shows the high permeability magnetic substance green sheet 1, the high permeability magnetic substance paste 5, the low permeability magnetic body green she 2 in which the coil conductor pattern was printed, and the low permeability magnetic body green sheet 2 in which only the high permeability magnetic substance paste 5 was printed to Fig.4, That is, it has been arranged in the central part and division arrangement was carried c at the upper and lower sides of the primary coil which the through hole 8 comes to connect, and the primary coil, and it calcinated, after laminating, and sticking by pressure and unifying the mode which the secondary coil which the through hole 8 comes to connect comprises.

[0016]In the case of lamination compression bonding, the low permeability magnetic body green sheet which adjoins by press-fit buries between each coil conductor pattern and a high permeability magnetic substance paste, and it will be in the state where the circumference of the conductive pattern is covered in a low permeability layer.

[0017]Subsequently, after carrying out barrel finishing of the surface of the calcinated laminated chip element assembly, electrode paste was applied to the end face which the coil conductor end piece in the element assembly is drawing, by printing this, exterior electrodes were formed and the laminated chip transformer of the present invention was obtained.
[0018]As a laminated chip transformer manufactured with a described method is shown in a cross sectional view of Fig.1, to the primary coil 6 which consists of two-layer [of a central part], it divides into two at the upper and lower sides, and the secondary coil 7 of every two-layer one is arranged.
And since all the surroundings of each coil conductor pattern are low permeability layers, leakage flux in a primary coil and a secondary coil part is reduced.

[0019]
[Effect of the Invention]As described above, the laminated chip transformer of the present invention, Since the surroundings of the coil conductor are occupied in the low permeability region, the leakage flux in a primary coil part and a secondary coil part can be reduced, the electromagnetic-induction-connection coefficient between coils can be enlarged, and also parallel stray capacitance in each coil part can be made small.
[0020]The joint stray capacitance between both coils can also make withstand voltage small highly, enlarging the electromagnetic-induction-connection coefficient, and a good high frequency characteristic is acquired.

[Translation done.]

Electronic Acknowledgement Receipt

EFS ID:	30813221
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Jeff Lloyd/Megan Kuchenthal
Filer Authorized By:	Jeff Lloyd
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	31-OCT-2017
Filing Date:	10-AUG-2017
Time Stamp:	14:28:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SIDS.pdf	174907 25e0f48132f9f892adad3778cf16e0691eda4f95	yes	3

	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	3	
Warnings:					
Information:					
2	Foreign Reference	F1.pdf	6578837 11ef9e74465147c96135c62273f1f7516c865d13	no	10
Warnings:					
Information:					
		Total Files Size (in bytes):	6753744		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

I hereby certify that this correspondence is being electronically filed in the United States Patent and Trademark Office on October 31, 2017.

/MEGAN KUCHENTHAL/

Megan Kuchenthal

SUPPLEMENTAL INFORMATION
DISCLOSURE STATEMENT
UNDER 37 C.F.R §§ 1.97 AND 1.98
Examining Group 2683
Patent Application
Docket No. SUN.LGI.417D2
Serial No. 15/673,763

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit	:	2683
Applicants	:	Ki Min Lee, Jung Oh Lee
Serial No.	:	15/673,763
Filed	:	August 10, 2017
Conf. No.	:	7725
For	:	WIRELESS POWER RECEIVER AND CONTROL METHOD THEREOF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 AND 1.98

Sir:

In accordance with 37 C.F.R. § 1.56, the references listed on the attached form PTO/SB/08 are being brought to the attention of the Examiner for consideration in connection with the examination of the patent application identified above. A copy of the cited references is attached. However, Applicants have not submitted copies of the U.S. Patents and published U.S. Patent Application cited on attached Form PTO/SB/08 pursuant to 37 CFR 1.98(a)(2)(ii).

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the attached form PTO/SB/08 with initials or other appropriate marks.

Applicants respectfully assert that the substantive provisions of 37 C.F.R. §§ 1.56, 1.97, and 1.98 are met by the foregoing statements.

J:\SUN\LGI\417D2\IDS-Refs\10-31-2017\SIDS.doc/mrk

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 or 1.17 as required by this paper to Deposit Account 19-0065.

Respectfully submitted,

/JEFF LLOYD/

Jeff Lloyd
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Gainesville, FL 32614-2950

JL/mrk

Attachments: Form PTO/SB/08; copy of reference cited.

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A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE FL 32614

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 15/673,763

1. THE REQUEST FILED August 10, 2017 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination

A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to Brian W. Brown at 571-272-5338.

/Brian W. Brown/
[*Signature*]

Petitions Examiner, Office of Petitions
(Title)

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/673,763	08/10/2017	2683	2320	SUN.LGI.417D2	29	1

CONFIRMATION NO. 7725

FILING RECEIPT

23557
SALIWANCHIK, LLOYD & EISENSCHENK
A PROFESSIONAL ASSOCIATION
PO Box 142950
GAINESVILLE, FL 32614

Date Mailed: 08/18/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ki Min Lee, Seoul, KOREA, REPUBLIC OF;
Jung Oh Lee, Seoul, KOREA, REPUBLIC OF;

Applicant(s)

LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF;

Power of Attorney: The patent practitioners associated with Customer Number 23557

Domestic Priority data as claimed by applicant

This application is a CON of 15/195,390 06/28/2016
which is a CON of 13/658,116 10/23/2012 PAT 9461364

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
REPUBLIC OF KOREA 10-2011-0114721 11/04/2011

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to**

Retrieve Electronic Priority Application(s) (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 08/16/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/673,763**

Projected Publication Date: 11/23/2017

Non-Publication Request: No

Early Publication Request: No

Title

Wireless Power Receiver and Control Method Thereof

Preliminary Class

340

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/673,763

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	29 minus 20 =	* 9			OR	x 80 =	720
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2320

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/SB/424 (12-11)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	LEE, Ki Min	Nonprovisional Application Number (if known):	
Title of Invention:	Wireless Power Receiver and Control Method Thereof		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, examination fee, and any required excess claims and application size fees are filed with the request or have been already been paid.

2. The application contains or is amended to contain no more than four independent claims and no more than thirty total claims, and no multiple dependent claims.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed oath or declaration under 37 CFR 1.63 is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /JEFF LLOYD/	Date 2017-08-10
Name (Print/Typed) Jeff Lloyd	Practitioner Registration Number 35,589

Note: *Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below*.*

☑ *Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ki Min		Lee	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Seoul	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	98, Huam-ro, Jung-gu
Address 2	
City	Seoul
State/Province	
Postal Code	04637
Country [i]	KR

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jung Oh		Lee	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Seoul	Country of Residence [i]	KR

Mailing Address of Inventor:

Address 1	98, Huam-ro, Jung-gu
Address 2	
City	Seoul
State/Province	
Postal Code	04637
Country [i]	KR

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	23557		
Email Address	JL@SLEPATENTS.COM	Add Email	Remove Email

Application Information:

Title of the Invention	Wireless Power Receiver and Control Method Thereof		
Attorney Docket Number	SUN.LGI.417D2	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	11	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	23557		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15195390	2016-06-28
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15195390	Continuation of	13658116	2012-10-23	9461364	2016-10-04

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
10-2011-0114721	KR	2011-11-04	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	LG INNOTEK CO., LTD.		
Mailing Address Information For Applicant:			
Address 1	98, Huam-ro, Jung-gu		
Address 2			
City	Seoul	**State/Province**	
Country	KR	Postal Code	04637
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/JEFF LLOYD/			Date (YYYY-MM-DD)	2017-08-10
First Name	JEFF	Last Name	LLOYD	Registration Number	35589

Additional Signature may be generated within this form by selecting the Add button. Add

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SUN.LGI.417D2
	Application Number	
Title of Invention	Wireless Power Receiver and Control Method Thereof	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

FIG.1

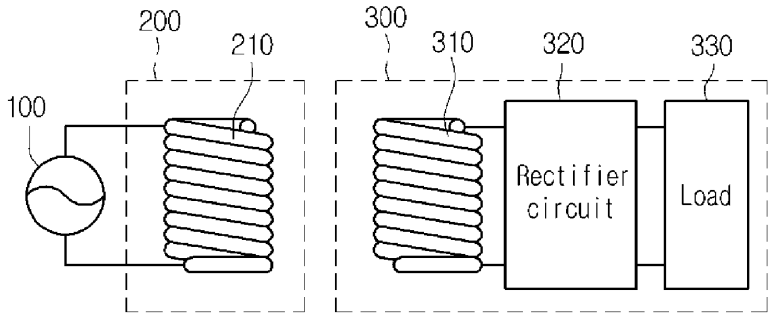


FIG.2

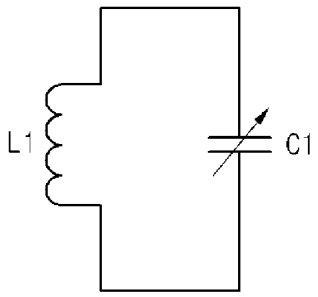


FIG.3

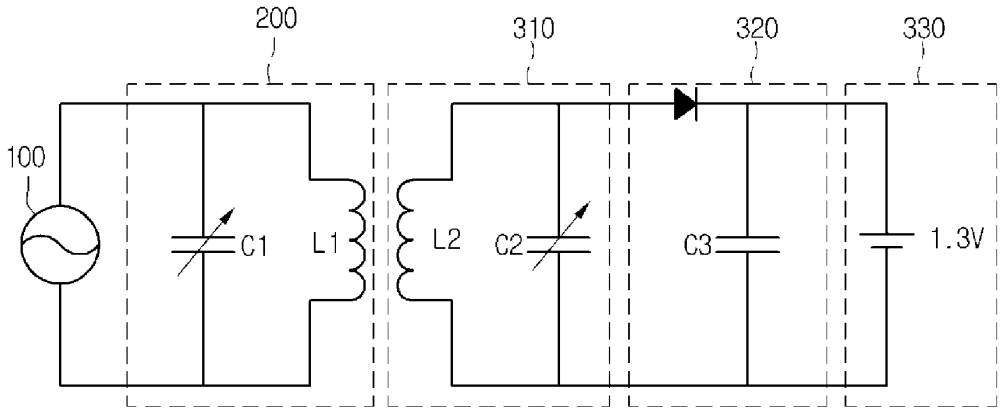


FIG.4

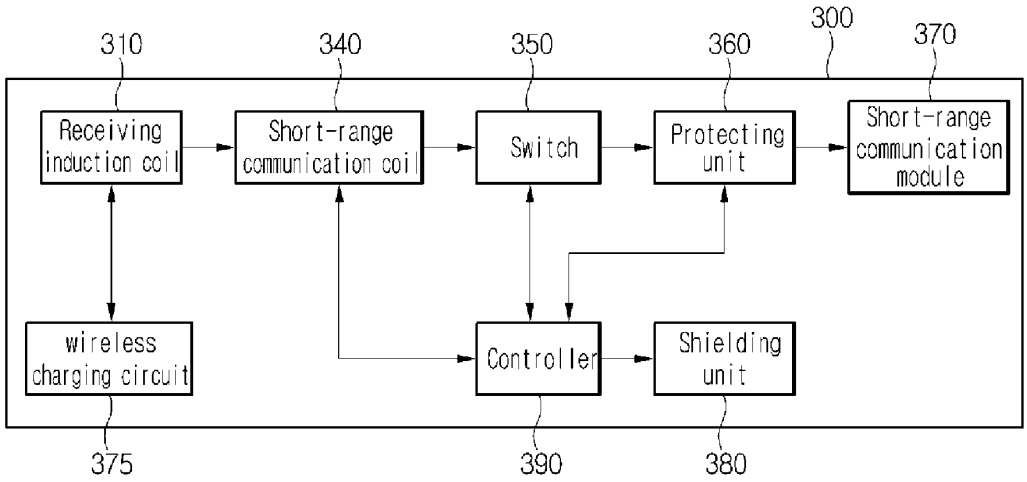

300
310
340
350
360
370
Receiving induction coil
Short-range communication coil
Switch
Protecting unit
Short-range communication module
wireless charging circuit
Controller
Shielding unit
375
390
380

FIG.5

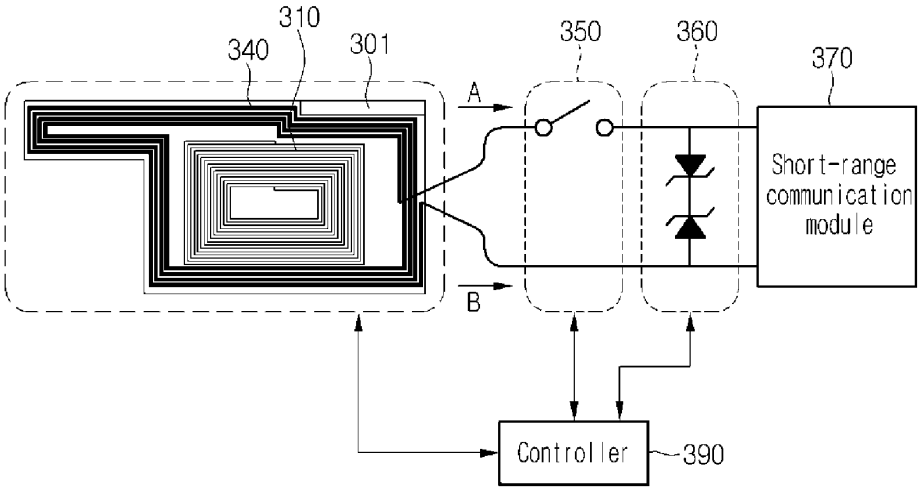
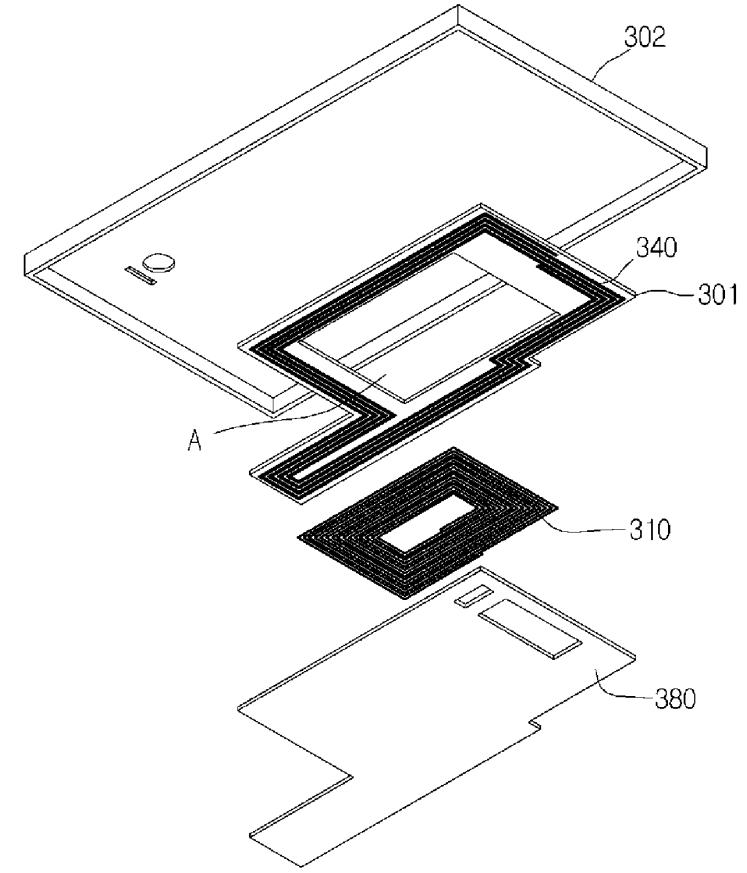
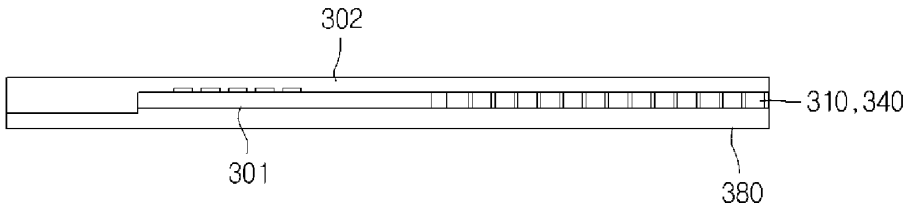

310
340
301
350
360
370
A
B
Short-range communication module
Controller
390

FIG.6



(a)



(b)

FIG.7

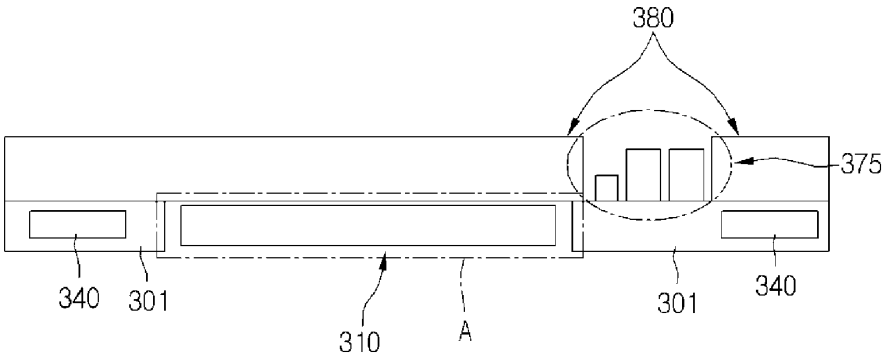


FIG.8

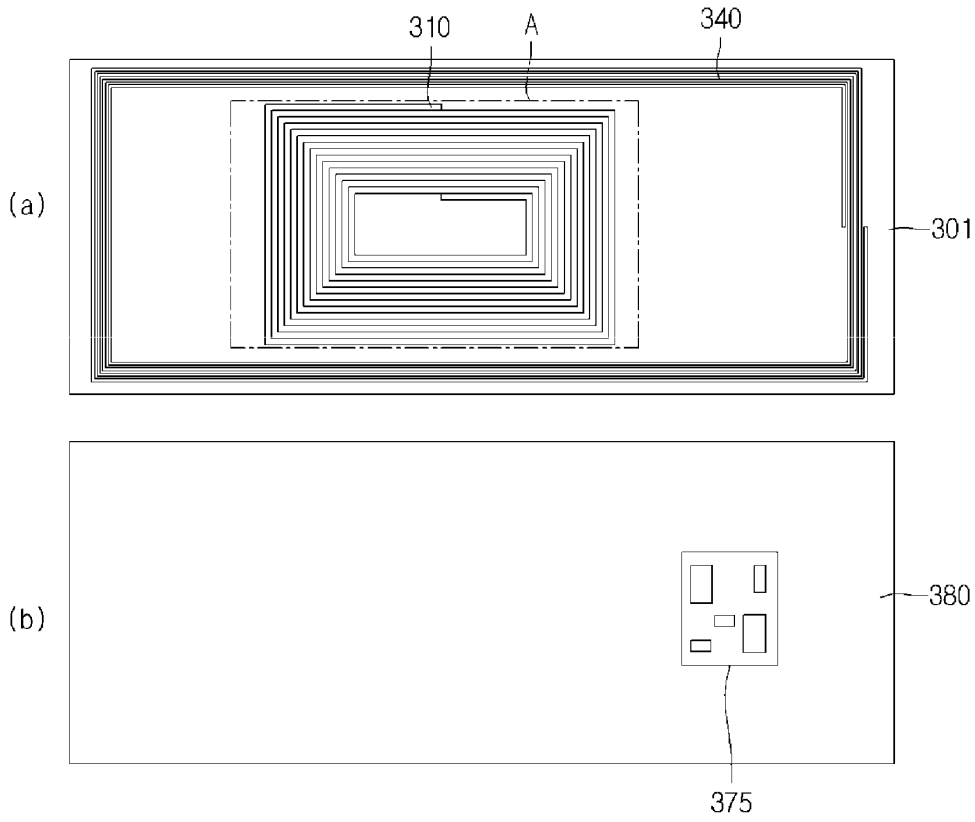


FIG.9

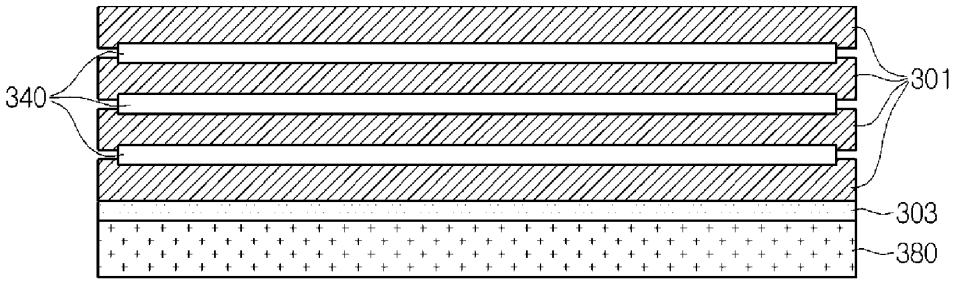


FIG.10

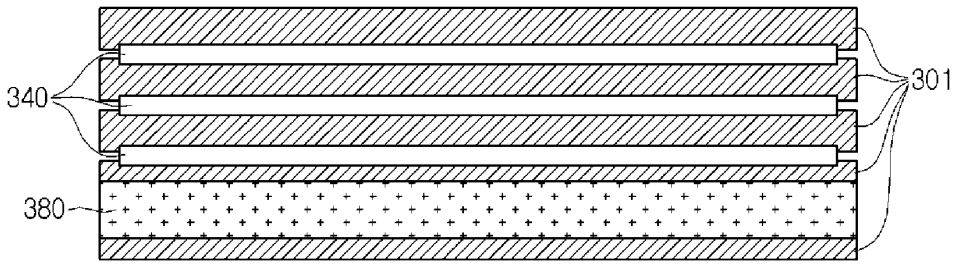
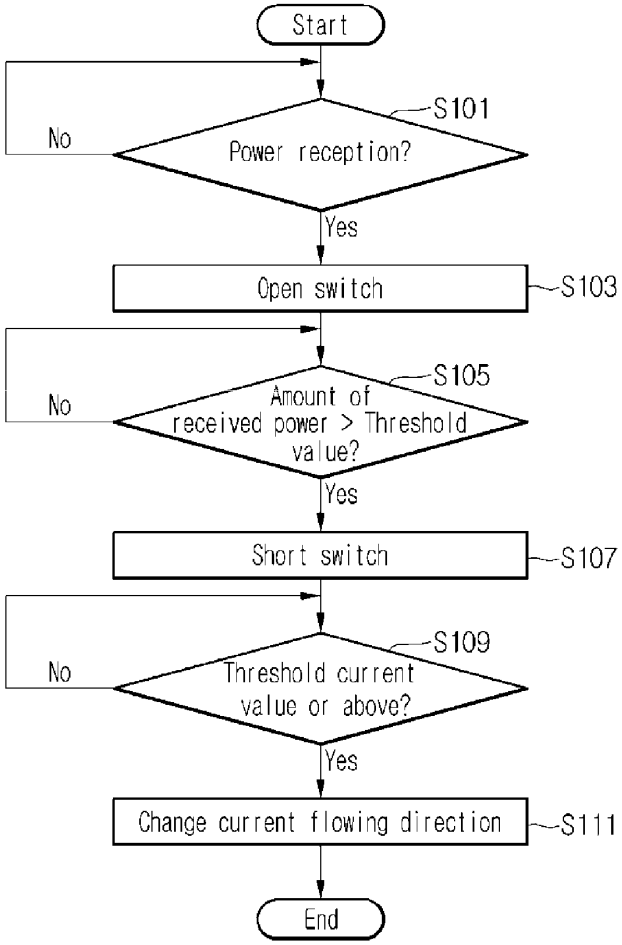


FIG.11


Start
S101
Power reception?
No
Yes
Open switch
S103
S105
Amount of received power > Threshold value?
No
Yes
Short switch
S107
S109
Threshold current value or above?
No
Yes
Change current flowing direction
S111
End

ABSTRACT

A wireless power receiver according to an embodiment wirelessly receives power from a wireless power transmitter. The wireless power receiver includes a printed circuit board having a reception space in a predetermined area, a receiving coil disposed in the reception space of the printed circuit board for receiving power from the wireless power transmitter, and a short-range communication antenna disposed on the printed circuit board while surrounding the receiving coil.

CLAIMS

What is claimed is:

1. A wireless power receiver that wirelessly receives power from a wireless power transmitter, the wireless power receiver comprising:

a board comprising a plurality of layers;

a wireless receiving coil disposed in the board;

a short-range communication coil disposed in the board; and

a shielding unit disposed in the board,

wherein the shielding unit is disposed on the wireless receiving coil and the short range communication coil, and

wherein the wireless receiving coil, the short-range communication coil, and the shielding unit are disposed between the plurality of layers.

2. A wireless power receiver of claim 1,

wherein the plurality of players comprises a first layer, a second layer under the first layer, and a third layer under the second layer.

3. A wireless power receiver of claim 2,

wherein the shielding unit is disposed between the first layer and the second layer.

4. A wireless power receiver of claim 3,

wherein the short-range communication coil is disposed between the second layer and the third layer.

5. A wireless power receiver of claim 4,

further comprising a separation distance between the second layer and the third layer.

6. A wireless power receiver of claim 5,

wherein the separation distance is smaller than a thickness of the short-range

communication coil.

7. A wireless power receiver of claim 3,

wherein the wireless receiving coil is disposed between the second layer and the third layer.

8. A wireless power receiver of claim 7,

further comprising a separation distance between the second layer and the third layer.

9. A wirless power receiver of claim 8,

wherein the separation distance is smaller than a thickness of the wireless receiving coil.

10. A wireless power receiver of claim 1,

wherein the plurality of layers comprises a first layer, a second layer under the first layer, a third layer under the second layer, and a fourth layer under the third layer.

11. A wireless power receiver of claim 10,

wherein the shielding unit is disposed between the first layer and the second layer.

12. A wireless power receiver of claim 11,

wherein the wireless receiving coil comprises a plurality of layers.

13. A wireless power receiver of claim 12,

wherein the wireless receiving coil is disposed between the second layer and the third layer and between the third layer and the fourth layer.

14. A wireless power receiver of claim 13,

further comprising a separation distance between the second layer and the third layer and between the third layer and the fourth layer.

15. A wireless power receiver of claim 14,

wherein the separation distance is smaller than a thickness of at least one of the plurality of

layers of the wireless receiving coil.

16. A wireless power receiver of claim 11,

wherein the short-range communication coil comprises a plurality of layers.

17. A wireless power receiver of claim 16,

wherein the short-range communication coil is disposed between the second layer and the third layer and between the third layer and the fourth layer.

18. A wireless power receiver of claim 17,

further comprising a separation distance between the second layer and the third layer and between the third layer and the fourth layer.

19. A wireless power receiver of claim 18,

wherein the separation distance is smaller than a thickness of at least one of the plurality of layers of the short-range communication coil.

20. A wireless power receiver of claim 1,

wherein the wireless receiving coil comprises a first wireless receiving coil and a second wireless receiving coil,

wherein at least one of the plurality of layers is disposed between the first wireless receiving coil and the second wireless receiving coil.

21. A wireless power receiver of claim 1,

wherein the short-range communication coil comprises a first short-range communication coil and a second short-range communication coil,

wherein at least one of the plurality of layers is disposed between the first short-range communication coil and the second short-range communication coil.

22. A wireless power receiver of claim 1,

wherein the wireless receiving coil is surrounded by the short-range communication coil.

23. A wireless power receiver of claim 1,

wherein the shielding unit is arranged to correspond to an area occupied by the wireless power receiving coil and the short-range communication coil.

24. A wireless power receiver of claim 1,

wherein the shielding unit comprises a ferrite.

25. A wireless power receiver of claim 1,

wherein the board comprises a reception space.

26 A wireless power receiver of claim 20,

wherein a thickness of the first wireless receiving coil is thinner than a thickness of the shielding unit.

27. A wireless power receiver of claim 26,

wherein a thickness of the first wireless receiving coil is thicker than a thickness of at least one of the plurality of layers.

28. A wireless power receiver of claim 21,

wherein a thickness of the first short-range communication coil is thinner than a thickness of the shielding unit.

29. A wireless power receiver of claim 28,

wherein a thickness of the first short-range communication coil is thicker than a thickness of at least one of the plurality of layers.

WIRELESS POWER RECEIVER AND CONTROL METHOD THEREOF

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. Application No. 15/195,390, filed June 28, 2016, entitled "Wireless Power Receiver and Control Method Thereof", which is a continuation of U.S. Application No. 13/658,116, filed October 23, 2012, now U.S. Patent No. 9,461,364, issued on October 4, 2016, entitled "Wireless Power Receiver and Control Method Thereof", which claims the benefit under 35 U.S.C. §119 of Korean Patent Application No. 10-2011-0114721, filed November 4, 2011, entitled "Apparatus for Receiving Wireless Power and Method for Controlling Thereof", all of which are incorporated herein by reference in their entirety.

BACKGROUND

[0001] The embodiment relates to a wireless power receiver and a control method thereof.

[0002] A wireless power transmission or a wireless energy transfer refers to a technology of 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 electrical energy by irradiating electromagnetic waves, such as radio waves or lasers, has been suggested. Actually, electrical toothbrushes or electrical 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.

[0003] Recently, among wireless power transmitting technologies, an energy transmitting scheme employing resonance has been widely used.

[0004] Since an electric signal generated between the wireless power transmitter and the wireless power receiver is wirelessly transferred through coils in a wireless power transmitting system using electromagnetic induction, a user may easily charge electronic appliances such as a portable device.

[0005] However, due to the thickness of each of a receiving coil, a short-range communication antenna and a printed circuit board constituting a receiving side, a size of an electronic appliance becomes larger and it is not easy to embed them in the electronic appliance. Specifically, the size of the electronic appliance is increased corresponding to the thickness of the receiving coil, the short-range communication antenna and the printed circuit board.

[0006] Further, when an overcurrent flows through the short-range communication module, it is difficult to effectively cope with the overcurrent.

[0007] Further, a magnetic field generated from the receiving coil exerts an influence on an inside of an electronic appliance, so that the electronic appliance malfunctions.

SUMMARY

[0008] The embodiment provides a wireless power receiver with a minimized thickness by suitably arranging a receiving coil, a short-range communication antenna and a printed circuit board.

[0009] The embodiment provides a wireless power receiver with a reduced thickness by allowing a short-range communication antenna to be included in a printed circuit board.

[0010] The embodiment provides a wireless power receiver which prevents an electronic appliance from malfunctioning using a shielding unit.

[0011] The embodiment provides a wireless power receiver which breaks an overcurrent by using a protecting unit to protect a short-range communication module.

[0012] A wireless power receiver according to the embodiment wirelessly receives power from a wireless power transmitter. The wireless power receiver includes: a printed circuit board having a reception space in a predetermined area; a receiving coil disposed in the reception space of the printed circuit board for receiving power from the wireless power transmitter; and a short-range communication antenna disposed on the printed circuit board while surrounding the receiving coil.

[0013] A wireless power receiver according to the embodiment wirelessly receives power from a wireless power transmitter. The wireless power receiver includes: a short-range communication antenna for performing short-range communication; a receiving coil for wirelessly receiving power from the wireless power transmitter; and a switch for changing a conducting state of the short-range communication antenna according to a reception of the

power, wherein the wireless power receiver opens or shorts the switch according to the reception of the power.

[0014] A method of controlling a wireless power receiver, which includes a short-range communication antenna for communicating with an outside, according to the embodiment includes determining whether power is received from a transmitting coil through electromagnetic induction; opening a switch which changes a conducting state of the short-range communication antenna when the power is received; identifying whether an amount of received power is equal to or greater than a threshold value; and shorting the switch when the amount of the received power is equal to or greater than the threshold value.

[0015] According to the embodiments, the thickness of the wireless power receiver can be minimized by suitably arranging the receiving coil, the short-range communication antenna and the printed circuit board.

[0016] According to the embodiments, the wireless power receiver can be prevented from being broken by preventing an overcurrent from flowing in the wireless power receiver and malfunction of the wireless power receiver can be prevented by shielding a magnetic field.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a view showing a wireless power transmission system according to the embodiment;

[0018] FIG. 2 is an equivalent circuit diagram of a transmitting coil according to the embodiment;

[0019] FIG. 3 is an equivalent circuit diagram of the wireless power transmission system according to the embodiment;

[0020] FIG. 4 is a block diagram of a wireless power receiver according to the embodiment;

[0021] FIG. 5 is a view showing an example of a configuration of the wireless power receiver according to the embodiment;

[0022] FIG. 6 is a exploded perspective and sectional view illustrating the wireless power receiver according to the embodiment;

[0023] FIG. 7 is a sectional view showing an arrangement of elements of the wireless power receiver according to the embodiment;

[0024] FIG. 8 is a view illustrating a top surface and a bottom surface of the wireless power receiver according to the embodiment;

[0025] FIG. 9 is a view illustrating one example of attaching a shielding unit onto the wireless power receiver according to the embodiment;

[0026] FIG. 10 is a view illustrating one example of inserting the shielding unit into the wireless power receiver according to the embodiment; and

[0027] FIG. 11 is a flowchart illustrating a control method of the wireless power receiver according to the embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0028] Hereinafter, exemplary embodiments of the disclosure will be described in detail so that those skilled in the art can easily comprehend the disclosure.

[0029] FIG. 1 illustrates a wireless power transmission system according to an embodiment.

[0030] The power generated from a power source 100 is provided to a wireless power transmitter 200, such that the power is transferred by electromagnetic induction to a wireless power receiver 300.

[0031] In detail, the power source 100 is an AC power source for supplying AC power of a predetermined frequency.

[0032] The wireless power transmitter 200 includes a transmitting coil 210. The transmitting coil 210 is connected to the power source 100, such that an AC current flows through the transmitting coil 210. When the AC current flows through the transmitting coil 210, an AC current is induced to the receiving coil 310 physically apart from the transmitting coil 210 due to electromagnetic induction, so that the AC power is transferred to the wireless power receiver 300.

[0033] Power may be transferred by electromagnetic induction between two LC circuits which are impedance-matched with each other. The power transmission through electromagnetic induction may enable high efficiency power transmission.

[0034] The wireless power receiver 300 may include a receiving coil 310, a rectifier circuit 320 and a load 330. In the embodiment, the load 330 may be not included in the wireless power receiver 300, but may be provided separately. The power transmitted through the

transmitting coil 210 is received at the receiving coil 310 by electromagnetic induction. The power transferred to the receiving coil 310 is transferred through the rectifier circuit 320 to the load 330.

[0035] FIG. 2 is an equivalent circuit diagram of the transmitting coil 210 according to the embodiment.

[0036] As shown in FIG. 2, the transmitting coil 210 may include an inductor L1 and a capacitor C1, and form a circuit having a suitable inductance value and a suitable capacitance value. The capacitor C1 may be a variable capacitor. By controlling the variable capacitor, an impedance matching may be performed. Meanwhile, an equivalent circuit of the receiving coil 320 may be equal to that depicted in FIG. 2.

[0037] FIG. 3 is an equivalent circuit diagram of the wireless power transmitting system according to the embodiment.

[0038] As shown in FIG. 3, the transmitting coil 210 may include an inductor L1 having a predetermined inductance value and a capacitor C1 having a predetermined capacitance value.

[0039] Further, as shown in FIG. 3, the receiving coil 310 may include an inductor L2 having a predetermined inductance value and a capacitor C2 having a predetermined capacitance value. The rectifier circuit 320 may include a diode D1 and a rectifying capacitor C3 such that the rectifier circuit 320 converts AC power into DC power and outputs the DC power.

[0040] Although the load 330 is denoted as a DC power source, the load 330 may be a battery or other devices requiring DC power.

[0041] Next, a wireless power receiver according to the embodiment will be described with reference to FIGS. 4 to 10.

[0042] FIG. 4 is a block diagram of a wireless power receiver according to the embodiment, FIG. 5 is a view showing an example of a configuration of the wireless power receiver according to the embodiment, FIG. 6 is a exploded perspective and sectional view illustrating the wireless power receiver according to the embodiment, FIG. 7 is a sectional view showing an arrangement of elements of the wireless power receiver according to the embodiment, FIG. 8 is a view illustrating a top surface and a bottom surface of the wireless power receiver according to the embodiment, FIG. 9 is a view illustrating one example of attaching a shielding unit onto the wireless power receiver according to the embodiment, and

FIG. 10 is a view illustrating one example of inserting the shielding unit into the wireless power receiver according to the embodiment.

[0043] First, referring to FIG. 4, the wireless power receiver 300 may include a receiving coil 310, a short-range communication antenna 340, a switch 350, a protecting unit 360, a short-range communication module 370, a shielding unit 380, and a controller 390.

[0044] The wireless power receiver 300 according to the embodiment may be installed in a terminal or an electronic appliance requiring power, such as a portable terminal, a laptop computer, and a mouse.

[0045] The receiving coil 310 receives power from the transmitting coil 210 of the wireless power transmitter 200 through electromagnetic induction. That is, if a magnetic field is generated as an AC current flows through the transmitting coil 210, a current is induced to the receiving coil 310 by the generated magnetic field so that an AC current flows therethrough.

[0046] In the embodiment, the receiving coil 310 may be disposed in a reception space of a printed circuit board 301.

[0047] The receiving coil 310 may be provided by winding a conducting wire server times. In the embodiment, the receiving coil 310 may have a spiral shape, but the embodiment is not limited thereto.

[0048] The short-range communication antenna 340 may communicate with a reader capable of performing a short-range communication. The short-range communication antenna 340 may perform a function of an antenna which transmits and receives information to and from the reader. In the embodiment, the short-range communication antenna 340 may be disposed at an outside of the receiving coil 310. In the embodiment, the receiving coil 310 may be disposed in the reception space inside the printed circuit board 301, and the short-range communication antenna 340 may be disposed to surround the receiving coil 310 on the printed circuit board 301.

[0049] The above configuration will be described in more detail with reference to FIG. 6.

[0050] Referring to the exploded perspective view of the wireless power receiver 300 shown in FIG. 6(a), the wireless power receiver 300 may include a case 302, the printed circuit board 301, the receiving coil 310, the short-range communication antenna 340 and the shielding unit 380. Here, the case 302 refers to a case of a portable terminal, but the embodiment is not limited thereto. The shielding unit 380 will be described later.

[0051] Referring to FIG. 6(a), it may be identified that the receiving coil 310 is disposed in the reception space A of the printed circuit board 301 and the short-range communication antenna 340 is disposed on the printed circuit board 301. That is, the receiving coil 310 may be disposed in the reception space A provided inside the printed circuit board 301, and the short-range communication antenna 340 may be disposed at an upper side of the printed circuit board 301 while surrounding the reception space A.

[0052] FIG. 6 (b) is a sectional view showing the arrangement of the elements of the wireless power receiver 300 illustrated in FIG. 6(a).

[0053] In the embodiment, the printed circuit board 301, the receiving coil 310 and the short-range communication antenna 340 may be inserted into the case 302 through the injection molding. Further, as described above, the short-range communication antenna 340 may be disposed at an outer periphery on the printed circuit board 301 while surrounding the receiving coil 310 placed in the reception space A.

[0054] Hereinafter, the arrangement among the receiving coil 310, the short-range communication antenna 340 and the printed circuit board 301 will be described in more detail with reference to FIGS. 7 and 8.

[0055] First, referring to FIG. 7, the printed circuit board 301 has the reception space A in a predetermined area thereof. In the embodiment, the predetermined area may include the central portion of the printed circuit board 301. In the embodiment, the central portion of the printed circuit board 301 may have the reception space having a polygonal shape, such as a rectangular shape and a circular shape.

[0056] The receiving coil 310 is disposed in the reception space A of the printed circuit board 301, and receives power from the transmission induction coil 210 through electromagnetic induction. In the embodiment, the receiving coil 310 and the printed circuit board 301 may be manufactured such that the thickness of the receiving coil 310 may be equal to that of the printed circuit board 301 or the thickness of the receiving coil 310 may be less than that of the printed circuit board 301. In this case, the increase of the thickness of the wireless power receiver 300 due to the thicknesses of the receiving coil 310 and the short-range communication antenna 340 is prevented, so that the wireless power receiver 300 can be easily embedded in the case of the portable terminal.

[0057] In the embodiment, the receiving coil 310 may be manufactured to have a shape in match with a shape of the reception space A of the printed circuit board 310. For example, when the shape of the reception space A of the printed circuit board 310 is rectangular, the receiving coil 310 or the conducting wire may be wound in a rectangular shape. When the shape of the reception space A of the printed circuit board 310 is circular, the receiving coil 310 or the conducting wire may be wound in a circular shape. Thus, the receiving coil 310 or the conducting wire may have various shapes.

[0058] The short-range communication antenna 340 may be included in the printed circuit board 301 and may be configured to surround the receiving coil 310. In the embodiment, the short-range communication antenna 340 may be manufactured such that the short-range communication antenna 340 may be embedded in the printed circuit board 301, and may be configured to surround the outer periphery of the receiving coil 310 having various shapes such as a rectangular shape or a circular shape. In this case, the increase of the thickness of the wireless power receiver 300 due to the thickness of the printed circuit board 301 and the short-range communication antenna 340 can be prevented so that the wireless power receiver 300 can be easily installed in the case of the portable terminal.

[0059] The wireless power receiver 300 may further include a shielding unit 380 for shielding a magnetic field generated by the receiving coil 310. In the embodiment, the shielding unit 380 may be disposed to cover an area occupied by the receiving coil 310. In the embodiment, the shielding unit 380 may be disposed on the receiving coil 310 and the short-range communication antenna 340 such that the shielding unit 380 may include the area occupied by the receiving coil 310 and the short-range communication antenna 340.

[0060] In the embodiment, the shielding unit 380 may have a reception space in a predetermined area thereof. A wireless charging circuit 375, which is place on the top surface of the printed circuit board 301, may be disposed in the reception space of the shielding unit 380. The wireless charging circuit 375 may include a rectifier circuit for converting AC power into DC power, a capacitor for removing a noise signal, and a main IC chip for performing the operation for the wireless power reception.

[0061] In the embodiment, the shielding unit 380 and the wireless charging circuit 375 may be manufactured such that the thickness of the shielding unit 380 may be equal to that of the wireless charging circuit 375 or the thickness of the shielding unit 380 may be less than that of

the wireless charging circuit 375. In this case, the increase of the thickness of the wireless power receiver 300 due to the thicknesses of the shielding unit 380 and the wireless charging circuit 375 can be prevented, so that the wireless power receiver 300 can be easily installed in the case of the portable terminal.

[0062] FIG. 8(a) is a view showing a bottom surface of the wireless power receiver according to the embodiment and FIG. 8(b) is a view showing a top surface of the wireless power receiver according to the embodiment.

[0063] FIG. 8(a) illustrates the arrangement of the printed circuit board 310, the receiving coil 310 and the short-range communication antenna 340 according to the embodiment. The printed circuit board 301 has a reception space A in the central area, and the receiving coil 310 having a rectangular shape is disposed in the reception space A. The short-range communication antenna 340 is embedded in the printed circuit board 301. In this case, the increase of the thickness of the wireless power receiver 300 due to the thickness of the printed circuit board 301 and the short-range communication antenna 340 can be prevented, so that the wireless power receiver 300 can be easily installed in the case of the portable terminal.

[0064] Further, the receiving coil 310 and the printed circuit board 301 may be manufactured such that the thickness of the receiving coil 310 may be equal to that of the printed circuit board 301 or the thickness of the receiving coil 310 may be less than that of the printed circuit board 301. In this case, the increase of the thickness of the wireless power receiver 300 due to the thickness of the receiving coil 310 and the printed circuit board 301 can be prevented, so that the wireless power receiver 300 can be easily installed in the case of the portable terminal.

[0065] FIG. 8 (b) illustrates the arrangement of the wireless charging circuit 375 and the shielding unit 380 according to the embodiment. The shielding unit 380 may have a reception space in a predetermined area thereof, and the wireless charging circuit 375 may be disposed in the reception space of the shielding unit 380.

[0066] In the embodiment, the shielding unit 380 and the wireless charging circuit 375 may be manufactured such that the thickness of the wireless charging circuit 375 may be equal to that of the wireless charging circuit 375 or the thickness of the shielding unit 380 may be less than that of the wireless charging circuit 375. In this case, the increase of the thickness of the wireless power receiver 300 due to the thickness of the shielding unit 380 and the wireless

charging circuit 375 can be prevented, so that the wireless power receiver 300 can be easily installed in the case of the portable terminal.

[0067] Referring again to FIG. 4, although various technologies can be applied to a short-range communication protocol used in the wireless communication antenna 340 and a short-range are communication module 370 which will be described below, NFC (Near Field Communication) may be preferably used for the wireless communication antenna 340 and the short-range communication module 370. The NFC is a technology for performing wireless communication in a short-range through the bandwidth of 13.56 MHz.

[0068] The switch 350 is connected to the short-range communication antenna 340 and receives an open or short signal from the controller 390 to be described below such that the switch 350 may change a conducting state of the short-range communication antenna.

[0069] If it is determined that the power is received from the transmitting coil 320, the switch 350 may receive the open signal from the controller 390 such that the switch 350 may break the current from flowing through the short-range communication antenna 340.

[0070] If the wireless power receiver 300 is charged with an amount of power equal to or higher than a threshold value, the switch 350 may receive the short signal from the controller 390 such that the switch 350 may conduct the current through the short-range communication antenna 340, so the switch 350 may allow the short-range communication antenna 340 to be operated.

[0071] The protecting unit 360 is operated when a current equal to or higher than a threshold current value flows through the protecting unit 360, such that the protecting unit 360 may break the current equal to or higher than the threshold current value from being transferred to the short-range communication module 370.

[0072] In the embodiment, as shown in FIG. 5, the protecting unit 360 may include at least one zener diode. The zener diode may allow only a current having a value equal to or less than a threshold current value to flow through a circuit. The threshold current value may be variably set and may be a limit value at which the short-range communication module 370 may be normally operated.

[0073] When a current transferred to the short-range communication antenna 340 has the threshold current value or above, the protecting unit 360 changes the flowing direction or the

flow of the current to prevent an overcurrent from flowing through the short-range communication module 370.

[0074] Referring to FIG. 5, if the current flowing through the short-range communication antenna 340 has the threshold current value or above, the protecting unit 350 is operated. Referring to FIG. 5, when the current flowing in the A-direction has the threshold current value or above, the current having the threshold current value or above flows into the zener diode placed at an upper side of the protecting unit 350.

[0075] In a case that the current flowing in the B-direction has the threshold current value or above, the same procedure is performed.

[0076] An overcurrent having the threshold current value or above flows through the zener diode and is discharged as thermal energy. That is, the protecting unit 360 may prevent the overcurrent from flowing through the short-range communication module 370, so that damage of the communication module 370 may be prevented.

[0077] Referring again to FIG. 4, the short-range communication module 370 may receive a current through the short-range communication antenna 340. Although various types of communication technologies can be applied to the short-range communication module 370, the NFC (Near Field Communication) protocol may be preferably used.

[0078] The shielding unit 380 may change a direction of the magnetic field generated from the receiving coil 310. The shielding unit 380 may absorb the magnetic field generated from the receiving coil 310 and may discharge the absorbed magnetic field as thermal energy.

[0079] That is, as the shielding unit 380 may change the direction of the magnetic field generated from the coil 310 or absorb and discharge the magnetic field as thermal energy, it is possible to prevent the magnetic field from exerting bad influence upon any other elements inside an electronic appliance to which the wireless power receiver 300 is installed. That is, the shielding unit 380 can prevent the malfunction caused by the magnetic field applied to other elements.

[0080] The shielding unit 380 may include ferrite, but the embodiment is not limited thereto.

[0081] The shielding unit 380 may be disposed at one side of the wireless power receiver 300.

[0082] Hereinafter, the arrangement of the shielding unit 380 on the wireless power receiver 300 will be described with reference to FIGS. 9 and 10.

[0083] First, referring to FIG. 9, after the short-range communication antenna 340 has been disposed on the printed circuit board 301, the shielding unit 380 may be attached to one side of the printed circuit board 301 with an adhesive.

[0084] Referring to FIG. 10, while the procedure of disposing the short-range communication antenna 340 or receiving coil(310)(not shown in the Fig. 10) in the printed circuit board 301 is being performed, the shielding unit 380 may be inserted into the printed circuit board 301. That is, unlike FIG. 9, since the shielding unit 380 is disposed in the printed circuit board 301, the procedure of disposing the shielding unit 380 may be included in the procedure of disposing the short-range communication antenna 340 without performing the procedure of disposing the shielding unit 380 at one side of the printed circuit board 301. That is, as described above, according to the embodiment shown in FIG. 8, when the shielding unit 380 is inserted into the printed circuit board 301, the entire thickness of the wireless power receiver 300 may be reduced corresponding to the thickness of the adhesive 303. Thus, a separate procedure of attaching the shielding unit 380 is not necessary, so the manufacturing process may be simplified.

[0085] Referring again to FIG. 4, the controller 390 may control an entire operation of the wireless power receiver 300.

[0086] The controller 390 may change an operating mode of the wireless power receiver 300 into a charging mode or a communication mode according to a reception of the power. In the embodiment, the charging mode may be that the wireless power receiver 300 does not communicate with an outside through the short-range communication module 370, but receives power from the transmitting coil 210. The communication mode may be that the wireless power receiver 300 does not receive power from the transmitting coil 210, but communicate with an outside through the short-range communication module 370.

[0087] The controller 390 may change the conducting state of the short-range communication antenna 340 by opening or shorting the switch 350. If a current is induced to the receiving coil 310 in the state that the switch 350 is shorted, the controller 390 may open the switch 350 to change the operating mode of the wireless power receiver 300 into the charging mode. That is, if the controller 390 receives power from the transmitting coil 210, the controller

390 opens the switch 350 to prevent the current from flowing through the short-range communication antenna 340. In the state that the switch 350 is opened, if a current is not induced to the receiving coil 310, the controller 390 may short the switch 350 to change the operating mode of the wireless power receiver 300 into the communication mode. That is, if the controller does not receive power from the transmitting coil 210, the controller 390 may short the switch 350 to allow a current to conduct the short-range communication antenna 340.

[0088] The controller 390 may sense the current flowing through the receiving coil 310 for changing the conductive state of the short-range communication antenna 340. In another embodiment, the wireless power receiver 300 may further include a separate current sensing unit (not shown) which can sense the current induced to the receiving coil 310 to sense the current flowing through the receiving coil 310.

[0089] The controller 390 may open or short the switch 350 according to an amount of power received at the wireless power receiver 300. This will be described below with reference to FIG. 11.

[0090] FIG. 11 is a flowchart illustrating a control method of the wireless power receiver according to the embodiment.

[0091] Hereinafter, the control method of the wireless power receiver according to the embodiment will be described with reference to FIGS. 1 to 10.

[0092] In step S101, the controller 390 may determine whether the receiving coil 310 receives power from the transmitting coil 210 through electromagnetic induction. In the embodiment, the wireless power receiver 300 may further include a detecting unit (not shown) to determine whether power is received. A detecting coil may be used as the detecting unit.

[0093] In step S103, if it is determined that the receiving coil 310 receives power from the transmitting coil 210 through electromagnetic induction, the switch 350, which changes the conductive state of the short-range communication antenna 340, may be opened. That is, the controller 390 may transmit an open signal to the switch 350 to prevent the current from flowing through the short-range communication antenna 340. In the embodiment, when it is determined that the receiving coil 310 receives power from the transmitting coil 210 through electromagnetic induction, the wireless power receiver 300 may be in the charging mode. When the wireless power receiver 200 is operated in the charging mode to receive power from the transmitting coil 310, the current flowing through the short-range communication antenna must be shut off

because the magnetic field generated during the charging mode may interfere with the communication between the short-range communication module 370 and the outside.

[0094] Then, in step S105, the controller 390 may determine whether the amount of power received at the wireless power receiver 300 is more than the threshold value. In the embodiment, although the threshold value corresponds to the state that the wireless power receiver 300 is charged at 100%, the threshold value is not limited thereto and may be variously set by a user.

[0095] Then, in step S107, when the amount of power has the threshold value or above, the controller 390 allows the switch to be shorted. In this case, the wireless power receiver 300 terminates the charging mode and operates in the communication mode.

[0096] Then, in step S109, the controller 390 determines whether the current flowing through the short-range communication antenna 340 is equal to or greater than the threshold current value. In step S111, when the current flowing through the short-range communication antenna 340 is equal to or greater than the threshold current value, the current flowing direction may be changed. In the embodiment, the threshold current value may mean a limit value allowing the short-range communication to be operated normally. In the embodiment, the threshold current value may be variously set by a user. In the embodiment, the change of the current flowing direction may be performed through the protecting unit 360. In the embodiment, the protecting unit 360 may be a zener diode. If the current having the threshold current value or above flows, the zener diode performs the function of discharging the current as thermal energy. In this case, the zener diode may prevent an overcurrent from flowing through the short-range communication module 370, such that damage of the short-range communication module 370 may be prevented.

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.

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Jeff Lloyd, Patent Attorney, Reg. No. 35,589

CLAIM OF PRIORITY UNDER 35 USC §119
Patent Application
Docket No. SUN.LGI.417D2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Ki Min Lee, Jung Oh Lee
Filed	:	August 10, 2017
For	:	Wireless Power Receiver and Control Method Thereof

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CLAIM OF PRIORITY UNDER 35 USC §119

Sir:

Applicants in the patent application identified above hereby reaffirm their claim to the right of priority granted pursuant to 35 USC §119 based upon Korean Application No. 10-2011-0114721, filed November 4, 2011.

A certified copy of the above Korean application can be found in the parent application, U.S. Application No. 15/195,390 or in ancestral application U.S. Application No. 13/658,116 (now U.S. Patent No. 9,461,364). Applicants respectfully request that a certified copy of the foreign priority application be made of record in the subject application pursuant to MPEP 201.14(b).

Respectfully submitted,

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PTO/SB/08A (08-03)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet	1	of	5

Complete if Known	
Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No. [1]	Document Number Number - Kind Code [2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U1	2012/0205989-A1	08-16-2012	Baarman	ALL
	U2	2009/0284082-A1	11-19-2009	Mohammadian	ALL
	U3	2013/0038278-A1	02-14-2013	Park *et al.*	ALL
	U4	2013/0113422-A1	05-09-2013	Lee *et al.*	ALL
	U5	2009/0096413-A1	04-16-2009	Partovi *et al.*	ALL
	U6	2011/0018358-A1	01-27-2011	Osamu Kozakai	ALL
	U7	2011/0227420-A1	09-22-2011	Takashi Urano	ALL
	U8	2004/0130915-A1	07-08-2004	David W. Baarman	ALL
	U9	2009/0309550-A1	12-17-2009	Chih-Min Liu	ALL
	U10	2011/0115303-A1	05-19-2011	Baarman *et al.*	ALL
	U11	5,430,618-A	07-04-1995	George Y. Huang	ALL
	U12	2011/0316475-A1	12-29-2011	Jung *et al.*	ALL
	U13	2010/0146308-A1	06-10-2010	Gioscia *et al.*	ALL
	U14	2008/0211455 -A1	09-04-2008	Park *et al.*	ALL
	U15	2011/0025265-A1	02-03-2011	Mochida *et al.*	ALL
	U16	2010/0191306-A1	07-29-2010	Stevenson *et al.*	ALL
	U17	2008/0197960-A1	08-21-2008	Hasegawa *et al.*	ALL
	U18	2009/0237194-A1	09-24-2009	Waffenschmidt *et al.*	ALL
	U19	2007/0182367-A1	08-09-2007	Afshin Partovi	ALL
	U20	2010/0066304-A1	03-18-2010	Masanori Oshimi	ALL

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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Sheet 2 of 5

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Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number - Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	U21	2012/0282857-A1	11-08-2012	Andrew Zhang	ALL
	U22	9,240,824-B2	01-19-2016	Hillan *et al.*	ALL
	U23	2011/0217927-A1	09-08-2011	Ben-Shalom *et al.*	ALL
	U24	2011/0127953-A1	06-02-2011	Walley *et al.*	ALL

FOREIGN PATENT DOCUMENTS

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	F1	KR-10-2005-0105200-A	11-03-2005	Access Business Group International LLC	ALL	
	F2	KR-10-2010-0112400-A	10-19-2010	LG Innotek Co., Ltd.	ALL	
	F3	KR-10-2008-0095643-A	10-29-2008	LS Cable Ltd.	ALL	
	F4	WO-2010/047850-A1	04-29-2010	Qualcomm Inc.	ALL	
	F5	KR-10-2013-0016588-A	02-18-2013	Samsung Electronics Co., Ltd.	ALL	
	F6	KR-10-2013-0049608-A	05-14-2013	LG Innotek Co., Ltd.	ALL	
	F7	KR-10-2013-0072181-A	07-01-2013	Amosense Co., Ltd.	ALL	
	F8	KR-10-2013-0049781-A	05-14-2013	LG Innotek Co., Ltd.	ALL	
	F9	KR-10-2013-0015244-A	02-13-2013	LG Electronics Inc.	ALL	
	F10	KR-10-1298660-B1	08-14-2013	Seoul Electronics & Telecom	ALL	
	F11	KR-10-2011-0120122-A	11-03-2011	Jong Ho Kim	ALL	
	F12	KR-10-2011-0033836-A	03-31-2011	Min Sun Cho	ALL	

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Art Unit	
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Attorney Docket Number	SUN.LGI.417D2

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	F13	KR-10-2008-0074640-A	08-13-2008	Anyquitous Co., Ltd.	ALL	
	F14	CN-10-1971453-A	02-09-2011	Mojo Mobility Inc.	ALL	
	F15	CN-10-1964678-A	02-02-2011	Sony Corp.	ALL	
	F16	CN-20-1749754-U	02-16-2011	Beijing MXH Device Ltd.	ALL	
	F17	CN-2012-15827-Y	04-01-2009	Inventec Shanghai Electronics Co., Ltd.	ALL	
	F18	CN-20-1663492-U	12-01-2010	Fudatong Technology Corp.	ALL	
	F19	JP-2010-073976-A	04-02-2010	Yazaki Corp.	ALL	
	F20	JP-2006-302567-A	11-02-2006	Nec Tokin Corp., *et al.*	ALL	
	F21	CN-10-2195366-A	09-21-2011	TDK Corp.	ALL	
	F22	CN-1768462-A	05-03-2006	Access Business Group Int., LLC.	ALL	
	F23	TW-2009-52303-A	12-16-2009	KYE Systems Corp.	ALL	
	F24	EP-2367262-A2	09-21-2011	Hanrim Postech Co., Ltd.	ALL	
	F25	WO-2007/015599-A1	02-08-2007	LS Cable Ltd.	ALL	
	F26	TW-201132014-A	09-16-2011	Qualcomm Incorporated	ALL	
	F27	KR-10-2011-0056334-A	05-26-2011	Powermat Ltd.	ALL	
	F28	JP-2011-523336-A	08-04-2011	N/A	ALL	

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Sheet 4 of 5

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Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	R1	Office Action dated December 26, 2012 in Korean Application No. 10-2011-0114721, filed November 4, 2011.	
	R2	Office Action dated July 22, 2013 in Korean Application No. 10-2011-0114721, filed November 4, 2011.	
	R3	Notice of Allowance dated October 23, 2013 in Korean Application No. 10-2011-0114721, filed November 4, 2011.	
	R4	Search Report dated September 3, 2013 in Korean Application No. 10-2013-0100314, filed August 23, 2013.	
	R5	Office Action dated January 6, 2014 in Korean Application No. 10-2013-0100314.	
	R6	Office Action dated June 26, 2014 in Chinese Application No. 201210432152.X.	

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Application Number	
Filing Date	August 10, 2017
First Named Inventor	Ki Min Lee
Art Unit	
Examiner Name	
Attorney Docket Number	SUN.LGI.417D2

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article, (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	R7	Office Action dated July 17, 2014 in Korean Application No. 10-2013-0018321.	
	R8	Office Action dated August 6, 2014 in Taiwanese Application No. 101139085.	
	R9	European Search Report dated February 18, 2015 in European Application No. 12189931.4.	
	R10	European Search Report dated February 17, 2015 in European Application No. 14167637.9.	
	R11	Office Action dated April 19, 2017 in Taiwanese Application No. 105133529.	
	R12	Office Action dated May 15, 2017 in Korean Application No. 10-2014-0081260.	

Examiner Signature		Date Considered	

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[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Jeff Lloyd, Patent Attorney, Reg. No. 35,589

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R §§ 1.97 AND 1.98
Patent Application
Docket No. SUN.LGI.417D2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Ki Min Lee, Jung Oh Lee
Filed	:	August 10, 2017
For	:	Wireless Power Receiver and Control Method Thereof

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§1.97 AND 1.98

Sir:

In accordance with 37 CFR §1.97 and §1.98, Applicants would like to bring to the attention of the Examiner the references cited in the following patent applications:

U.S. Serial No. 13/658,116, filed October 23, 2012, and U.S. Serial No. 15/195,390, filed June 28, 2016.

The subject application claims the benefit under 35 USC §120 of the filing date of patent application Serial Nos. 13/658,116 and 15/195,390. In accordance with 37 CFR §1.98(d), Applicants respectfully request that the copies of references supplied in the Information Disclosure Statements of the 13/658,116 and 15/195,390 applications as well as references cited during the prosecutions thereof be made of record in the subject application. As copies of the references filed in the 13/658,116 and 15/195,390 applications and cited on the attached form PTO/SB/08 can be found in the 13/658,116 and 15/195,390 casefiles, copies of those references are not provided herewith.

It is respectfully requested that the references cited in the 13/658,116 and 15/195,390 applications be considered in the examination of the subject application and that their consideration be made of record.

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Applicants respectfully assert that the substantive provisions of 37 CFR §§1.97 and 1.98 are met by the foregoing statements.

The Commissioner is hereby authorized to charge any fees under 37 CFR §§1.16 or 1.17 as required by this paper to Deposit Account No. 19-0065.

Respectfully submitted,

Jeff Lloyd
Patent Attorney
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Phone No.: 352-375-8100
Fax No.: 352-372-5800
Address: P.O. Box 142950
Gainesville, FL 32614-2950

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	WIRELESS POWER RECEIVER AND CONTROL METHOD THEREOF

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: LEE, Ki Min Date (Optional): 2012. 10. 16.

Signature: _____

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	WIRELESS POWER RECEIVER AND CONTROL METHOD THEREOF

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [x] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: LEE, Jung Oh Date (Optional): 2012. 10. 16

Signature: _____

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 15673763 Document Date: 08/10/2017

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

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Form Revision Date: August 26, 2013

PTO/AIA/82B(07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

■ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

23557

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Name	Registration Number		Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

■ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant:

☐ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (*e.g.*, a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature	Jeong Joong Kim	Date	October 5, 2012
Name	Jeong-Joong Kim	Telephone	+82-31-436-7890
Title and Company	Vice President, LG Innotek Co., Ltd.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

☐ *Total of _____ forms are submitted.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Filer:	Jeff Lloyd/Miranda Price
Attorney Docket Number:	SUN.LGI.417D2

Filed as Large Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4000	4000
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	9	80	720
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**6460**

Electronic Acknowledgement Receipt

EFS ID:	30043051
Application Number:	15673763
International Application Number:	
Confirmation Number:	7725
Title of Invention:	Wireless Power Receiver and Control Method Thereof
First Named Inventor/Applicant Name:	Ki Min Lee
Customer Number:	23557
Filer:	Jeff Lloyd/Miranda Price
Filer Authorized By:	Jeff Lloyd
Attorney Docket Number:	SUN.LGI.417D2
Receipt Date:	10-AUG-2017
Filing Date:	
Time Stamp:	14:15:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6460
RAM confirmation Number	081117INTEFSW14181500
Deposit Account	190065
Authorized User	Miranda Price
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	SUN-LGI-417D2-Track1.pdf	140631 26f8635ddd2a2e6d0e09184fbd0a2996938 3c73e	no	2
Warnings:					
Information:					
2	Application Data Sheet	ADS.pdf	1823213 63a84f798e8f12fcd83ce15996b2090e8fe80 49a	no	8
Warnings:					
Information:					
3		SUN-LGI-417D2-App-AF.pdf	253243 27fe289ad29c94aa222019d5486b6671df7c 4675	yes	30

Multipart Description/PDF files in .zip description

Document Description	Start	End
Drawings-other than black and white line drawings	20	30
Abstract	19	19
Claims	15	18
Specification	1	14

Warnings:					
Information:					
4	Request for USPTO to retrieve priority docs	Claim-of-Priority.pdf	60200 91f721fab9fd16a2efd1356852f219d6fea1d aa8	no	1
Warnings:					
Information:					

5		IDS.pdf	627846 948ec3266d2030ed667af8ae6206f437c9a79778	yes	7
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Information Disclosure Statement (IDS) Form (SB08)		3	7	
	Transmittal Letter		1	2	
Warnings:					
Information:					
6	Oath or Declaration filed	Dec-AF.pdf	93535 96772e38930ec7c67af306b60041fc928d2e1080	no	2
Warnings:					
Information:					
7	Power of Attorney	POA.pdf	60076 661ed07583d3c7a5f7ced369520c4586f09ded99	no	1
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	41957 07b10b3e1711f76b91a86991a8ea42be9a52deff	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3100701		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.