AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00454-ADA	4/30/2021	Western District of Texas

PLAINTIFF	DEFENDANT
SCRAMOGE TECHNOLOGY LIMITED	SAMSUNG ELECTRONICSCO., LTD.; and SAMSUNG ELECTRONICS AMERICA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,553,476	1/24/2017	Scramoge Technology Limited
2	9,825,482	11/21/2017	Scramoge Technology Limited
3	9,997,962	6/12/2018	Scramoge Technology Limited
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY
6/22/2021	☑ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,843,215	12/12/2017	Scramoge Technology Limited
2	10,367,370	7/30/2019	Scramoge Technology Limited
3	10,424,941	9/24/2019	Scramoge Technology Limited
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

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AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00616	6/15/2021	Western District of Texas

PLAINTIFF	DEFENDANT
SCRAMOGE TECHNOLOGY LIMITED	GOOGLE LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,843,215	12/12/2017	Scramoge Technology Limited
2	10,367,370	7/30/2019	Scramoge Technology Limited
3	10,804,740	10/13/2020	Scramoge Technology Limited
4	9,997,962	6/12/2018	Scramoge Technology Limited
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

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AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00579	6/7/2021	Western District of Texas

PLAINTIFF	DEFENDANT
SCRAMOGE TECHNOLOGY LIMITED	APPLE INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,622,842	4/14/2020	Scramoge Technology Limited
2	9,806,565	10/31/2017	Scramoge Technology Limited
3	10,804,740	10/13/2020	Scramoge Technology Limited
4	9,843,215	12/12/2017	Scramoge Technology Limited
5	10,424,941	9/24/2019	Scramoge Technology Limited

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

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AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00579	6/7/2021	Western District of Texas

PLAINTIFF	DEFENDANT
SCRAMOGE TECHNOLOGY LIMITED	APPLE INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,622,842	4/14/2020	Scramoge Technology Limited
2	9,806,565	10/31/2017	Scramoge Technology Limited
3	10,804,740	10/13/2020	Scramoge Technology Limited
4	9,843,215	12/12/2017	Scramoge Technology Limited
5	10,424,941	9/24/2019	Scramoge Technology Limited

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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DECISION/JUDGEMENT

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Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

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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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/636,347	03/03/2015	Jai Hoon YEOM	0106.001POA1

CONFIRMATION NO. 9944

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

POA ACCEPTANCE LETTER

OC000000124919226

Date Mailed: 04/16/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/14/2021.

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**.

/tmwilliams/

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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028

CONFIRMATION NO. 9944

34610
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

POWER OF ATTORNEY NOTICE

OC000000124919096

Date Mailed: 04/16/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/14/2021.

- 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**.

/tmwilliams/

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	[signature]	Date (Optional)	FEB 19 2021
Name	Carlos Olaso		
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

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	14/636,347
Filing Date	03-03-2015
First Named Inventor	Jai Hoon YEOM
Title	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
Art Unit	2859
Examiner Name	BERHANU, SAMUEL
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.

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	9,843,215
Issue Date	12-12-2017
Application Number	14/636,347
Filing Date	03-03-2015
First Named Inventor	Jai Hoon YEOM
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 13, 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.

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.: 9,843,215 Filed/Issue Date: 12-12-2017

Titled: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

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: YEOM, JAI HOON, LEE, SANG WON, BAE, SEOK, KIM, SO YEON, NOH, JIN MI, SONG, JI YEON, LEE, HEE JU To: LG INNOTEK CO., LTD.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 035073, Frame 0324, 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 13, 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.

Electronic Acknowledgement Receipt

EFS ID:	42438381
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Khaled Shami/Susanh Perez
Filer Authorized By:	Khaled Shami
Attorney Docket Number:	CJL-0028
Receipt Date:	14-APR-2021
Filing Date:	03-MAR-2015
Time Stamp:	09:57:55
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	Transmittal Letter	Pat_9843215_POA_Transmittal.pdf	236854 8181e7ac58b56eeb712ca2be2f7a86c71445bf4c	no	1
Warnings:					
Information:					
3	Change of Address	Pat_9843215_aia0123.pdf	263712 ccb8d5abbd88f46e4fd628dd67983cc476430e4b	no	2
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	Pat_9843215_373_aia0096.pdf	167205 592c974913eabc085e73b991bab40855600e0421	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	1723539		

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.

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/636,347	12/12/2017	9843215	CJL-0028	9944

34610 7590 11/21/2017

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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 21 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):

Jai Hoon YEOM, Seoul, KOREA, REPUBLIC OF;
LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF;
Sang Won LEE, Seoul, KOREA, REPUBLIC OF;
Seok BAE, Seoul, KOREA, REPUBLIC OF;
So Yeon KIM, Seoul, KOREA, REPUBLIC OF;
Jin Mi NOH, Seoul, KOREA, REPUBLIC OF;
Ji Yeon SONG, Seoul, KOREA, REPUBLIC OF;
Hee Jung 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)

34610 7590 08/11/2017
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$960	$960	11/13/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
BERHANU, SAMUEL	2859	320-108000

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 KED & Associates, LLP
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, REPUBLIC OF 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. Issue Fee previously submitted on June 27, 2017
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 16-0607 (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 /David D. Nelson/ Date November 6, 2017

Typed or printed name David D. Nelson Registration No. 47,818

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 Acknowledgement Receipt

EFS ID:	30865374
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Elisa Becker
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	06-NOV-2017
Filing Date:	03-MAR-2015
Time Stamp:	15:35:52
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	Issue Fee Payment (PTO-85B)	IssueFeeTransmittal.pdf	995828 3407b2578e35df0c694cb5e52a6c465d5419a131	no	1

Warnings:

Information:	
Total Files Size (in bytes):	995828

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

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

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New International Application Filed with the USPTO as a Receiving Office

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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)

34610 7590 08/11/2017
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

11/07/2017 HVUONG2 00000015 14636347

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$960	$960	11/13/2017

01 FC:1501 960.00 OP

EXAMINER	ART UNIT	CLASS-SUBCLASS
BERHANU, SAMUEL	2859	320-108000

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 KED & Associates, LLP
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, REPUBLIC OF 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. Issue Fee previously submitted on June 27, 2017
☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 16-0607 (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 /David D. Nelson/ Date November 6, 2017

Typed or printed name David D. Nelson Registration No. 47,818

Document date: 11/07/2017 HVUONG2
05/30/2017 INTEFSW 00003384 14636347
01 FC:1501 -960.00 OP

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

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UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
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NOTICE OF ALLOWANCE AND FEE(S) DUE

34610 7590 08/11/2017

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER
BERHANU, SAMUEL

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 08/11/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$960	$960	11/13/2017

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: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

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P.O. Box 8638
Reston, VA 20195

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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EXAMINER	ART UNIT	CLASS-SUBCLASS
BERHANU, SAMUEL	2859	320-108000

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.
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2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
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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
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  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
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

34610 7590 08/11/2017

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER	
BERHANU, SAMUEL	
ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 08/11/2017

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. 14/636,347	Applicant(s) YEOM ET AL.	
	Examiner SAMUEL BERHANU	Art Unit 2859	AIA (First Inventor to File) Status Yes

-- 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 *Remarks filled on 07/06/2017*.
   ☐ 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 *1-6,10,12,18-20, 22, 25-34*. 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 _____
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 _____.

/SAMUEL BERHANU/
Primary Examiner, Art Unit 2859

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	Art Unit
	SAMUEL BERHANU	2859

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
320	108	8/21/2016	SB

* 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 inventor search conducted----------see printout	8/21/2016	SB

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	PGPUB CLAIM TEXT SEARCH CONDUCTED----SEE PRINTOUT	3/14/2017	SB
	Updated	8/6/2017	SB

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	34	(magnetic layer polymeric coil alloy).clm.	US-PGPUB; USPAT	AND	ON	2017/08/06 21:51
L2	0	(magnetic layer polymeric coil alloy charg$3).clm.	US-PGPUB; USPAT	WITH	ON	2017/08/06 21:52
L3	0	(magnetic layer surface coil alloy charg$3).clm.	US-PGPUB; USPAT	WITH	ON	2017/08/06 21:53

8/6/2017 10:20:58 PM
C:\Users\sberhanu\Documents\EAST\Workspaces\14636347\first.wsp

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	**Art Unit**
	SAMUEL BERHANU	2859

CPC						
Symbol					**Type**	**Version**
H02J		7	/	025	F	2013-01-01
H02J		5	/	005	I	2013-01-01
H02J		7	/	0042	I	2013-01-01
H02J		50	/	10	I	2016-02-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

(Assistant Examiner)	(Date)	**Total Claims Allowed:** 22	
/SAMUEL BERHANU/ Primary Examiner.Art Unit 2859	08/06/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5,6

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	**Art Unit**
	SAMUEL BERHANU	2859

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
320	108	H	0	2	J	7 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

(Assistant Examiner)	(Date)	Total Claims Allowed: 22	
/SAMUEL BERHANU/ Primary Examiner.Art Unit 2859	08/06/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5,6

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	**Art Unit**
	SAMUEL BERHANU	2859

☐ 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	21	33										
2	2	13	18	22	34										
3	3	14	19												
4	4	15	20												
5	5	-	21												
6	6	16	22												
-	7	-	23												
-	8	-	24												
-	9	17	25												
7	10	18	26												
-	11	9	27												
8	12	10	28												
-	13	11	29												
-	14	12	30												
-	15	19	31												
-	16	20	32												

(Assistant Examiner)	(Date)	**Total Claims Allowed:** 22	
/SAMUEL BERHANU/ Primary Examiner.Art Unit 2859	08/06/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5,6

REQUEST FOR CONTINUED EXAMINATION (RCE)
TRANSMITTAL UNDER 37 C.F.R. §1.114

DOCKET NUMBER:	**CJL-0028**
Prior Appln Serial No.:	**14/636,347**
Filed:	**March 3, 2015**
Inventor(s):	**Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE**
Confirmation No.:	**9944**
Group Art Unit:	**2859**
Examiner:	**Samuel BERHANU**

U.S. Patent and Trademark Office
Customer Service Window, **Mail Stop RCE**
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

NOTE: 37 C.F.R. §1.114 is effective on May 29, 2000. If the above-identified application was filed prior to May 29, 2000, applicant may wish to consider filing a continued prosecution application (CPA) under 37 C.F.R. §1.53(d) (PTO/SB/29) instead of a RCE to be eligible for the patent term adjustment provisions of the AIPA. See Changes to Application Examination and Provisional Application Practice, Final Rule, 65 Fed. Reg. 50092 (Aug. 16, 2000); Interim Rule, 65 Fed. Reg. 14865 (Mar. 20, 2000), 1233 Off. Gaz. Pat. Office 47 (Apr. 11, 2000), which established RCE practice.

1. **Submission required under 37 C.F.R. §1.114**
   - a. ☐ Previously submitted
     - i. ☐ Consider the amendment(s/reply under 37 C.F.R. §1.116 previously filed on _____ (Any unentered amendment(s) referred to above will be entered).
     - ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
     - iii. ☐ Other: _____
   - b. ☒ Enclosed
     - i. ☒ Amendment/Reply
     - ii. ☐ Affidavit(s)/Declaration(s)
     - iii. ☐ Information Disclosure Statement (IDS)
     - iv. ☐ Other. _____
2. **Miscellaneous**
   - a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. §1.103(c) for a period of _____ months. Fee amount $130.00 under 37 C.F.R. §1.17(i) enclosed. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R.§1.17(i) required).
   - b. ☐ Other. _____
3. **Fees** ☒ RCE fee required under 37 C.F.R. §1.17(e); Small Entity $600.00, other than small entity $1,200.00. The RCE fee under 37 C.F.R. §1.17(e) is required by 37 C.F.R. §1.114 when the RCE is filed.
   ☒ Petition to Withdraw from Issue fee (37 C.F.R. §§1.313 and 1.17); $140.00

   Payment by:
   - a. ☐ Check in the amount of $_____ (Check No. _____) enclosed.
   - b. ☒ Please charge my Credit Card.
   - c. ☐ Please charge my Deposit Account No. 16-0607 in the amount of $_____. A duplicate copy of this sheet is enclosed.

The Commissioner is hereby authorized to charge payment of any deficiency in the above fees associated with this communication or credit any overpayment to Deposit Account No. 16-0607.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David D. Nelson/

David D. Nelson, Esq.
Registration No. 47,818
Daniel Y.J. Kim, Esq.
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
703 766-3777 DYK/DDN:eb
Please direct all correspondence to Customer Number 34610
Q:\Documents\2417-028\672799

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of		Confirmation No.:	**9944**
Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE		Group Art Unit:	**2859**
Serial No.:	**14/636,347**	Examiner:	**Samuel BERHANU**
Filed:	**March 3, 2015**	Customer No.:	**34610**

For: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

REPLY AND/OR AMENDMENT UNDER 37 C.F.R. §1.114

U.S. Patent and Trademark Office
Customer Service Window, **MAIL STOP RCE**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

In connection with a Request for Continued Examination (RCE) and a Petition to Withdraw this Application from issue, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims.

Remarks/Arguments begin after the listing of the claims.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A wireless charging and communication board, comprising:

a plurality of soft magnetic layers comprising a first soft magnetic layer and a second soft magnetic layer;

a first polymeric material layer arranged on a first surface of the plurality of soft magnetic layers;

a second polymeric material layer arranged on a second surface of the plurality of soft magnetic layers opposed to the first surface; and

a coil pattern arranged on the second polymeric material layer,

wherein the plurality of soft magnetic layers are positioned between the first polymeric material layer and the second polymeric material layer,

wherein the first polymeric material layer includes a first extending portion extending longer than the plurality of soft magnetic layers,

wherein the second polymeric material layer includes a second extending portion extending longer than the plurality of soft magnetic layers, [[and]]

wherein the first extending portion and the second extending portion are connected to ~~contact~~ each other.

wherein at least one of the first soft magnetic layer or the second soft magnetic layer is made with one or more of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, or a silicon steel plate.

2. (Currently Amended) The wireless charging and communication board of claim 1, wherein a distance between the first extending portion and the second extending portion becomes closer [[of]] to the soft magnetic layer as the plurality soft magnetic layers become farther apart.

3. (Previously Presented) The wireless charging and communication board of claim 2, wherein a length(l) of the first extending portion or the second extending portion and a thickness(h) of the plurality of soft magnetic layers have a relation of the following equation, wherein A represents a constant of 0.6 to 10:

[equation]

$l = A \times h$.

4. (Previously Presented) The wireless charging and communication board of claim 1, wherein at least one of the first polymeric material layer or the second polymeric material layer contains one or more of polyethylene, polyacrylic, polyimide, polyamide, or polyurethane.

5. (Previously Presented) The wireless charging and communication board of claim 1, further comprising an adhesive layer that adheres the first polymeric material layer and the second polymeric material layer to the plurality of soft magnetic layers.

6. (Previously Presented) The wireless charging and communication board of claim 1, wherein an air gap is further formed between the plurality of soft magnetic layers, the first extending portion, and the second extending portion .

7-9. (Canceled)

10. (Currently Amended) The wireless charging and communication board of claim 1, further comprising a lead frame connected to the coil pattern,

wherein the first polymeric material layer and the second polymeric material layer are arranged to surround the lead frame.

11. (Canceled)

12. (Currently Amended) The wireless charging and communication board of claim 1, wherein the first polymeric material layer and the first extending portion are made with a same material.

13-17. (Canceled)

18. (Currently Amended) A portable terminal, comprising:

a housing;

a plurality of soft magnetic layers arranged in the housing, and comprising a first soft magnetic layer and a second soft magnetic layer;

a first polymeric material layer arranged on a first surface of the plurality of soft magnetic layers;

a second polymeric material layer arranged on a second surface of the plurality of soft magnetic layers opposed to the first surface; and

a coil pattern arranged on the second polymeric material layer,

wherein the plurality of soft magnetic layers are disposed between the first polymeric material layer and the second polymeric material layer,

wherein the first polymeric material layer comprises a first extending portion extending longer than the plurality of soft magnetic layers,

wherein the second polymeric material layer comprises a second extending portion extending longer than the plurality of soft magnetic layers, and

wherein the first extending portion and the second extending portion are connected to ~~contact with~~ each other, and

wherein at least one of the first soft magnetic layer or the second soft magnetic layer is made with one or more of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, or a silicon steel plate.

19. (Previously Presented) The portable terminal of claim 18, wherein a distance between the first extending portion and the second extending portion becomes closer as the plurality of soft magnetic layers becomes farther apart.

20. (Previously Presented) The portable terminal of claim 19, wherein a length (l) of the first extending portion or the second extending portion and a thickness (h) of the plurality of soft magnetic layers have a relation of the following equation, wherein A represents a constant of 0.6 to 10:

[equation]

$l = A \times h$.

21. (Canceled)

22. (Currently Amended) The portable terminal of claim 18, further comprising a lead frame connected to the coil pattern,

wherein the first polymeric material layer and the second polymeric material layer are arranged to surround the lead frame.

23. (Canceled)

24. (Canceled)

25. (Previously Presented) The portable terminal of claim 18, wherein the first polymeric material layer and the first extending portion are made of a same material.

26. (Previously Presented) The portable terminal of claim 18, further comprising an adhesive layer to adhere the first polymeric material layer and the second polymeric material layer to the plurality of soft magnetic layers.

27. (New) The wireless charging and communication board of claim 1, wherein the second soft magnetic layer is arranged on the first soft magnetic layer.

28. (New) The wireless charging and communication board of claim 1, wherein the coil pattern includes a first coil pattern and a second coil pattern which arranged to surround a side of the first coil pattern,

wherein the first coil pattern includes a wireless charging antenna, and the second coil pattern includes a near field communication antenna.

29. (New) The wireless charging and communication board of claim 1, wherein the first extending portion and the second extending portion contact each other.

30. (New) The wireless charging and communication board of claim 1, further comprising an adhesive layer positioned between the first extending portion and the second extending portion,

wherein the first extending portion adheres to the second extending portion.

31. (New) The portable terminal of claim 18, wherein the second soft magnetic layer is provided on the first soft magnetic layer.

32. (New) The portable terminal of claim 18, wherein the coil pattern includes a first coil pattern and a second coil pattern which arranged to surround a side of the first coil pattern,

wherein the first coil pattern includes a wireless charging antenna, and the second coil pattern includes a near field communication antenna.

33. (New) The portable terminal of claim 18, wherein the first extending portion and the second extending portion contact each other.

34. (New) The portable terminal of claim 18, further comprising an adhesive layer positioned between the first extending portion and the second extending portion,

wherein the first extending portion adheres to the second extending portion.

REMARKS

Claims 1-6, 10, 12, 18-20, 22, and 25-34 are pending. Claims 1, 2, 10, 12, 18, and 22 are amended; claims 7, 8, 11, 21, 23, and 24 are canceled without prejudice or disclaimer; and new claims 27-34 are added. Prompt examination and allowance in due course are respectfully solicited. Applicant respectfully submits that the pending claims are allowable for reasons similar to the reasons identified in the Notice of Allowance mailed March 28, 2017.

CONCLUSION

Should the Examiner have any questions regarding the above-identified application, the Examiner is invited to contact the undersigned attorney, **David D. Nelson**, at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. §1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David D. Nelson/

David D. Nelson, Esq.
Registration No. 47,818
Daniel Y.J. Kim, Esq.
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
703 766-3777 DYK/DDN:eb

Please direct all correspondence to Customer Number 34610

Q:\Documents\2417-028\672534

Electronic Patent Application Fee Transmittal

Application Number:	14636347
Filing Date:	03-Mar-2015
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Filer:	Daniel Y.J. Kim/Elisa Becker
Attorney Docket Number:	CJL-0028

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PETITION FEE- 37 CFR 1.17(H) (GROUP III)	1464	1	140	140
RCE- 1st Request	1801	1	1200	1200
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1340**

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date : July 6, 2017

In re Application of :

Jai Hoon YEOM

DECISION ON PETITION
UNDER CFR 1.313(c)(2)

Application No : 14636347

Filed : 03-Mar-2015

Attorney Docket No : CJL-0028

This is an electronic decision on the petition under 37 CFR 1.313(c)(2), filed July 6, 2017 , to withdraw the above-identified application from issue after payment of the issue fee.

The petition is **GRANTED.**

The above-identified application is withdrawn from issue for consideration of a submission under 37 CFR 1.114 (request for continued examination). See 37 CFR 1.313(c)(2).

Petitioner is advised that the issue fee paid in this application cannot be refunded. If, however, this application is again allowed, petitioner may request that it be applied towards the issue fee required by the new Notice of Allowance.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

This application file is being referred to Technology Center AU 2859 for processing of the request for continuing examination under 37 CFR 1.114 .

Office of Petitions

Electronic Acknowledgement Receipt

EFS ID:	29706866
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Elisa Becker
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	06-JUL-2017
Filing Date:	03-MAR-2015
Time Stamp:	16:43:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1340
RAM confirmation Number	070717INTEFSW16431900
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	31578 8fce43988601a4e675938e161e65aee975981a79	no	2
Warnings:					
Information:					
2	Transmittal Letter	AmendmentTransmittal.pdf	66577 31ff1a2a257617f45282835bbdcd2d669d2fe111	no	1
Warnings:					
Information:					
3	Transmittal Letter	PetitionToWithdraw.pdf	62983 90281cfc93fbfa1e8c1b6b87c1d9720578d2540c	no	1
Warnings:					
Information:					
4	Request for Continued Examination (RCE)	RCE.pdf	69408 357cf1b2e767c85ca2f43ecb29c93360fc332e2d	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
5		Amendment.pdf	85025 74bcf9f5803d91adfb5176f21da268730506a0c5	yes	9

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment Submitted/Entered with Filing of CPA/RCE	1	1
Claims	2	8

	Applicant Arguments/Remarks Made in an Amendment		9	9	
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	32289 4c39522b71f7d1dc76a0f41709e7c4d758bb7191	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	347860		

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: PET.AUTO Document Description: Petition automatically granted by EFS-Web	PTO/SB/140 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**PETITION TO WITHDRAW AN APPLICATION FROM ISSUE AFTER PAYMENT OF THE ISSUE FEE UNDER 37 CFR 1.313(c)**
Application Number	14636347
Filing Date	03-Mar-2015
First Named Inventor	Jai Hoon YEOM
Art Unit	2859
Examiner Name	SAMUEL BERHANU
Attorney Docket Number	CJL-0028
Title	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

An application may be withdrawn from issue for further action upon petition by the applicant. To request that the Office withdraw an application from issue, applicant must file a petition under this section including the fee set forth in § 1.17(h) and a showing of good and sufficient reasons why withdrawal of the application from issue is necessary.

APPLICANT HEREBY PETITIONS TO WITHDRAW THIS APPLICATION FROM ISSUE UNDER 37 CFR 1.313(c).

A grantable petition requires the following items:
(1) Petition fee; and
(2) One of the following reasons:
(a) Unpatentability of one or more claims, which must be accompanied by an unequivocal statement that one or more claims are unpatentable, an amendment to such claim or claims, and an explanation as to how the amendment causes such claim or claims to be patentable;
(b) Consideration of a request for continued examination in compliance with § 1.114 (for a utility or plant application only); or
(c) Express abandonment of the application. Such express abandonment may be in favor of a continuing application, but not a CPA under 37 CFR 1.53(d).

Petition Fee

- ○ Small Entity
- ○ Micro Entity
- ◉ Regular Undiscounted

Reason for withdrawal from issue

◯ One or more claims are unpatentable ◉ Consideration of a request for continued examination (RCE) (List of Required Documents and Fees) ◯ Applicant hereby expressly abandons the instant application (any attorney/agent signing for this reason must have power of attorney pursuant to 37 CFR 1.32(b)).
RCE request,submission, and fee. ☐ I certify, in accordance with 37 CFR 1.4(d)(4) that : The RCE request ,submission, and fee have already been filed in the above-identified application on ☒ Are attached.
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application. ◯ An attorney or agent registered to practice before the Patent and Trademark Office, acting in a representative capacity. ◯ A sole inventor ◯ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ◯ A joint inventor; all of whom are signing this e-petition

Signature	/David D. Nelson/
Name	David D. Nelson
Registration Number	47818

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE

EXPEDITED PROCEDURE UNDER 37 C.F.R. § 1.114

Group Art Unit: **2859**

Serial No.: **14/636,347**

Filed: **March 3, 2015**

Examiner: **Samuel BERHANU**

Confirmation No.: **9944**

Customer No.: **34610**

For **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

U.S. Patent and Trademark Office
Customer Window, **MAIL STOP RCE**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Dear Sir:

Transmitted herewith is an Amendment and/or Reply in the above identified application.

☐ No additional fee is required.

☒ Also attached: **Request for Continued Examination**
Petition to Withdraw from Issue Under 37 C.F.R. §1.313

The fee has been calculated as shown below:

	NO. OF CLAIMS	HIGHEST PREVIOUSLY PAID FOR	EXTRA CLAIMS	RATE	FEE
Total Claims	22	20	2	x $80.00 =	**$160.00**
Independent Claims	2	3	0	x $420.00 =	**$0.00**
		If multiple claims newly presented, add $780.00			**$0.00**
		Fee for Request for Continued Examination			**$1,200.00**
		Fee for Petition to Withdraw from Issue			**$140.00**
		TOTAL FEE DUE			**$1,500.00**

☐ Please charge my Deposit Account No. 16-0607 in the amount of $_____. An additional copy of this transmittal sheet is submitted herewith.

☒ Please charge my Credit Card.

☒ The Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment, to Deposit Account No. 16-0607, including any filing fees under 37 C.F.R. §1.16 for presentation of extra claims and any patent application processing fees under 37 C.F.R.§ 1.17.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David D. Nelson/

David D. Nelson, Esq.
Registration No. 47,818
Daniel Y.J. Kim, Esq.
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
(703) 766-3777 DYK/DDN:eb
Please direct all correspondence to Customer Number 34610
Q:\Documents\2417-028\672803

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE

ISSUE FEE PAID: JUNE 27, 2017

Confirmation No.: **9944**

Serial No.: **14/636,347**

Filed: **March 3, 2015**

Group Art Unit: **2859**

Examiner: **Samuel BERHANU**

Customer No.: **34610**

For: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

PETITION TO WITHDRAW FROM ISSUE UNDER 37 C.F.R. §1.313(c)(2)

U.S. Patent and Trademark Office
Customer Service Window Mail Stop 313(c)
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

Applicants petition to withdraw the above-identified application from issue pursuant to 37 C.F.R. §1.313(c)(2) in favor of the Request for Continued Examination (RCE) and accompanying Amendment filed herewith.

The petition fee of $140.00 under 37 C.F.R. §1.17(h) is attached hereto.

Please charge any shortage in fees due in connection with the filing of this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David D. Nelson/

David D. Nelson, Esq.
Registration No. 47,818
Daniel Y.J. Kim, Esq.
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
703 766-3777 DYK/DDN:eb
Please direct all correspondence to Customer Number 34610
Q:\Documents\2417-028\672800

Electronic Patent Application Fee Transmittal

Application Number:	14636347
Filing Date:	03-Mar-2015
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Filer:	Daniel Y.J. Kim/Elisa Becker
Attorney Docket Number:	CJL-0028

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:				
CLAIMS IN EXCESS OF 20	1202	2	80	160
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

Electronic Acknowledgement Receipt

EFS ID:	29707468
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Elisa Becker
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	06-JUL-2017
Filing Date:	03-MAR-2015
Time Stamp:	16:45:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$160
RAM confirmation Number	070717INTEFSW16452001
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	30574 f98a0e9bf9d9f881277da4d54a70d0cae4b2cf34	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	30574		

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/636,347	Filing Date 03/03/2015	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	07/06/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 22	Minus	** 20	= 2	X $80 =	160
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**160**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						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 number found in the appropriate box in column 1.

LIE
LAJUAN HICKSON

10, the polymeric material layer 310, 312 may excessively extend so that the polymeric material layer can be easily bent and damaged by an external impact, or a thickness can be increased because a separate receiving part should be added.

Change(s) applied to document. /M.G./ 4/6/2017

Please replace paragraph [0074] with the following amended paragraph:

[0074] However, in the embodiment of FIG. 3, the wireless charging and communication board further includes a polymeric material connector 313 intended for connecting the first polymeric material layer 310 and the second polymeric material layer 312 and surrounding the exposed portion of the soft magnetic layer 220. In this specification, a term of the polymeric material connector 313 can be used with a term of the extending portion. That is, a first extending portion may be extended in the first polymeric material layer 310, and a second extending portion may be extended in the second polymeric material layer 312.

arranged on the other surface opposed to the one surface; and a coil pattern arranged on the second polymeric material layer, wherein the plurality of soft magnetic layers are disposed between the first polymeric material layer and the second polymeric material layer, wherein the first polymeric material layer comprises a first extending portion extending longer than the plurality of the soft magnetic layers, wherein the second polymeric material layer comprises a second extending portion extending longer than the plurality of the soft magnetic layers, and wherein the first extending portion and the second extending portion contact with each other.

Change(s) applied to document, /M.G./ 4/6/2017

[043]

Please replace paragraph ~~[0063]~~ with the following amended paragraph:

[0063] Also, an ~~extension~~extending portion length l of ~~the~~ a first polymeric material layer 310[[,]] or a second polymeric material layer 312 and a thickness h of the magnetic soft material layer 220, 230 may be formed to have a relation of the following Equation 1.

[044]

Please replace paragraph ~~[0066]~~ with the following amended paragraph:

[0066] At this time, l represents an ~~extension~~extending portion length of the first polymeric material layer 310 or the second polymeric material layer 312, h represents a thickness of the soft magnetic layer 220, 230, and A represents a constant of 0.6 to 10. When the value of A is less than 0.6, the polymeric material layer 310, 312 may not sufficiently surround the soft magnetic layer 220, 230, so that moisture can penetrate. When the value of A is more than

[0016] The plurality of the soft magnetic layer may include: a first soft magnetic layer; and a second soft magnetic layer arranged ~~at a periphery portion of~~ on the first soft magnetic layer ~~on the same plane on which the first soft magnetic layer is arranged~~.

Change(s) applied to document, /M.G./ 4/6/2017

[091]
Please replace paragraph ~~[0019]~~ with the following amended paragraph:

[0019] The wireless charging and communication board may further include a lead frame connected to the coil pattern. The first polymeric material layer and the second polymeric material layer may be arranged to surround the lead frame.

[093]
Please replace paragraph ~~[0021]~~ with the following amended paragraph:

[0021] ~~The~~ Any one of the first soft magnetic layer and the second soft magnetic layer may be made with any one of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, and a silicon steel plate.

[098]
Please replace paragraph ~~[0026]~~ with the following amended paragraph:

[0026] According to another aspect of embodiments of the present invention, ~~a wireless charging and communication device may include the wireless charging and communication board configured as described above~~ a portable terminal includes a housing; a plurality of soft magnetic layers arranged in the housing; a first polymeric material layer arranged on one surface of the plurality of the soft magnetic layers; a second polymeric material layer

Change(s) applied to document, /M.G./ 4/6/2017

AMENDMENTS TO THE SPECIFICATION

[082]-[088]

Please replace paragraphs ~~[0010]~~ - ~~[0016]~~ with the following amended paragraphs:

[0010] According to an aspect of embodiments of the present invention, a wireless charging and communication board may include: ~~a soft magnetic layer, a polymeric material layer arranged on one surface and the other surface of the soft magnetic layer and extending longer than an exposed portion of the soft magnetic layer, and a coil pattern arranged on the polymeric material layer~~ a plurality of soft magnetic layers; a first polymeric material layer arranged on one surface of the plurality of the soft magnetic layers; a second polymeric material layer arranged on the other surface opposed to the one surface; and a coil pattern arranged on the second polymeric material layer, wherein the plurality of soft magnetic layers are disposed between the first polymeric material layer and the second polymeric material layer, wherein the first polymeric material layer comprises a first extending portion extending longer than the plurality of the soft magnetic layers; wherein the second polymeric material layer comprises a second extending portion extending longer than the plurality of the soft magnetic layers, and wherein the first extending portion and the second extending portion contact with each other. The first polymeric material layer and the first extending portion are made of same material.

[0011] ~~The polymeric material layer may include a first polymeric material layer arranged on one surface of the soft magnetic layer, and a second polymeric material layer arranged on the other surface of the soft magnetic layer.~~ A distance between the first extending portion and

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)

34610 7590 03/28/2017
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	06/28/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
BERHANU, SAMUEL	2859	320-108000

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 KED & Associates, LLP
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, REPUBLIC OF 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.
☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 16-0607 (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 /David D. Nelson/ Date June 27, 2017
Typed or printed name David D. Nelson Registration No. 47,818

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:	14636347
Filing Date:	03-Mar-2015
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Filer:	Daniel Y.J. Kim/Elisa Becker
Attorney Docket Number:	CJL-0028

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	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt	
EFS ID:	29623736
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Elisa Becker
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	27-JUN-2017
Filing Date:	03-MAR-2015
Time Stamp:	16:18:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$960
RAM confirmation Number	062817INTEFSW16184700
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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)	IssueFee.pdf	175397 40b5bbef9372b191e66395badd9a9a2bb79d40a3	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30820 a675dbd3e7ff0fee93fd70fdc07377f6f6345fde	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	206217		

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

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

34610 7590 03/28/2017

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER
BERHANU, SAMUEL

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 03/28/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	06/28/2017

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: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

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
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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)

34610 7590 03/28/2017
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

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.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

TITLE OF INVENTION: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	06/28/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
BERHANU, SAMUEL	2859	320-108000

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

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14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

34610 7590 03/28/2017

KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER	
BERHANU, SAMUEL	
ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 03/28/2017

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. 14/636,347	Applicant(s) YEOM ET AL.	
	Examiner SAMUEL BERHANU	Art Unit 2859	AIA (First Inventor to File) Status Yes

-- 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 *11/21/2016*.
   ☐ 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 *1-8,10-12,18-26*. 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 _____
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 _____.

/SAMUEL BERHANU/
Primary Examiner, Art Unit 2859

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	Art Unit
	SAMUEL BERHANU	2859

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
320	108	8/21/2016	SB

SEARCH NOTES		
Search Notes	Date	Examiner
EAST inventor search conducted----------see printout	8/21/2016	SB

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	PGPUB CLAIM TEXT SEARCH CONDUCTED----SEE PRINTOUT	3/14/2017	SB

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L6	601	(magnetic and layer and coil and polymer).clm.	US-PGPUB; USPAT	OR	ON	2017/03/14 12:32
L7	20	(magnetic layer coil polymer).clm.	US-PGPUB; USPAT	WITH	ON	2017/03/14 12:32

3/14/2017 1:07:12 PM

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	**Art Unit**
	SAMUEL BERHANU	2859

CPC						
Symbol					**Type**	**Version**
H02J		7	/	025	F	2013-01-01
H02J		5	/	005	I	2013-01-01
H02J		7	/	0042	I	2013-01-01
H02J		50	/	10	I	2016-02-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	19	
/SAMUEL BERHANU/ Primary Examiner.Art Unit 2859	03/14/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	5,6

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	**Art Unit**
	SAMUEL BERHANU	2859

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
320	108	H	0	2	J	7 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/SAMUEL BERHANU/ Primary Examiner.Art Unit 2859 (Primary Examiner)	03/14/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 5,6

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14636347	YEOM ET AL.
	Examiner	**Art Unit**
	SAMUEL BERHANU	2859

☐ 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												
2	2	12	18												
3	3	13	19												
4	4	14	20												
5	5	15	21												
6	6	16	22												
7	7	17	23												
8	8	18	24												
-	9	19	25												
9	10	20	26												
10	11														
11	12														
-	13														
-	14														
-	15														
-	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/SAMUEL BERHANU/ Primary Examiner.Art Unit 2859 (Primary Examiner)	03/14/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 5,6

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: **9944**
Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE	Group Art Unit: **2859**
Serial No.: **14/636,347**	Examiner: **Samuel BERHANU**
Filed: **March 3, 2015**	Customer No.: **34610**

For: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

AMENDMENT

U.S. Patent and Trademark Office
Customer Window, **MAIL STOP AMENDMENT**
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

In reply to the Office Action of **August 25, 2016**, please amend the above-identified application as follows:

Amendments to the Specification are reflected in this paper.

Amendments to the Claims are reflected in the listing of claims.

Remarks/Arguments begin after the listing of the claims.

AMENDMENTS TO THE SPECIFICATION

Please replace paragraphs [0010]-[0016] with the following amended paragraphs:

[0010] According to an aspect of embodiments of the present invention, a wireless charging and communication board may include: ~~a soft magnetic layer, a polymeric material layer arranged on one surface and the other surface of the soft magnetic layer and extending longer than an exposed portion of the soft magnetic layer, and a coil pattern arranged on the polymeric material layer~~ a plurality of soft magnetic layers; a first polymeric material layer arranged on one surface of the plurality of the soft magnetic layers; a second polymeric material layer arranged on the other surface opposed to the one surface; and a coil pattern arranged on the second polymeric material layer, wherein the plurality of soft magnetic layers are disposed between the first polymeric material layer and the second polymeric material layer, wherein the first polymeric material layer comprises a first extending portion extending longer than the plurality of the soft magnetic layers; wherein the second polymeric material layer comprises a second extending portion extending longer than the plurality of the soft magnetic layers, and wherein the first extending portion and the second extending portion contact with each other. The first polymeric material layer and the first extending portion are made of same material.

[0011] ~~The polymeric material layer may include a first polymeric material layer arranged on one surface of the soft magnetic layer, and a second polymeric material layer arranged on the other surface of the soft magnetic layer.~~ A distance between the first extending portion and

the second extending portion may become closer as the plurality of the soft magnetic layers becomes farther.

[0012] ~~The wireless charging and communication board may further include a polymeric material connector intended for connecting the first polymeric material layer and the second polymeric material layer and surrounding the exposed portion of the soft magnetic layer.~~ A length(l) of the first extending portion or the second extending portion and a thickness(h) of the plurality of the soft magnetic layers may have a relation of the following equation, wherein A represents a constant of 0.6 to 10.

[equation]

$l = A \times h$.

[0013] ~~The~~ Any one of the first polymeric material layer and the second polymeric material layer may contain any one material of polyethylene, polyacrylic, polyimide, polyamide, and polyurethane.

[0014] The wireless charging and communication board may further include an adhesive layer intended for adhering the first polymeric material layer ~~to~~ and the second polymeric material layer to the plurality of the soft magnetic ~~layer~~ layers.

[0015] ~~The wireless charging and communication board may further include a processing hole passing through the soft magnetic layer and the polymeric material layer.~~ An air gap may be further formed between the plurality of the soft magnetic layers, the first extending portion and the second extending portion.

[0016] The plurality of the soft magnetic layer may include: a first soft magnetic layer; and a second soft magnetic layer arranged ~~at a periphery portion of~~ on the first soft magnetic layer ~~on the same plane on which the first soft magnetic layer is arranged~~.

Please replace paragraph [0019] with the following amended paragraph:

[0019] The wireless charging and communication board may further include a lead frame connected to the coil pattern. The first polymeric material layer and the second polymeric material layer may be arranged to surround the lead frame.

Please replace paragraph [0021] with the following amended paragraph:

[0021] ~~The~~ Any one of the first soft magnetic layer and the second soft magnetic layer may be made with any one of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, and a silicon steel plate.

Please replace paragraph [0026] with the following amended paragraph:

[0026] According to another aspect of embodiments of the present invention, ~~a wireless charging and communication device may include the wireless charging and communication board configured as described above~~ a portable terminal includes a housing; a plurality of soft magnetic layers arranged in the housing; a first polymeric material layer arranged on one surface of the plurality of the soft magnetic layers; a second polymeric material layer

arranged on the other surface opposed to the one surface; and a coil pattern arranged on the second polymeric material layer, wherein the plurality of soft magnetic layers are disposed between the first polymeric material layer and the second polymeric material layer, wherein the first polymeric material layer comprises a first extending portion extending longer than the plurality of the soft magnetic layers, wherein the second polymeric material layer comprises a second extending portion extending longer than the plurality of the soft magnetic layers, and wherein the first extending portion and the second extending portion contact with each other.

Please replace paragraph [0063] with the following amended paragraph:

[0063] Also, an ~~extension~~extending portion length l of ~~the~~ a first polymeric material layer 310[[,]] or a second polymeric material layer 312 and a thickness h of the magnetic soft material layer 220, 230 may be formed to have a relation of the following Equation 1.

Please replace paragraph [0066] with the following amended paragraph:

[0066] At this time, l represents an ~~extension~~extending portion length of the first polymeric material layer 310 or the second polymeric material layer 312, h represents a thickness of the soft magnetic layer 220, 230, and A represents a constant of 0.6 to 10. When the value of A is less than 0.6, the polymeric material layer 310, 312 may not sufficiently surround the soft magnetic layer 220, 230, so that moisture can penetrate. When the value of A is more than

10, the polymeric material layer 310, 312 may excessively extend so that the polymeric material layer can be easily bent and damaged by an external impact, or a thickness can be increased because a separate receiving part should be added.

Please replace paragraph [0074] with the following amended paragraph:

[0074] However, in the embodiment of FIG. 3, the wireless charging and communication board further includes a polymeric material connector 313 intended for connecting the first polymeric material layer 310 and the second polymeric material layer 312 and surrounding the exposed portion of the soft magnetic layer 220. In this specification, a term of the polymeric material connector 313 can be used with a term of the extending portion. That is, a first extending portion may be extended in the first polymeric material layer 310, and a second extending portion may be extended in the second polymeric material layer 312.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A wireless charging and communication board, comprising:

a plurality of soft magnetic [[layer]] layers;

a first polymeric material layer arranged on [[one]] a first surface ~~and the other surface~~ of the plurality of soft magnetic layers; ~~layer and extending longer than an exposed portion of the soft magnetic layer~~

a second polymeric material layer arranged on a second surface of the plurality of soft magnetic layers opposed to the first surface; and

a coil pattern arranged on the second polymeric material layer,

wherein the plurality of soft magnetic layers are positioned between the first polymeric material layer and the second polymeric material layer,

wherein the first polymeric material layer includes a first extending portion extending longer than the plurality of soft magnetic layers,

wherein the second polymeric material layer includes a second extending portion extending longer than the plurality of soft magnetic layers, and

wherein the first extending portion and the second extending portion contact each other.

2. (Currently Amended) The wireless charging and communication board of claim 1, wherein a distance between the first extending portion and the second extending portion becomes closer ~~the polymeric material layer comprises a first polymeric material layer arranged on one surface~~ of the soft magnetic layer~~, and a second polymeric material layer arranged on the other surface of~~ as the plurality soft magnetic layers [[layer]] become farther apart.

3. (Currently Amended) The wireless charging and communication board of claim 2, wherein a length(l) of the first extending portion or the second extending portion and a thickness(h) ~~further comprising a polymeric material connector intended for connecting the first polymeric material layer and the second polymeric material layer and surrounding the exposed portion~~ of the plurality of soft magnetic [[layer]] layers have a relation of the following equation, wherein A represents a constant of 0.6 to 10:

[equation]

$l = A \times h$.

4. (Currently Amended) The wireless charging and communication board of claim 1, wherein at least one of the first polymeric material layer or the second polymeric material layer contains [[any]] one or more ~~material~~ of polyethylene, polyacrylic, polyimide, polyamide, [[and]] or polyurethane.

5. (Currently Amended) The wireless charging and communication board of claim 1, further comprising an adhesive layer ~~intended for adhering~~ that adheres the first polymeric material layer and the second polymeric material layer to the plurality of soft magnetic ~~layer~~ layers.

6. (Currently Amended) The wireless charging and communication board of claim 1, ~~further comprising a processing hole passing through~~ wherein an air gap is further formed between the plurality of soft magnetic layers, the first extending portion, and the second extending portion ~~layer and the polymeric material layer~~.

7. (Currently Amended) The wireless charging and communication board of claim 1, wherein the plurality of soft magnetic [[layer]] layers comprises~~[[:]]~~ a first soft magnetic layer[[;]] and a second soft magnetic layer arranged ~~at a periphery portion of~~ on the first soft magnetic layer ~~on the same plane on which the first soft magnetic layer is arranged~~.

8. (Currently Amended) The wireless charging and communication board of claim 7, wherein at least one of the first soft magnetic layer [[and]] or the second soft magnetic layer ~~are made of different materials~~ is made with one or more of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, or a silicon steel plate.

9. (Canceled)

10. (Currently Amended) The wireless charging and communication board of claim [[7]]1, further comprising a lead frame connected to the coil pattern.

11. (Currently Amended) The wireless charging and communication board of claim [[7]]10, wherein the ~~second soft magnetic layer is~~ first polymeric material layer and the second polymeric material layer are arranged to surround the lead frame ~~at a regular interval~~.

12. (Currently Amended) The wireless charging and communication board of claim 1, wherein the ~~soft magnetic~~ first polymeric material layer and the first extending portion are [[is]] made a same material ~~with any one of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, and a silicon steel plate~~.

13-17. (Canceled)

18. (New) A portable terminal, comprising:

a housing;

a plurality of soft magnetic layers arranged in the housing;

a first polymeric material layer arranged on a first surface of the plurality of soft magnetic layers;

a second polymeric material layer arranged on a second surface of the plurality of soft magnetic layers opposed to the first surface; and

a coil pattern arranged on the second polymeric material layer,

wherein the plurality of soft magnetic layers are disposed between the first polymeric material layer and the second polymeric material layer,

wherein the first polymeric material layer comprises a first extending portion extending longer than the plurality of soft magnetic layers,

wherein the second polymeric material layer comprises a second extending portion extending longer than the plurality of soft magnetic layers, and

wherein the first extending portion and the second extending portion contact with each other.

19. (New) The portable terminal of claim 18, wherein a distance between the first extending portion and the second extending portion becomes closer as the plurality of soft magnetic layers becomes farther apart.

20. (New) The portable terminal of claim 19, wherein a length (l) of the first extending portion or the second extending portion and a thickness (h) of the plurality of soft magnetic layers have a relation of the following equation, wherein A represents a constant of 0.6 to 10:

[equation]

$l = A \times h$.

21. (New) The portable terminal of claim 18, wherein the plurality of soft magnetic layer comprises:

a first soft magnetic layer; and

a second soft magnetic layer arranged on the first soft magnetic layer.

22. (New) The portable terminal of claim 18, further comprising a lead frame connected to the coil pattern.

23. (New) The portable terminal of claim 22, wherein the first polymeric material layer and the second polymeric material layer are arranged to surround the lead frame.

24. (New) The portable terminal of claim 18, wherein any one of the plurality of soft magnetic layers is made with one or more of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, or a silicon steel plate.

25. (New) The portable terminal of claim 18, wherein the first polymeric material layer and the first extending portion are made of a same material.

26. (New) The portable terminal of claim 18, further comprising an adhesive layer to adhere the first polymeric material layer and the second polymeric material layer to the plurality of soft magnetic layers.

REMARKS/ARGUMENTS

Claims 1-8, 10-12, and 18-26 are pending in this application. By this Reply, the Specification and claims 1-8 and 10-12 are amended; claims 9 and 13-17 are canceled without prejudice or disclaimer; and new claims 18-26 are added.

The Office Action states:

(1) Claims 1-8, 12-14, 16, and 17 were rejected 35 U.S.C. §102 as allegedly being anticipated by LEE et al. (Korean Patent Publication No. 2013-00721810;

(2) Claim 9 is rejected under 35 U.S.C. §103 as allegedly being unpatentable over LEE et al. in view of YANG et al. (U.S. Patent Publication No. 2006/0266435); and

(3) Claims 10, 11, and 15 are rejected under 35 U.S.C. §103 as allegedly being unpatentable over LEE et al. in view of THOMAS et al. (U.S. Patent No. 6,331,763).

Applicant respectfully traverses these rejections.

Claim 1 recites a wireless charging and communication board, comprising:

a plurality of soft magnetic layers;

a first polymeric material layer arranged on a first surface of the plurality of soft magnetic layers;

a second polymeric material layer arranged on a second surface of the plurality of soft magnetic layers opposed to the first surface; and

a coil pattern arranged on the second polymeric material layer,

wherein the plurality of soft magnetic layers are positioned between the first polymeric material layer and the second polymeric material layer, wherein the first polymeric material layer includes a first extending portion extending longer than the plurality of soft magnetic layers, wherein the second polymeric

> material layer includes a second extending portion extending longer than the plurality of soft magnetic layers, and wherein the first extending portion and the second extending portion contact each other.

LEE et al. does not teach or suggest each of these features as required for *prima facie* anticipation under 35 U.S.C. §102 (see, for example, MPEP §2131).

As depicted in Figs. 16 and 17 of LEE et al. (reproduced below), a synthetic resin substrate 6b is arranged on a surface of a magnetic layer 10, and a battery 7 is arranged on the other surface of the magnetic layer 10. The Office Action at page 3 alleges that the synthetic resin substrate 6b and the magnetic layer 10 correspond, respectively, to a polymeric material layer and a soft magnetic layer recited in original claim 1.

However, LEE et al. does not teach or suggest that "the first polymeric material layer is arranged on a first surface of the plurality of soft magnetic layers, and the second polymeric material layer is arranged on a second surface of the plurality of soft magnetic layers opposed to the first surface," as recited in claim 1. Rather, as previously described, LEE et al. teaches a structure that includes the single substrate 6b is positioned on one side of the single magnetic layer 10, and that the battery 7 is arranged on the other surface of the single magnetic layer 10.

FIG. 16

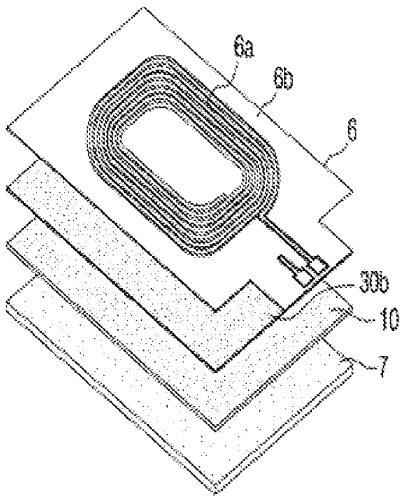
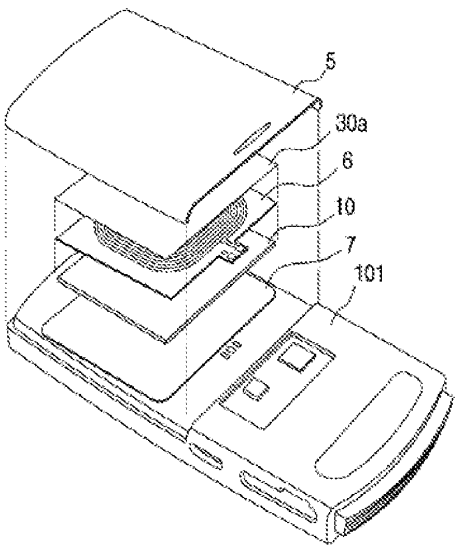


FIG. 17



Moreover, since the LEE et al. does not teach or suggest the first and second polymeric material layers recited in claim 1, LEE et al. cannot teach or suggest that the first polymeric material layer includes a first extending portion extending longer than the plurality of the soft magnetic layers, and the second polymeric material layer includes a second extending portion extending longer than the plurality of the soft magnetic layers, as further recited in claim 1.

Furthermore, since the LEE et al. does not teach or suggest the first and second first extending portions recited in claim 1, LEE et al. cannot teach or suggest that the first extending portion and the second extending portion contact with each other, as further recited in claim 1.

For at least these reasons, claim 1 is not anticipated by LEE et al.

YANG et al. does not cure the above-identified deficiencies in LEE et al. with respect to claim 1. Rather, the Office Action at page 6 relies on YANG et al. as allegedly teaching a first coil pattern and a second coil pattern, as recited in claim 9. Without acquiescing in these allegations, Applicant respectfully submits that the applied sections of YANG et al. are unrelated to the above-identified features related to the first and the second extending portions, as recited in claim 1.

THOMAS et al. does not cure the above-identified deficiencies in LEE et al. and YANG et al. with respect to claim 1. Rather, the Office Action at page 6 relies on THOMAS et al. as allegedly teaching features related to a lead frame, as recited in claims 10 and 11. Without acquiescing in these allegations, Applicant respectfully submits that the applied sections of THOMAS et al. are unrelated to are unrelated to the above-identified features related to the first and the second extending portions, as recited in claim 1.

Claim 1 is, therefore, patentable over LEE et al., YANG et al., and THOMAS et al., whether taken alone or in any reasonable combination, for at least the reasons identified above.

Claims 2-8 and 10-12 depend from claim 1 and are, therefore, also patentable over LEE et al., YANG et al., and THOMAS et al., whether taken alone or in any reasonable combination, based at least on their dependences.

Withdrawal of the pending 35 U.S.C. §§ 102 and 103 rejections is respectfully requested.

New claim 18 recited features similar to (yet potentially different in scope from) the above-identified features of claim 1. Claim 18 and claims 19-26 that depend therefrom are, thus, also patentable over the applied references for at least reasons similar to the reasons identified above with respect to claim 1.

CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited.

If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. §1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this,

concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David D. Nelson/

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Please direct all correspondence to Customer Number 34610
Q:\Documents\2417-028\625697

Electronic Acknowledgement Receipt

EFS ID:	27567380
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Heather Hildreth
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	21-NOV-2016
Filing Date:	03-MAR-2015
Time Stamp:	11:08:03
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	Transmittal Letter	Transmittal.pdf	63270 edfc43544b63c2bef30a7a96df3820709822779b	no	1

Warnings:

Information:					
2		Amendment.pdf	189537 8467a8e7da04082447455415a2e4ebf441cfc7ac	yes	19

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	6
	Amendment Copy Claims/Response to Suggested Claims	7	13
	Applicant Arguments/Remarks Made in an Amendment	14	19

Warnings:	
Information:	
Total Files Size (in bytes):	252807

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.

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of		Confirmation No.:	**9944**
Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE		Group Art Unit:	**2859**
Serial No:	**14/636,347**	Examiner :	**Samuel BERHANU**
Filed:	**March 3, 2015**	Customer No.:	**34610**

For: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

U.S. Patent and Trademark Office
Customer Window, **MAIL STOP AMENDMENT**
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Dear Sir:

Transmitted herewith is an Amendment and/or Reply in the above identified application.
☒ No additional fee is required.
☐ Also attached:

The fee has been calculated as shown below:

	NO. OF CLAIMS	HIGHEST PREVIOUSLY PAID FOR	EXTRA CLAIMS	RATE	FEE
Total Claims	**20**	**20**	**1**	x $80.00 =	**$0.00**
Independent Claims	**2**	**3**	**0**	x $420.00 =	**$0.00**
		If multiple claims newly presented, add $780.00			**$0.00**
		Fee for extension of time			**$0.00**
		TOTAL FEE DUE			**$0.00**

☐ Please charge my Deposit Account No. 16-0607 in the amount of $_____. An additional copy of this transmittal sheet is submitted herewith.

☐ Please charge my Credit Card. (Please see completed form PTO-2038 attached).

☒ The Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment, to Deposit Account No. 16-0607, including any filing fees under 37 C.F.R.§1.16 for presentation of extra claims and any patent application processing fees under 37 C.F.R. §1.17.

Respectfully submitted,
KED & ASSOCIATES, LLP

/David D. Nelson/

Daniel Y.J. Kim, Esq.
Registration No. 36,186
David D. Nelson, Esq.
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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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/636,347	Filing Date 03/03/2015	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	11/21/2016	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $420 =	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

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						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 number found in the appropriate box in column 1.

LIE
PARTHENIA D. MERRILL

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028	9944

34610 7590 08/25/2016

KED & ASSOCIATES, LLP
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EXAMINER
BERHANU, SAMUEL

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
08/25/2016	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):

ked-docket@ked-iplaw.com
mydocket@icloud.com
keddocket@gmail.com

Office Action Summary	Application No. 14/636,347	Applicant(s) YEOM ET AL.	
	Examiner SAMUEL BERHANU	Art Unit 2859	AIA (First Inventor to File) Status Yes

-- 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 *03/03/2015*.

☐ 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) *1-17* 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) *1-17* 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 *03/03/2015* 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 *10/30/2015*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on 10/30/2015 is acknowledged by the examiner.

Claim Rejections - 35 USC § 102

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

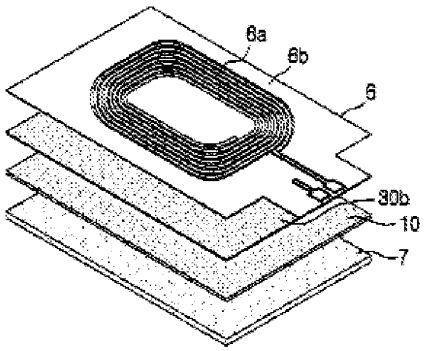
5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale or otherwise available to the public before the effective filing date of the claimed invention.

6. Claims 1-8, 12-14 and 16-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. (KR 2013-00721810, hereinafter Lee (US patent 2015/0123604 used as the translation).

As to claim 1, Lee discloses in figures 1-17 (figure 16 is reproduced below),

FIG. 16



wireless charging and communication board [see figure 16; see above], comprising:

a soft magnetic layer [magnetic layer 10];

a polymeric material layer (6b) arranged on one surface and the other surface of the soft magnetic layer and extending longer than an exposed portion of the soft magnetic layer; and a coil [coil 6a; see figure above] pattern arranged on the polymeric material layer [see ¶0156-0166].

As to claim 2, Lee discloses in figures 16-17, ,wherein the polymeric material layer comprises a first polymeric material layer arranged on one surface of the soft magnetic layer, and a second polymeric material layer arranged on the other surface of the soft magnetic layer [see ¶0009, 0015,¶ 0148, ¶0079-0092, ¶0189].

As to claim 3, Lee disclose in figure 17, a polymeric material connector intended for connecting the first polymeric material layer and the second polymeric material layer and surrounding the exposed portion of the soft magnetic layer [see0029].

As to claim 4, Lee discloses in figures 16-17, wherein the polymeric material layer contains any one material of polyethylene, polyacrylic, polyimide, polyamide, and polyurethane [see ¶0079, ¶0082, and ¶0177].

As to claim 5, Lee discloses in figures 16-17, an adhesive layer intended for adhering the polymeric material layer to the soft magnetic layer [see ¶0014].

As to claim 6, Lee discloses in figure 6, further comprising a processing hole passing through the soft magnetic layer and the polymeric material layer [see figure 6].

As to claim 7, Lee discloses in figures 1-17, wherein the soft magnetic layer comprises: a first soft magnetic layer; and a second soft magnetic layer arranged at a periphery portion of the first soft magnetic layer on the same plane on which the first soft magnetic layer is arranged [a plurality of layers are discloses; see ¶0067].

As to claim 8, Lee discloses in figures 1-17, wherein the first soft magnetic layer and the second soft magnetic layer are made of different materials [noted that different martials are disclosed; see ¶0068].

As to claim 12, Lee discloses in figures 1-17, wherein the soft magnetic layer is made with any one of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, and a silicon steel plate [see ¶0079, ¶0082, and ¶0177].

AS to claim 13, Lee discloses in figures 1-17, wherein the soft magnetic layer is made of a ferrite material and is formed in a pellet form, a plate form, a ribbon form, a foil form, or a film form [see figure 15B; a ferrite loop is disclosed; see ¶0151].

As to claim 14, Lee discloses in figures 1-17, wherein the soft magnetic layer contains at least one of Fe, Ni, Co, Mn, Al, Zn, Cu, Ba, Ti, Sn, Sr, P, B, N, C, W, Cr, Bi, Li, Y and Cd [see ¶0071].

As to claim 16, Lee discloses in figures 17, a housing [the base 101 and the lid 5 creates housing for the coils and the layers] radiating heat from the coil pattern [the coils generates heat due to the magnetic currents generated by the magnetic field]

As to claim 17, Lee discloses in figures 16-19, a wireless charging and communication board of claim 1 [see 0165-0168].

Claim Rejections - 35 USC § 103

7. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

8. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 9 is rejected under 35 U.S.C. 103 as being unpatentable over Lee in view of Yang et al. (US 2006/0266435), hereinafter Yang.

As to claim 9, Lee discloses all of the claim limitations, wherein the coil pattern comprises: a first coil pattern arranged in a region on the polymeric material layer corresponding

to the first soft magnetic layer; and a second coil pattern arranged in a region on the polymeric material layer corresponding to the second soft magnetic layer.

Yang discloses in figure 10, wherein the coil pattern comprises: a first coil pattern arranged in a region on the polymeric material layer corresponding to the first soft magnetic layer; and a second coil pattern arranged in a region on the polymeric material layer corresponding to the second soft magnetic layer [layer discloses in figure 10; plurality of layers 45a and 45b; see ¶0106].

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use plurlatiy of coils in Lee's apparatus as taught by Yang in order to fast charge the rechargeable battery.

10. Claims 10-11 and 15 are rejected under 35 U.S.C. 103 as being unpatentable over Lee in view of Thomas et al. (US 6,331,763), hereinafter Thomas

As to claim 10, Lee discloses all of the claim limitation except, a lead frame connected to the coil pattern.

Thomas discloses in figure 49, Lead frame [the frame is use for protecting electrical elements; Col. 24, lines 49-59]

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use a frame in the coil arrangement of Lee as taught by Thomas in order to protect the apparatus from heat emission, external moisture, and shock.

As to claim 11, Lee discloses in figure 1, wherein the second soft magnetic layer is arranged to surround the lead frame at a regular interval [see ¶0020, 0310 and 0311].

As to claim 15, Lee disclose all of the claim limitations except, charging and communication board of claim 1, wherein the polymeric material layer is a black film.

Further, it would have been an obvious to one having ordinary skill in the art at the time the invention was made to use films with different color, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin, 125 USPQ 416* .

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SAMUEL BERHANU whose telephone number is (571)272-8430. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew A. Dunn can be reached on 571-272-2312. 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.

/SAMUEL BERHANU/
Primary Examiner, Art Unit 2859

Notice of References Cited	Application/Control No. 14/636,347	Applicant(s)/Patent Under Reexamination YEOM ET AL.	
	Examiner SAMUEL BERHANU	Art Unit 2859	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-6,331,763 B1	12-2001	Thomas; Brian	H02H9/042	320/136
*	B	US-2006/0266435 A1	11-2006	Yang; Jae Suk	G06K19/07771	148/105
*	C	US-2015/0077296 A1	03-2015	An; Jeong Wook	H01Q1/22	343/720
*	D	US-2015/0256023 A1	09-2015	YEOM; Jai Hoon	H02J5/005	320/108
	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.

LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
CJL-0028	14/636,347

APPLICANT(S)
Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE

FILING DATE	GROUP
March 3, 2015	2859

U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	*PATENT NO.	*ISSUE DATE	*INVENTOR NAME	CLASS	SUBCLASS	FILING DATE

U.S. PATENT APPLICATION PUBLICATIONS

EXAMINER'S INITIALS	*APPLICATION PUBLICATION NO.	*PUBLICATION DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE
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	2011/0210696 A1	09/01/2011	INOUE, Tetsuo			
	2015/0123604 A1	05/07/2015	LEE et al.			

U.S. PATENT APPLICATIONS

EXAMINER'S INITIALS	*APPLICATION NO.	*FILING DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE

FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	Translation Yes	Translation No
	KR 10-2013-0072181 A	07/01/2013	KR (English Abstract and Full Korean Text)			X	

OTHER ART (Including Author, Title, Date, Pertinent Pages, Publisher, Place of Publication, Etc.)

	Extended European Search Report issued in Application No. 15157518.0 dated July 30, 2015.

EXAMINER	DATE CONSIDERED
/Samuel Berhanu/	08/21/2016

EXAMINER: Initial if reference has been 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.
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.B./

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	0	(("Jai Hoon") near2 (YEOM)).INV.	USPAT	OR	OFF	2016/08/21 13:21
S2	88	(("Sang Won") near2 (LEE)).INV.	USPAT	OR	OFF	2016/08/21 13:21
S3	70	((Seok) near2 (BAE)).INV.	USPAT	OR	OFF	2016/08/21 13:21
S4	124	(("So Yeon") near2 (KIM)).INV.	USPAT	OR	OFF	2016/08/21 13:21
S5	0	(("Jin Mi") near2 (NOH)).INV.	USPAT	OR	OFF	2016/08/21 13:21
S6	34	(("Jai Hoon") near2 (YEOM)).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/21 13:21
S7	1437	(("Sang Won") near2 (LEE)).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/21 13:21
S8	1112	((Seok) near2 (BAE)).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/21 13:21
S9	20	(("Jin Mi") near2 (NOH)).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/21 13:22
S10	1154	(("So Yeon") near2 (KIM)).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/08/21 13:22

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14/636,347	03/03/2015 RULE	320	2859	CJL-0028

APPLICANTS

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Jin Mi NOH, Seoul, KOREA, REPUBLIC OF;
Ji Yeon SONG, Seoul, KOREA, REPUBLIC OF;
Hee Jung LEE, Seoul, KOREA, REPUBLIC OF;

**** CONTINUING DATA ***************************

**** FOREIGN APPLICATIONS ***************************

REPUBLIC OF KOREA 10-2014-0025290 03/04/2014

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

03/13/2015

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/SAMUEL BERHANU/ Examiner's Signature	☐ Initials	KOREA, REPUBLIC OF	6	17	1

ADDRESS

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P.O. Box 8638
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UNITED STATES

TITLE

WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

FILING FEE RECEIVED		
1600	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

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	14636347	YEOM ET AL.
	Examiner	Art Unit
	SAMUEL BERHANU	2859

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
320	108	8/21/2016	SB

SEARCH NOTES		
Search Notes	Date	Examiner
EAST inventor search conducted----------see printout	8/21/2016	SB

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
CJL-0028	14/636,347

APPLICANT(S)
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EXAMINER'S INITIALS	*APPLICATION PUBLICATION NO.	*PUBLICATION DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE
	2006/0266435 A1	11/30/2006	YANG et al.			
	2011/0210696 A1	09/01/2011	INOUE, Tetsuo			
	2015/0123604 A1	05/07/2015	LEE et al.			

U.S. PATENT APPLICATIONS

EXAMINER'S INITIALS	*APPLICATION NO.	*FILING DATE	*INVENTOR	CLASS	SUBCLASS	FILING DATE

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OTHER ART (Including Author, Title, Date, Pertinent Pages, Publisher, Place of Publication, Etc.)

	Extended European Search Report issued in Application No. 15157518.0 dated July 30, 2015.

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EXAMINER: Initial if reference has been 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.
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MAGNETIC SHIELDING SHEET FOR A WIRELESS CHARGER CAPABLE OF BLOCKING THE MAGNETIC FIELD, A MANUFACTURING METHOD THEREOF, AND A RECEIVING DEVICE FOR THE WIRELESS CHARGER USING THEREOF

(11) Publication No. 1020130072161 A

(43) Publication Date 01.07.2013

(21) Application No 1020120151138

(22) Application Date 21.12.2012

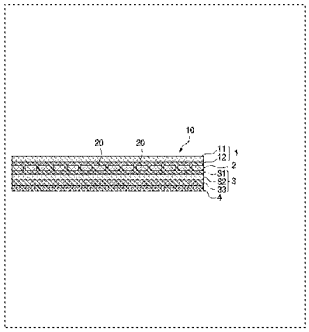
(30) Priority 21.12.2011 KR 1020110138987

(51) Int. Cl. H05K 9/00(01.01.2006) B32B 27/08 (01.01.2006) H01F 38/14(01.01.2006) H02J 17/00(01.01.2006)

(71) Applicant AMOSENSE CO., LTD

(72) Inventor LEE, DONG HOON
JANG, KIL JAE

For Drawing



Abstract PURPOSE: A magnetic shielding sheet for a wireless charger, a manufacturing method thereof, and a receiving device for the wireless charger using thereof are provided to reduce the eddy current, thereby improving the power transmission efficiency.CONSTITUTION: A thin film magnetic sheet (2) of at least a first layer is formed in the amorphous ribbon. The amorphous ribbon is separated into a plurality of tiny piece. A protective film (1) is adhered to one side of the thin film magnetic sheet through a first adhesive layer. A double-sided tape (3) is adhered to the other side of the thin film magnetic sheet through a second adhesive layer. The gap between the tiny pieces isolates the tiny pieces.COPYRIGHT KIPO 2013

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

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H05K 9/00 (2006.01) *B32B 27/08* (2006.01)
H01F 38/14 (2006.01) *H02J 17/00* (2006.01)
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(74) 대리인
이재화

전체 청구항 수 : 총 20 항

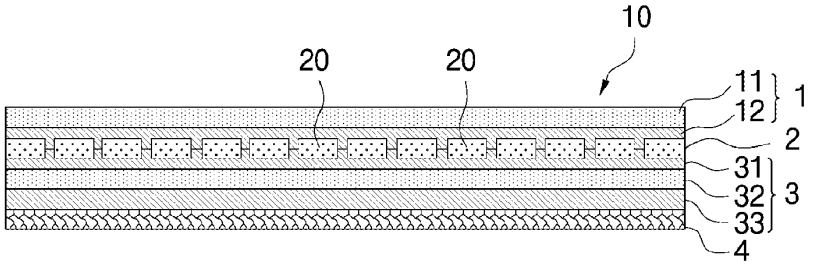
(54) 발명의 명칭 **무선 충전기용 자기장 차폐시트 및 그의 제조방법과 이를 이용한 무선충전기용 수신장치**

(57) 요 약

본 발명은 휴대 단말기기 등에 충전기 기능을 비접촉(무선) 방식으로 구현할 때 발생되는 교류 자기장에 의해 휴대 단말기기 등의 본체에 미치는 영향을 차단하며 전력전송 효율이 우수한 무선 충전기용 자기장 차폐시트 및 그의 제조방법과 이를 이용한 무선충전기용 수신장치에 관한 것이다.

본 발명은 다수의 미세 조각으로 분리된 비정질 리본으로 이루어진 적어도 1층의 박판 자성시트; 상기 박판 자성시트의 일면에, 제1접착층을 통하여 접착되는 보호필름; 및 상기 박판 자성시트의 타면에, 일측면에 구비된 제2접착층을 통하여 접착되는 양면 테이프를 포함하며, 상기 다수의 미세 조각 사이의 틈새는 상기 제1접착층과 제2접착층의 일부가 충진되어 상기 다수의 미세 조각을 절연(isolation)시키는 것을 특징으로 한다.

대 표 도 - 도13



특허청구의 범위

청구항 1

다수의 미세 조각으로 분리된 비정질 리본으로 이루어진 적어도 1층의 박판 자성시트;

상기 박판 자성시트의 일면에, 제1접착층을 통하여 접착되는 보호필름; 및

상기 박판 자성시트의 타면에, 일측면에 구비된 제2접착층을 통하여 접착되는 양면 테이프를 포함하며,

상기 다수의 미세 조각 사이의 틈새는 상기 제1접착층과 제2접착층의 일부가 충진되어 상기 다수의 미세 조각을 절연(isolation)시키는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 2

제1항에 있어서,

상기 박판 자성시트는

제1투자율로 이루어진 제1자성시트;

상기 제1자성시트에 적층되며 제1투자율보다 낮은 제2투자율의 제2자성시트; 및

상기 제1자성시트와 제2자성시트를 상호 접착시키며 상기 다수의 미세 조각 사이의 틈새를 충진하는 접착층을 포함하는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 3

제2항에 있어서,

상기 제1자성시트는 비정질 시트, 페라이트 시트, 퍼멀로이(permalloy) 시트, MPP(Moly Permalloy Powder) 시트 중 어느 하나를 사용하며,

상기 제2자성시트는 자성분말과 수지로 이루어진 폴리머 시트를 사용하는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 4

제2항에 있어서,

상기 제1자성시트는 비정질 시트로 이루어지고, 상기 제2자성시트는 페라이트 시트로 이루어지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 5

제1항에 있어서, 상기 차폐시트는 송신장치에 영구자석을 포함하는 무선 충전기의 수신장치에 적용되며,

상기 박판 자성시트가 Fe계 비정질 합금 또는 나노 결정립 합금으로 이루어지고, 2 내지 12층의 적층된 비정질 리본과 적층된 비정질 리본 사이에 삽입되는 접착층으로 이루어지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 6

제1항에 있어서, 상기 차폐시트는 송신장치에 영구자석을 포함하지 않는 무선 충전기의 수신장치에 적용되며,

상기 박판 자성시트는 1 내지 4층의 적층된 비정질 리본과 적층된 비정질 리본 사이에 삽입되는 접착층으로 이루어지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 7

제1항에 있어서, 상기 양면 테이프는 기재, 상기 기재의 일측면에 형성되고 박판 자성시트의 타측면에 접착되는 제2접착층 및 기재의 타측면에 형성되는 제3접착층을 포함하며,

상기 제2접착층은 상기 다수의 미세 조각 사이의 틈새에 충진되어 상기 제1접착층과 일체화되는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 8

제1항에 있어서,

차폐시트는 무선 충전기의 수신장치에 구비된 2차 코일과 대응하는 형상으로 이루어진 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 9

제1항에 있어서, 상기 박판 자성시트는 Fe계 비정질 합금으로 이루어지며, 300℃ 내지 600℃의 온도에서 30분 ~ 2시간 동안 무자장 열처리가 이루어지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 10

제1항에 있어서, 상기 박판 자성시트는 나노 결정립 합금으로 이루어지며, 600℃ 내지 700℃의 온도에서 30분 ~ 2시간 동안 무자장 열처리가 이루어지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 11

제1항에 있어서, 상기 다수의 미세 조각은 수십 ㎛ 내지 3㎜ 크기로 이루어지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트.

청구항 12

적어도 1층의 비정질 리본으로 이루어진 박막 자성시트의 양측면에 보호 필름과 노출면에 릴리즈 필름이 형성된 양면 테이프를 부착하여 적층시트를 형성하는 단계;

상기 적층시트를 플레이크 처리하여 상기 박막 자성시트를 다수의 미세 조각으로 분할하는 단계; 및

상기 플레이크 처리된 적층시트를 라미네이트 처리하여 적층시트의 평탄화 및 슬림화와 함께 상기 보호 필름과 양면 테이프에 구비된 제1 및 제2 접착층의 일부를 상기 다수의 미세 조각의 틈새로 충진시켜서 절연(isolation)시키는 단계를 포함하는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트의 제조방법.

청구항 13

제12항에 있어서,

상기 적층시트를 형성하기 전에 비정질 리본을 열처리하는 단계를 더 포함하는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트의 제조방법.

청구항 14

제12항에 있어서,

상기 제1접착층 및 제2접착층의 두께는 상기 비정질 리본의 두께 대비 50% 이상 크게 형성되는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트의 제조방법.

청구항 15

제12항에 있어서,

상기 박판 자성시트는 제1투자율로 이루어진 제1자성시트와 제1투자율보다 낮은 제2투자율의 제2자성시트가 접착층을 통하여 적층된 하이브리드 자성시트인 것을 특징으로 하는 무선 충전기용 자기장 차폐시트의 제조방법.

청구항 16

제12항에 있어서,

상기 제1자성시트는 비정질 시트로 이루어지고, 상기 제2자성시트는 페라이트 시트 또는 폴리머 시트로 이루어

지는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트의 제조방법.

청구항 17

무선 충전기의 송신장치로부터 전자유도방식으로 이차전지 배터리를 충전하는 무선 충전기용 수신장치에 있어서,

상기 송신장치로부터 전자유도방식으로 전송된 무선 고주파 신호를 수신하기 위한 2차 코일; 및

상기 2차 코일과 이차전지 배터리 사이에 배치되며, 상기 무선 고주파 신호에 의해 발생된 자기장을 차폐함과 동시에 상기 2차 코일에 무선 충전 기능을 수행하는 데 필요한 무선 고주파 신호를 흡수하도록 유도하는 자기장 차폐시트를 포함하며,

상기 자기장 차폐시트는

다수의 미세 조각으로 분리된 비정질 리본으로 이루어진 적어도 1층의 박판 자성시트;

상기 박판 자성시트의 일면에, 제1접착층을 통하여 접착되는 보호필름; 및

상기 박판 자성시트의 타면에, 일측면에 구비된 제2접착층을 통하여 접착되는 양면 테이프를 포함하며,

상기 다수의 미세 조각 사이의 틈새는 상기 제1접착층과 제2접착층의 일부가 충진되어 상기 다수의 미세 조각을 절연(isolation)시키는 것을 특징으로 하는 무선 충전기용 수신장치.

청구항 18

제17항에 있어서,

상기 무선 충전기의 수신장치는 상기 2차 코일과 NFC(Near field communications)용 안테나 코일이 하나의 절연 기판 위에 동시에 형성되는 것을 특징으로 하는 무선 충전기용 수신장치.

청구항 19

제18항에 있어서,

상기 자기장 차폐시트의 박판 자성시트는 비정질 리본시트와 페라이트 시트 또는 폴리머 시트가 접착층을 통하여 접착된 시트인 것을 특징으로 하는 무선 충전기용 수신장치.

청구항 20

제18항에 있어서,

상기 자기장 차폐시트의 박판 자성시트는

중앙부에 일정 면적으로 배치되는 비정질 리본시트; 및

상기 비정질 리본시트의 외부에 비정질 리본시트를 둘러싸는 환형의 페라이트 루프를 포함하는 것을 특징으로 하는 무선 충전기용 수신장치.

명 세 서

기 술 분 야

[0001] 본 발명은 무선 충전기용 자기장 차폐시트 및 그의 제조방법과 이를 이용한 무선충전기용 수신장치에 관한 것으로, 특히 휴대 단말기기 등에 충전기 기능을 비접촉(무선) 방식으로 구현할 때 발생되는 교류 자기장에 의해 휴대 단말기기 등의 본체에 미치는 영향을 차단하며 전력전송 효율이 우수한 무선 충전기용 자기장 차폐시트 및 그의 제조방법과 이를 이용한 무선충전기용 수신장치에 관한 것이다.

배 경 기 술

[0002] 휴대 단말기, 비디오 카메라 등의 전자 기기에 탑재된 2차 전지의 충전 방법에는, 2가지 타입의 충전 방식, 즉 접촉형 충전 방식과 비접촉형 충전 방식이 있다. 접촉형 충전 방식은 수전 장치의 전극과 급전 장치의 전극을 직접 접촉시킴으로써 충전을 행하는 방식이다.

[0003] 접촉형 충전 방식은 그 장치 구조가 단순하므로 폭넓은 응용 분야에서 일반적으로 사용되어 왔으나, 전자 기기의 소형화 및 경량화에 수반하여 각종 전자 기기의 중량이 가벼워짐에 따라, 수전 장치의 전극과 급전 장치의 전극간의 접촉압이 부족하여, 충전 불량(충전 오류)을 일으키는 등의 문제가 발생하고 있다. 또한, 2차 전지는 열에 약하여 전지의 온도 상승을 방지할 필요가 있으며, 과방전 및 과충전을 일으키지 않도록 회로 설계에 주의를 기울여야만 했다. 이러한 문제에 대처하기 위해, 최근에 비접촉형 충전 방식이 검토되고 있다.

[0004] 비접촉형 충전 방식은 수전 장치와 급전 장치의 양쪽에 코일을 설치함으로써 전자기 유도를 이용한 충전 방식이다.

[0005] 비접촉형 충전기는 페라이트 코어를 자심으로 하여 그 둘레에 코일을 권회함으로써 소형화를 실현하고 있다. 또한, 소형화 및 박형화를 위해, 페라이트 분말과 아몰퍼스 분말을 혼합하여 수지기판을 형성하여 이 수지 기판에 코일 등을 실장하는 기술이 제안되었다. 그러나, 페라이트는 얇게 가공하면, 부러지기 쉽고 내충격성이 약하여, 기기의 낙하 또는 충돌 등으로 인해 수전 시스템에 결함이 발생하는 문제가 있었다.

[0006] 또한, 전자 기기의 박형화에 대응하여 수전 부분을 박형화하기 위해, 코일에 금속 분말 페이스트를 인쇄하여 형성된 평면 코일을 채용하였다. 평면 코일과 자성 시트를 사용하여 결합을 강화하는 구조가 제안되어 있다. 이들 제안된 구조에서는, 자성체(자성 시트)는 1차, 2차 코일간의 결합을 강화하기 위한 코어재로서 사용되고 있다.

[0007] 한편, 송전 속도가 커지면, 인접한 변압기간의 결합뿐만 아니라, 그 주변 부품에서 발열에 의한 결함이 발생하기 쉽다. 즉, 평면 코일을 사용하는 경우, 평면 코일을 통과하는 자속이 기기 내부의 기판 등에 연결되어, 전자기 유도에 의해 발생하는 와전류에 의해 장치 내부가 발열하게 된다. 그 결과, 큰 전력을 송신할 수 없어 충전 시간이 오래 걸리는 등의 문제가 있었다.

[0008] 이러한 문제에 대처하기 위해, 자성체(자성 시트)는 이면에 대한 실드재(shielding member)로서도 사용되고 있었다. 충분한 실드 효과를 얻기 위해서는, 자성체(자성 시트)는 투자율이 크고, 면적 및 두께가 클수록, 보다 유효한 실드 효과를 얻을 수 있다.

[0009] 이러한 자기장 차폐시트로는 비정질 리본, 페라이트, 자성분말이 포함된 폴리머 시트 등의 자성체를 사용하는 것이 일반적이다. 자기장 차폐 및 부가 기능 성능 향상을 위한 자기장 집속 효과는 자기 투자율이 높은 비정질 리본, 페라이트, 자성분말이 포함된 폴리머 시트 순으로 좋다.

[0010] 종래의 비접촉형 충전 시스템의 수전 장치는, 송전 효율 향상을 위한 결합 강화, 발열 억제를 위한 실드성 향상을 위해, 1차 코일측과는 반대인 면, 즉 2차 코일의 표면에 고투자율 및 큰 체적의 자성체(자성 시트)를 배치한다. 이러한 배치에 따르면, 1차 코일의 인덕턴스의 변동이 커지고, 자성체와 1차 코일간의 상대 위치 관계에 따라서 공진 회로의 동작 조건이 충분한 효과를 발휘할 수 있는 공진 조건으로부터 어긋나게 되는 문제가 발생한다.

[0011] 공개특허 제10-2010-31139호(특허문헌 1)에는 상기한 문제를 해결하고자 공진성을 향상시키고, 또한 발열을 억제할 수 있는 수전 장치를 제공함에 의해 수전 장치를 사용한 전자 기기 및 수전 시스템은 송전 전력을 크게 하는 것이 가능해지고, 충전 시간의 단축이 가능한 기술을 제안하고 있다.

[0012] 즉, 공개특허 제10-2010-31139호에는 스파이럴 코일(수전측 스파이럴 코일: 2차 코일)과 2차 전지 사이, 및 정류기와 상기 스파이럴 코일 사이의 적어도 1군데에 복수의 자성 시트(자성 리본)를 포함하는 복합 자성체를 배치함에 의해, 급전측 스파이럴 코일(1차 코일)로부터 발생한 자속이 회로 기판 및 2차 전지 등에 쇄교하는 것을 방지하고, 유도기전력(전자기 유도)에 기인한 노이즈 및 발열을 억제하면서, 2차 코일의 유무에 의한 1차 코일의 인덕턴스 변동량을 제어하여, 1차 코일이 구성하는 공진 회로의 공진성을 향상시켜 발진을 효과적으로 제어할 수 있는 기술을 제안하고 있다.

[0013] 상기 복합 자성체는 스파이럴 코일과 인접한 제1자성시트의 제1자기저항이 60보다 작거나 같고, 제1자성시트에 적층되는 제2자성시트의 제2자기저항이 100보다 크거나 같도록 설정되며, (제2자기저항/제1자기저항)값이 1.0보다 크거나 같도록 설정하고 있다.

[0014] 상기 제1자성시트는 제1비정질 리본의 양면에 접착층을 이용하여 폴리카보네이트 수지를 각각 접착하여 제조하고, 제2자성시트는 상대적으로 비투자율이 더 큰 제2비정질 리본의 양면에 접착층을 이용하여 폴리카보네이트 수지를 각각 접착하여 제조한 후, 제1자성시트와 제2자성시트를 접착층을 개재하여 일체로 접착시키고 있다.

[0015] 한편, 페라이트 시트 또는 자성분말을 함유한 폴리머 시트의 경우 비정질 리본에 비해 자기 투자율이 다소 낮으며, 이러한 낮은 자기 투자율의 성능을 개선하고자 하는 경우 수십 um 두께의 박판인 비정질 리본에 비해 두께

가 두꺼워지므로 얇아지는 단말기 추세에 대응하기 어려운 부분이 있다.

[0016] 또한, 자기 투자율이 높은 비정질 리본의 경우 리본 자체가 금속 박판이므로 두께에 대한 부담은 없으나, 전력 전송에 사용되는 100kHz 주파수에 따른 교류 자기장이 비정질 리본에 인가될 때 리본 표면의 와전류(Eddy Current) 영향으로 응용 기능이 저하되거나 무선 충전 시 효율 저하 및 발열 등의 문제점이 발생한다.

[0017] Co계나 Fe계 비정질 리본의 경우 열처리를 통해 약간의 표면 저항을 높일 수는 있으나, 와전류 영향을 더욱 낮추기 위해 리본 표면적을 줄이는 플레이크(Flake) 등의 가공이 들어갈 경우 자기 투자율이 현격하게 떨어져 차폐 시트로서의 기능이 크게 떨어진다.

[0018] 또한, 무선 충전기의 경우 충전기의 효율을 최대한 높이기 위해 전력전송 송신기에 수신부와의 정합(align)을 돕는 영구자석을 채용한 구조가 많은데, 영구자석의 직류 자기장에 의해 얇은 차폐시트는 착자(포화) 현상이 발생하여 성능이 떨어지거나 전력전송 효율이 급격하게 떨어지는 문제가 발생된다.

[0019] 이에 따라 종래에는 영구자석의 영향을 받지 않고 차폐 특성을 나타내기 위해서는 차폐시트의 두께가 0.5T 이상으로 아주 두꺼워져야 높은 전력전송 효율을 유지할 수 있기 때문에 휴대 단말기의 슬림화에 큰 걸림돌이 되고 있다.

선행기술문헌

특허문헌

[0020] (특허문헌 0001) 특허문헌 1 : 공개특허 제10-2010-31139호 A(공개일자 2010.03.19)

발명의 내용

해결하려는 과제

[0021] 무선 충전기의 2차 코일에 유도되는 전압은 패러데이 법칙(Faraday's law)과 렌쯔 법칙(Lenz's law)에 의하여 결정되므로, 높은 전압 신호를 얻기 위해서는 2차 코일과 쇄교하는 자속의 양이 많을수록 유리하다. 자속의 양은 2차 코일에 포함된 연자성 재료의 양이 많을수록, 그리고 재료의 투자율이 높을수록 크게 된다. 특히, 무선 충전 장치는 본질적으로 비접촉에 의한 전력 전송이기 때문에 송신장치의 1차 코일에서 만들어지는 무선 전자기파를 수신장치의 2차 코일로 집속시키기 위해서는 2차 코일이 실장되는 자기장 차폐시트가 투자율이 높은 자성재료로 이루어지는 것이 필요하다.

[0022] 종래의 무선 충전기용 자기장 차폐시트는 박막이면서 차폐에 의한 발열 문제와 무선 충전 효율을 높일 수 있는 해결방안을 제시하지 못하고 있다. 이에 본 발명자는 비정질 리본의 경우 리본이 플레이크가 되어도 인덕턴스(투자율)는 적게 감소하며, 자기저항의 감소가 크게 이루어짐에 따라 2차 코일의 품질계수(Q)가 증가한다는 점을 인식하여 본 발명에 이르게 되었다.

[0023] 따라서, 본 발명은 상기한 종래기술의 문제점을 해결하고자 제안된 것으로, 그 목적은 비정질 리본의 플레이크 처리에 의해 와전류(Eddy Current)에 의한 손실을 크게 줄여줌에 의해 휴대 단말기기 등의 본체 및 배터리에 미치는 자기장 영향을 차단함과 동시에 2차 코일의 품질계수(Q)를 증가시켜 전력전송 효율이 우수한 무선 충전기용 자기장 차폐시트 및 그의 제조방법과 이를 이용한 무선충전기용 수신장치를 제공하는 데 있다.

[0024] 본 발명의 다른 목적은 비정질 리본의 플레이크 처리 후 압착 라미네이팅 처리에 의해 비정질 리본의 미세 조각 사이의 틈새를 접착제를 채워서 수분 침투를 방지함과 동시에 미세 조각의 모든 면을 접착제(유전체)로 둘러쌈에 의해 미세 조각을 상호 절연(isolation)시켜서 와전류 저감을 도모하여 차폐성능이 떨어지는 것을 방지할 수 있는 무선 충전기용 자기장 차폐시트 및 그의 제조방법을 제공하는 데 있다.

[0025] 본 발명의 또 다른 목적은 차폐시트의 형상을 무선 충전기용 수신장치의 2차 코일과 유사한 형상으로 설정함에 의해 적은 수의 나노 결정립 리본을 사용하면서도 높은 전력전송 효율을 갖는 무선 충전기용 자기장 차폐시트 및 이를 이용한 무선충전기용 수신장치를 제공하는 데 있다.

[0026] 본 발명의 다른 목적은 롤-투-롤 방법으로 플레이크와 라미네이팅 처리를 순차적으로 수행함에 의해 시트 성형이 이루어질 수 있어 시트의 원래 두께를 유지하면서 생산성이 높고 제조비용이 저렴한 무선 충전기용 자기장

차폐시트 및 그의 제조방법을 제공하는 데 있다.

과제의 해결 수단

[0027] 상기한 목적을 달성하기 위하여, 본 발명은 다수의 미세 조각으로 분리된 비정질 리본으로 이루어진 적어도 1층의 박판 자성시트; 상기 박판 자성시트의 일면에, 제1접착층을 통하여 접착되는 보호필름; 및 상기 박판 자성시트의 타면에, 일측면에 구비된 제2접착층을 통하여 접착되는 양면 테이프를 포함하며, 상기 다수의 미세 조각 사이의 틈새는 상기 제1접착층과 제2접착층의 일부가 충진되어 상기 다수의 미세 조각을 절연(isolation)시키는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트를 제공한다.

[0028] 본 발명의 다른 특징에 따르면, 본 발명은 적어도 1층의 비정질 리본으로 이루어진 박막 자성시트의 양측면에 보호 필름과 노출면에 릴리즈 필름이 형성된 양면 테이프를 부착하여 적층시트를 형성하는 단계; 상기 적층시트를 플레이크 처리하여 상기 박막 자성시트를 다수의 미세 조각으로 분할하는 단계; 및 상기 플레이크 처리된 적층시트를 라미네이트 처리하여 적층시트의 평탄화 및 슬림화와 함께 상기 보호 필름과 양면 테이프에 구비된 제1 및 제2 접착층의 일부를 상기 다수의 미세 조각의 틈새로 충진시켜서 절연(isolation)시키는 단계를 포함하는 것을 특징으로 하는 무선 충전기용 자기장 차폐시트의 제조방법을 제공한다.

[0029] 본 발명의 또 다른 특징에 따르면, 본 발명은 무선 충전기의 송신장치로부터 전자유도방식으로 이차전지 배터리를 충전하는 무선 충전기용 수신장치에 있어서, 상기 송신장치로부터 전자유도방식으로 전송된 무선 고주파 신호를 수신하기 위한 2차 코일; 및 상기 2차 코일과 이차전지 배터리 사이에 배치되며, 상기 무선 고주파 신호에 의해 발생된 자기장을 차폐함과 동시에 상기 2차 코일에 무선 충전 기능을 수행하는 데 필요한 무선 고주파 신호를 흡수하도록 유도하는 자기장 차폐시트를 포함하며, 상기 자기장 차폐시트는 다수의 미세 조각으로 분리된 비정질 리본으로 이루어진 적어도 1층의 박판 자성시트; 상기 박판 자성시트의 일면에, 제1접착층을 통하여 접착되는 보호필름; 및 상기 박판 자성시트의 타면에, 일측면에 구비된 제2접착층을 통하여 접착되는 양면 테이프를 포함하며, 상기 다수의 미세 조각 사이의 틈새는 상기 제1접착층과 제2접착층의 일부가 충진되어 상기 다수의 미세 조각을 절연(isolation)시키는 것을 특징으로 하는 무선 충전기용 수신장치를 제공한다.

발명의 효과

[0030] 상기한 바와 같이 본 발명에서는 비정질 리본의 플레이크 처리에 의해 와전류(Eddy Current)에 의한 손실을 크게 줄여줌에 의해 휴대 단말기기 등의 본체 및 배터리에 미치는 자기장 영향을 차단함과 동시에 2차 코일의 품질계수(Q)를 증가시켜 전력전송 효율이 우수하다.

[0031] 또한, 본 발명에서는 비정질 리본의 플레이크 처리 후 압착 라미네이팅 처리에 의해 비정질 리본의 미세 조각 사이의 틈새를 접착제를 채워서 수분 침투를 방지함과 동시에 미세 조각의 모든 면을 접착제(유전체)로 둘러쌈에 의해 미세 조각을 상호 절연(isolation)시켜서 와전류 저감을 도모하여 차폐성능이 떨어지는 것을 방지할 수 있다. 그 결과, 미세 조각의 모든 면을 접착제(유전체)로 둘러쌈에 의해 수분이 침투하여 비정질 리본이 산화되어 외관의 변화와 특성이 악화되는 것을 방지할 수 있다.

[0032] 더욱이, 본 발명에서는 차폐시트의 형상을 수신기 코일과 유사한 형상으로 설정함에 의해 적은 수의 나노 결정립 리본을 사용하면서도 높은 전력전송 효율을 갖거나 또는 동등한 전력전송 효율을 나타내면서 시트의 두께를 0.3㎜ 이하로 낮출 수 있게 된다.

[0033] 또한, 본 발명에서는 롤-투-롤 방법으로 플레이크와 라미네이팅 처리를 순차적으로 수행함에 의해 시트 성형이 이루어질 수 있어 시트의 원래 두께를 유지하면서 생산성이 높고 제조비용이 저렴하다.

도면의 간단한 설명

[0034] 도 1은 본 발명에 따른 무선 충전기용 자기장 차폐시트를 나타내는 분해 사시도,

도 2는 제1실시예에 따라 1장의 나노 결정립 리본시트를 사용하는 예를 나타내는 단면도,

도 3은 제2실시예에 따라 6장의 나노 결정립 리본시트를 사용하는 예를 나타내는 단면도,

도 4 및 도 5는 각각 본 발명에 사용되는 보호 필름과 양면 테이프의 구조를 보여주는 단면도,

도 6은 본 발명의 제3실시예에 따른 무선 충전기용 자기장 차폐시트를 나타내는 분해 사시도,

도 7은 본 발명에 따른 무선 충전기용 자기장 차폐시트를 제조하는 공정을 설명하기 위한 공정도,

도 8 및 도 9는 각각 본 발명에 따른 적층시트의 플레이크 공정을 나타내는 단면도,

도 10은 본 발명에 따른 적층시트를 플레이크 처리한 상태를 나타내는 단면도,

도 11 및 도 12는 각각 본 발명에 따른 플레이크 처리된 적층시트의 라미네이트 공정을 나타내는 단면도,

도 13은 본 발명의 제1실시예에 따른 무선 충전기용 자기장 차폐시트를 플레이크 처리 후 라미네이트한 상태를 나타내는 단면도,

도 14a 및 도 14b는 각각 플레이크 처리후 라미네이트 공정을 거치지 않은 자기장 차폐시트의 습도 테스트를 거친 확대 사진과 본 발명에 따른 플레이크 처리 후 라미네이트된 자기장 차폐시트의 습도 테스트를 거친 후 확대 사진,

도 15는 본 발명의 제4실시예에 따른 무선 충전기용 자기장 차폐시트에 사용되는 박판 자성시트를 나타내는 단면도,

도 16은 본 발명에 따른 자기장 차폐시트가 무선 충전기의 수신장치에 적용된 구조를 나타내는 분해 사시도,

도 17는 도 16의 무선 충전기용 수신장치가 배터리 커버에 조립되어 휴대 단말기기에 결합되는 것을 나타내는 분해 사시도,

도 18은 NFC 안테나와 무선 충전기용 안테나가 FPCB를 사용하여 형성된 듀얼 안테나 구조를 보여주는 평면도,

도 19는 본 발명에 따른 차폐시트의 효율 및 온도 특성을 시험하기 위한 측정 구조를 나타낸 개략도이다.

발명을 실시하기 위한 구체적인 내용

[0035] 상술한 목적, 특징 및 장점은 첨부된 도면을 참조하여 상세하게 후술되어 있는 상세한 설명을 통하여 더욱 명확해 질 것이며, 그에 따라 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자가 본 발명의 기술적 사상을 용이하게 실시할 수 있을 것이다.

[0036] 또한, 본 발명을 설명함에 있어서 본 발명과 관련된 공지 기술에 대한 구체적인 설명이 본 발명의 요지를 불필요하게 흐릴 수 있다고 판단되는 경우에 그 상세한 설명을 생략하기로 한다.

[0037] 첨부된 도 1은 본 발명에 따른 무선 충전기용 자기장 차폐시트를 나타내는 분해 사시도, 도 2는 제1실시예에 따라 1장의 나노 결정립 리본시트를 사용하는 예를 나타내는 단면도이다.

[0038] 도 1 및 도 2를 참고하면, 본 발명의 바람직한 제1실시예에 따른 무선 충전기용 자기장 차폐시트(10)는 비정질 합금 또는 나노결정립 합금의 리본을 열처리한 후 플레이크 처리하여 다수의 미세 조각(細片)(20)으로 분리 및/또는 크랙이 형성된 적어도 1층 이상의 다층 박판 자성시트(2), 상기 박판 자성시트(2)의 상부에 접착되는 보호필름(1), 상기 박판 자성시트(2)의 하부에 접착되는 양면 테이프(3), 상기 양면 테이프(3)의 하부에 분리 가능하게 접착되는 릴리즈 필름(4)을 포함하고 있다.

[0039] 상기 박판 자성시트(2)는 예를 들어, 비정질 합금 또는 나노결정립 합금으로 이루어진 박판의 리본을 사용할 수 있다.

[0040] 상기 비정질 합금은 Fe계 또는 Co계 자성 합금을 사용할 수 있으며, 재료비용을 고려할 때 Fe계 자성 합금을 사용하는 것이 바람직하다.

[0041] Fe계 자성 합금은, 예를 들어, Fe-Si-B 합금을 사용할 수 있으며, Fe가 70-90atomic%, Si 및 B의 합이 10-30atomic%인 것이 바람직하다. Fe를 비롯한 금속의 함유량이 높을수록 포화자속밀도가 높아지지만 Fe 원소의 함유량이 과다할 경우 비정질을 형성하기 어려우므로, 본 발명에서는 Fe의 함량이 70-90atomic%인 것이 바람직하다. 또한, Si 및 B의 합이 10-30atomic%의 범위일 때 합금의 비정질 형성능이 가장 우수하다. 이러한 기본 조성에 부식을 방지시키기 위해 Cr, Co 등 내부식성 원소를20 atomic% 이내로 첨가할 수도 있고, 다른 특성을 부여하도록 필요에 따라 다른 금속 원소를 소량 포함할 수 있다.

[0042] 상기 Fe-Si-B 합금은 예를 들어, 결정화 온도가 508℃이고, 큐리온도(Tc)가 399℃인 것을 사용할 수 있다. 그러나, 이러한 결정화 온도는 Si 및 B의 함량이나, 3원계 합금 성분 이외에 첨가되는 다른 금속 원소 및 그의 함량에 따라 변동될 수 있다.

[0043] 본 발명은 Fe계 비정질 합금으로서 필요에 따라 Fe-Si-B-Co계 합금을 사용할 수 있다.

[0044] 한편, 상기 박판 자성시트(2)는 Fe계 나노 결정립 자성 합금으로 이루어진 박판의 리본을 사용할 수 있다.

[0045] Fe계 나노 결정립 자성 합금은, 다음 수학식 1을 만족하는 합금을 사용하는 것이 바람직하다.

[0046] [수학식 1]

[0047] $Fe_{100-c-d-e-f-g-h}A_cD_dE_eSi_fB_gZ_h$

[0048] 상기 수학식 1에서, A는 Cu 및 Au로부터 선택되는 적어도 1종의 원소를, D는 Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Ni, Co 및 희토류 원소로부터 선택되는 적어도 1종의 원소를, E는 Mn, Al, Ga, Ge, In, Sn 및 백금족 원소로부터 선택되는 적어도 1종의 원소를, Z는 C, N 및 P로부터 선택되는 적어도 1종의 원소를 나타내고, c, d, e, f, g 및 h는 관계식 $0.01 \leq c \leq 8at\%$, $0.01 \leq d \leq 10at\%$, $0 \leq e \leq 10at\%$, $10 \leq f \leq 25at\%$, $3 \leq g \leq 12at\%$, $15 \leq f+g+h \leq 35at\%$를 각각 만족하는 수이며, 상기 합금 구조의 면적비로 20% 이상이 입경 50㎚ 이하의 미세구조로 이루어져 있다.

[0049] 상기한 수학식 1에 있어서, A 원소는 합금의 내식성을 높이고, 결정 입자의 조대화를 방지함과 함께, 철손이나 합금의 투자율 등의 자기 특성을 개선하기 위해 사용된다. A 원소의 함유량이 너무 적으면, 결정립의 조대화 억제 효과를 얻기 곤란하다. 반대로, A 원소의 함유량이 지나치게 많으면, 자기 특성이 열화된다. 따라서, A원소의 함유량은 0.01 내지 8at%의 범위로 하는 것이 바람직하다. D 원소는 결정립 직경의 균일화 및 자기 변형의 저감 등에 유효한 원소이다. D 원소의 함유량은 0.01 내지 10at%의 범위로 하는 것이 바람직하다.

[0050] E 원소는 합금의 연자기 특성 및 내식성의 개선에 유효한 원소이다. E 원소의 함유량은 10at% 이하로 하는 것이 바람직하다. Si 및 B는 자성 시트 제조 시에 있어서의 합금의 아몰퍼스화를 조성하는 원소이다. Si의 함유량은 10 내지 25at%의 범위로 하는 것이 바람직하고, B의 함유량은 3 내지 12at%의 범위로 하는 것이 바람직하다. 또한, Si 및 B 이외의 합금의 아몰퍼스화 조성 원소로서 Z 원소를 합금에 포함하고 있어도 된다. 그 경우, Si, B 및 Z 원소의 합계 함유량은 15 내지 35at%의 범위로 하는 것이 바람직하다. 미세 결정 구조는, 입경이 5 내지 30㎚의 결정립이 합금 구조 중에 면적비로 50 내지 90%의 범위로 존재하는 구조를 구현하도록 형성되는 것이 바람직하다.

[0051] 또한, 상기 박판 자성시트(2)에 사용되는 Fe계 나노 결정립 자성 합금은 Fe-Si-B-Cu-Nb 합금을 사용할 수 있으며, 이 경우, Fe가 73-80 at%, Si 및 B의 합이 15-26 at%, Cu와 Nb의 합이 1-5 at%인 것이 바람직하다. 이러한 조성 범위가 리본 형태로 제작된 비정질 합금이 후술하는 열처리에 의해 나노상의 결정립으로 쉽게 석출될 수 있다.

[0052] 상기 보호 필름(1)은 도 4와 같이 예를 들어, 폴리에틸렌 테레프탈레이트(PET) 필름, 폴리이미드 필름, 폴리에스테르 필름, 폴리페닐린설페이드(PPS) 필름, 폴리프로필렌(PP) 필름, 폴리테레프탈레이트(PTFE)와 같은 불소 수지계 필름 등의 수지 필름(11)을 사용할 수 있으며, 제1접착층(12)을 통하여 박판 자성시트(2)의 일측면에 부착된다.

[0053] 또한, 보호 필름(1)은 1 내지 100㎛, 바람직하게는 10-30um 범위인 것을 사용할 수 있고, 더욱 바람직하게는 20um의 두께를 갖는 것이 좋다.

[0054] 본 발명에 사용되는 보호 필름(1)은 비정질 리본시트(2)의 일측면에 부착될 때 제1접착층(12)의 타면에 제1접착층(12)을 보호하기 위해 부착된 릴리즈 필름(4a)은 제거하고 부착된다.

[0055] 또한, 양면 테이프(3)는 도 5에 도시된 바와 같이, 예를 들어, PET(Polyethylene Terephthalate) 필름과 같은 불소 수지계 필름으로 이루어진 기재(32)로 사용하여 양측면에 제2 및 제3 접착층(31,33)이 형성된 것을 사용하며, 제2 및 제3 접착층(31,33)의 외측면에는 릴리즈 필름(4)이 부착되어 있다. 상기 릴리즈 필름(4)은 양면 테이프(3)의 제조시에 일체로 형성되며, 차폐시트(10)를 전자기기에 부착할 때 박리되어 제거된다.

[0056] 도 3에 도시된 다수의 비정질 리본시트(21-26)를 상호 접합시키기 위해 비정질 리본시트(21-26) 사이에 삽입되는 양면 테이프(3a-3f)는 양측면의 릴리즈 필름(4,4b)을 모두 제거하고 사용한다.

[0057] 양면 테이프(3,3a-3f)는 위에서 설명한 바와 같은 기재가 있는 타입과, 기재가 없이 접착층만으로 형성되는 무기재 타입도 적용이 가능하다. 비정질 리본시트(21-26) 사이에 삽입되는 양면 테이프(3a-3f)의 경우 무기재 타입을 사용하는 것이 박막화 측면에서 바람직하다.

[0058] 상기 제1 내지 제3 접착층(12,31,33)은 예를 들어, 아크릴계 접착제를 사용할 수 있으며, 다른 종류의 접착제를

사용하는 것도 물론 가능하다.

[0059] 양면 테이프(3)는 10, 20, 30um의 두께를 갖는 것을 사용할 수 있으며, 바람직하게는 10um의 두께를 갖는 것이 좋다.

[0060] 상기 차폐시트(10)에 사용되는 박판 자성시트(2)는 1장당 예를 들어, 15 내지 35um의 두께를 갖는 것을 사용할 수 있다. 이 경우, 박판 자성시트(2)의 열처리 후의 핸들링 공정을 고려하면 박판 자성시트(2)의 두께는 25 내지 30um로 설정되는 것이 바람직하다. 리본의 두께가 얇을수록 열처리 후 핸들링시에 약간의 충격에도 리본의 깨짐 현상이 발생할 수 있다.

[0061] 한편, 무선 충전기의 수신장치가 휴대 단말기기(100)의 배터리 커버(5)에 실치되어 사용될 때, 무선 충전기용 자기장 차폐시트(10)는 도 16 및 도 17에 도시된 바와 같이, 2차 코일(수신 코일)(6)이 차폐시트(10)에 부착되어 사용된다. 이 경우, 2차 코일(6)이 공진회로를 형성하고 있으므로, 차폐시트(10)는 2차 코일(수신 코일)(6)이 형성하는 공진회로의 인덕턴스에 영향을 미치게 된다.

[0062] 이 경우, 자기장 차폐시트(10)는 송신장치로부터의 무선 전력신호가 휴대 단말기기(100)에 미치는 영향을 차단하는 자기장 차폐 역할과 동시에 수신장치의 2차 코일(6)로 무선 전력신호가 높은 효율로 수신되도록 유도하는 인덕터로서 역할을 한다.

[0063] 박판 자성시트(2)는 플레이크 처리에 의해 다수의 미세 조각(20)으로 분리되며, 다수의 미세 조각(20)은 수십um ~ 3mm 이하의 크기를 갖는 것이 바람직하다.

[0064] 박판 자성시트(2)는 플레이크 처리가 이루어져서 다수의 미세 조각(20)으로 분리되는 경우, 자성시트의 인덕턴스(L) 값의 감소보다, 자기저항(R)의 감소가 더 크게 이루어진다. 그 결과, 박판 자성시트(2)의 플레이크 처리가 이루어지면, 수신장치의 2차 코일(6)이 형성하는 공진회로의 품질계수(Q)가 증가하게 되어 전력전송 효율이 증가하게 된다.

[0065] 또한, 박판 자성시트(2)가 다수의 미세 조각(20)으로 분리되는 경우, 와전류에 의한 손실을 줄여줌에 의해 배터리의 발열 문제를 차단할 수 있게 된다.

[0066] 더욱이, 본 발명에서는 박판 자성시트(2)가 도 10과 같이 플레이크된 후, 도 13과 같이 라미네이트 처리됨에 따라 다수의 미세 조각(20) 사이의 틈새(20a)로 제1 및 제2 접착층(12,31)의 일부가 침투되어, 다수의 미세 조각(20)이 유전체 역할을 하는 접착제로 분리(isolation)가 이루어지게 된다.

[0067] 그 결과, 단순히 플레이크 처리만 이루어질 경우, 미세 조각(20)의 유동에 따라 미세 조각(20)이 서로 접촉됨에 따라 미세 조각(20)의 크기가 증가하여 와전류 손실이 증가하는 문제가 발생할 수 있으나, 라미네이션 처리에 의해 미세 조각(20)의 전면이 유전체로 둘러싸여지므로 이러한 문제가 차단된다.

[0068] 도 2에 도시된 바와 같이, 본 발명의 제1실시예에 따른 무선 충전기용 자기장 차폐시트(10a)는 박판 자성시트로서 1장의 비정질 리본시트(21)를 사용하여 일측면에 보호 필름(1)이 접착되고, 타측면에 양면 테이프(3)를 통하여 릴리즈 필름(4)이 접착되는 구조를 갖는다.

[0069] 또한, 본 발명의 자기장 차폐시트는 도 3에 도시된 제2실시예와 같이, 2차 코일(6)의 품질계수(Q)와 전력전송 효율을 높이기 위해 박판 자성시트로서 다수의 비정질 리본시트(21-26)를 적층하여 사용할 수 있다.

[0070] 무선 충전기는 충전기의 효율을 최대한 높이기 위해 전력전송 송신장치에 수신장치와의 정합(align)을 돕는 영구자석을 채용할 수 있다. 즉, 송신장치의 1차 코일(송신 코일)의 내부에 원형의 영구자석을 구비함에 따라 구비된 송신장치 위에 놓여지는 수신장치와 정확한 위치 정렬을 이루게 하며 수신장치를 움직이지 않게 잡아준다.

[0071] 따라서, 무선 충전기용 자기장 차폐시트는 송신장치로부터 100 내지 150KHz 주파수의 전력 전송에 따라 생성되는 교류(AC) 자기장 뿐 아니라 상기 영구자석에 의한 직류(DC) 자기장도 모두 차폐하는 것이 요구된다.

[0072] 그런데, 상기 직류(DC) 자기장은 교류(AC) 자기장에 의해 자기장 차폐시트(10)에 미치는 영향보다 더 크기 때문에 얇은 차폐시트를 자기 포화시켜서 차폐시트로서의 성능을 떨어트리거나 전력전송 효율이 급격하게 떨어지는 문제가 발생된다.

[0073] 이에 따라, 무선 충전기의 송신장치에 영구자석을 채용한 경우는 영구자석에 의해 자기포화가 이루어지는 층수를 고려하여 적층되는 비정질 리본시트(21-26)를 결정하는 것이 요구된다.

[0074] 또한, Fe계 비정질 합금은 나노결정립 합금보다 포화 자기장이 크다. 이에 따라 Fe계 비정질 합금으로 이루어진

비정질 리본시트(21-26)를 사용하는 경우, 2 내지 8층을 적층하여 사용할 수 있으며, 예를 들어, 3 내지 5층을 사용하는 것이 높은 투자율이 얻어져서 바람직하다. 이 경우, 적층시트의 인덕턴스(즉, 투자율)은 약 13 내지 19uH인 것이 바람직하다.

[0075] 또한, 나노결정립 합금으로 이루어진 비정질 리본시트(21-26)를 사용하는 경우, 4 내지 12층을 적층하여 사용할 수 있으며, 예를 들어, 7내지 9층을 사용하는 것이 높은 투자율이 얻어져서 바람직하다. 이 경우, 적층시트의 인덕턴스(즉, 투자율)은 약 13 내지 21uH인 것이 바람직하다.

[0076] 한편, 무선 충전기의 송신장치에 영구자석을 채용하지 않은 경우는 영구자석을 채용한 경우와 비교하여 상대적으로 적은 수의 비정질 리본시트를 사용하는 것도 가능하다.

[0077] 이 경우, Fe계 비정질 합금 또는 나노결정립 합금으로 이루어진 비정질 리본시트를 사용하는 경우, 1 내지 4층을 적층하여 사용할 수 있으며, 적층시트의 인덕턴스(즉, 투자율)은 약 13 내지 21uH인 것이 바람직하다.

[0078] 도 3을 참고하면, 박판 자성시트로서 다수, 예를 들어, 6층의 비정질 리본시트(21-26)를 적층하여 사용하는 경우를 나타낸 것으로, 다수의 비정질 리본시트(21-26) 사이에 다수의 접착층 또는 양면 테이프(3a-3f)가 삽입되어 있다.

[0079] 즉, 플레이크 및 라미네이팅 처리시에 분리된 미세 조각(20)이 분리된 위치를 유지하며 미세 조각(20) 사이의 틈새(20a)에 충진되도록 접착층 또는 양면 테이프(3a-3f)를 비정질 리본시트(21-26) 사이에 삽입하여 적층하는 것이 필요하다.

[0080] 본 발명에 따른 자기장 차폐시트(10-10b)는 일반적으로 배터리 셀에 대응하는 직사각형 또는 정사각형의 사각형상을 이루게 되나, 이외에도 오각형 등의 다각형 또는 원형이나 타원, 그리고 부분적으로 직사각 형상과 원형이 조합된 형상으로 이루어질 수 있으며, 바람직하게는 자기장 차폐가 요구되는 부위의 형상에 따라 이에 대응하는 형상을 갖는다.

[0081] 또한, 본 발명에 따른 자기장 차폐시트는 무선 충전기가 송신장치의 1차 코일 중앙부에 영구자석을 포함하는 경우, 영구자석의 자기장에 의해 차폐시트가 착자(포화)되는 현상을 방지하기 위해 도 6에 도시된 제3실시예의 자기장 차폐시트(10c)와 같이, 수신장치의 2차 코일과 대응하는 환형으로 성형되어 이루어질 수 있다.

[0082] 제3실시예의 자기장 차폐시트(10c)는 2차 코일이 사각형, 원형, 타원형 중 어느 하나의 형상으로 이루어질 때 이에 대응하여 사각형, 원형, 타원형 중 어느 하나의 형상으로 이루어진다. 이 경우, 자기장 차폐시트(10c)는 2차 코일(6)의 폭보다 약 1-2mm 더 넓은 폭으로 이루어지는 것이 바람직하다.

[0083] 제3실시예의 자기장 차폐시트(10c)는 상부면에 환형의 보호 필름(1a)이 부착된 환형의 박판 자성시트(2b)가 환형의 양면 테이프(30)를 통하여 릴리즈 필름(4)에 부착된 구조를 가질 수 있다.

[0084] 상기 환형의 자기장 차폐시트(10c)는 릴리즈 필름(4)으로부터 쉽게 박리가 이루어질 수 있도록 자기장 차폐시트(10c)보다 큰 면적을 갖는 사각 형상의 릴리즈 필름(4)을 사용하는 것이 바람직하다.

[0085] 이하에 본 발명에 따른 자기장 차폐시트의 제조방법을 도 7을 참고하여 설명한다.

[0086] 먼저, 비정질 합금 또는 나노 결정립 합금으로 이루어진 비정질 리본(2a)을 멜트 스피닝에 의한 급냉응고법(RSP)으로 제조한 후(S11), 열처리 후의 후처리를 용이하게 할 수 있도록 먼저 일정한 길이로 컷팅하여 시트 형태로 적층한다(S12).

[0087] 비정질 리본(2a)이 비정질 합금인 경우, Fe계 비정질 리본, 예를 들어, Fe-Si-B 또는 Fe-Si-B-Co 합금으로 이루어진 30um 이하의 극박형 비정질 리본을 멜트 스피닝에 의한 급냉응고법(RSP)으로 제조하며, 원하는 투자율을 얻을 수 있도록 적층된 비정질 리본을 300℃ 내지 600℃의 온도범위에서 30분 내지 2시간 동안 무자장 열처리를 행한다(S13).

[0088] 이 경우, 열처리 분위기는 비정질 리본(2a)의 Fe 함량이 높을지라도, 산화가 발생되지 않는 온도 범위에서 이루어지므로 분위기 로에서 이루어질 필요는 없고, 대기 중에서 열처리를 진행하여도 무방하다. 또한, 산화 분위기 또는 질소 분위기에서 열처리가 이루어질지라도 동일한 온도 조건이라면 비정질 리본의 투자율은 실질적으로 차이가 없다.

[0089] 상기한 열처리 온도가 300℃ 미만인 경우 원하는 투자율 보다 높은 투자율을 나타내며 열처리 시간이 길게 소요되는 문제가 있고, 600℃를 초과하는 경우는 과열처리에 의해 투자율이 현저하게 낮아져서 원하는 투자율을 나

타내지 못하는 문제가 있다. 일반적으로 열처리 온도가 낮으면 처리시간이 길게 소요되고, 반대로 열처리 온도가 높으면 처리시간은 단축된다.

[0090] 또한, 비정질 리본(2a)이 나노 결정립 합금으로 이루어진 경우, Fe계 비정질 리본, 예를 들어, Fe-Si-B-Cu-Nb 합금으로 이루어진 30um 이하의 극박형 비정질 리본을 멜트 스피닝에 의한 급냉응고법(RSP)으로 제조하며, 원하는 투자율을 얻을 수 있도록 적층된 리본 시트를 400℃ 내지 700℃의 온도범위에서 30분 내지 2시간 동안 무자장 열처리를 행함으로써 나노 결정립이 형성된 나노 결정립 리본시트를 형성한다(S13).

[0091] 이 경우 열처리 분위기는 Fe의 함량이 70at% 이상이므로 대기 중에서 열처리가 이루어지면 산화가 이루어져서 시각적인 측면에서 바람직하지 못하며, 따라서 질소 분위기에서 이루어지는 것이 바람직하다. 그러나, 산화 분위기에서 열처리가 이루어질지라도 동일한 온도 조건이라면 시트의 투자율은 실질적으로 차이가 없다.

[0092] 이 경우, 열처리 온도가 400℃ 미만인 경우 나노 결정립이 충분히 생성되지 않아 원하는 투자율이 얻어지지 않으며 열처리 시간이 길게 소요되는 문제가 있고, 700℃를 초과하는 경우는 과열처리에 의해 투자율이 현저하게 낮아지는 문제가 있다. 열처리 온도가 낮으면 처리시간이 길게 소요되고, 반대로 열처리 온도가 높으면 처리시간은 단축되는 것이 바람직하다.

[0093] 또한, 본 발명의 비정질 리본(2a)은 두께가 15 ~ 35um 범위를 갖는 것을 사용하며, 비정질 리본(2a)의 투자율은 리본의 두께에 비례하여 증가한다.

[0094] 더욱이, 상기 비정질 리본은 열처리가 이루어지면 취성이 강하게 되어 후속 공정에서 플레이크 처리를 실시할 때 쉽게 플레이크가 이루어질 수 있게 된다.

[0095] 이어서, 열처리가 이루어진 비정질 리본(2a)을 1장 또는 원하는 층수의 다층으로 사용하여, 일측에 보호 필름(1)을 부착하고, 타측에 릴리즈 필름(4)이 부착된 양면 테이프(3)를 부착한 상태로 플레이크 처리를 실시한다(S14).

[0096] 상기 플레이크 처리는 예를 들어, 보호 필름(1), 비정질 리본(2a) 및 양면 테이프(3)와 릴리즈 필름(4)이 순차적으로 적층된 적층시트(100)를 제1 및 제2 플레이크 장치(110,120)를 통과시킴에 의해 비정질 리본(2a)을 다수의 미세 조각(20)으로 분리시킨다. 이 경우, 분리된 다수의 미세 조각(20)은 양측면에 접착된 제1 및 제2 접착층(12,31)에 의해 분리된 상태를 유지하게 된다.

[0097] 사용 가능한 제1 플레이크 장치(110)는 예를 들어, 도 8에 도시된 바와 같이, 외면에 복수의 요철(116)이 형성되는 금속롤러(112)와, 금속롤러(112)와 대향하여 배치되는 고무롤러(114)로 구성될 수 있고, 제2 플레이크 장치(120)는 도 9에 도시된 바와 같이, 외면에 복수의 구형 볼(126)이 장착되는 금속롤러(122)와, 금속롤러(122)와 대향하여 배치되는 고무롤러(124)로 구성될 수 있다.

[0098] 이와 같이, 적층시트(100)를 제1 및 제2 플레이크 장치(110,120)를 통과시키면 도 10에 도시된 바와 같이, 비정질 리본(2a)이 다수의 미세 조각(20)으로 분리되면서, 미세 조각(20) 사이에는 틈새(20a)가 발생하게 된다.

[0099] 비정질 리본(2a)의 다수의 미세 조각(20)은 수십um ~ 3mm 범위의 크기를 갖도록 형성되므로 반자장을 증가시켜서 히스테리시스 로스를 제거함에 따라 시트에 대한 투자율의 균일성을 높이게 된다.

[0100] 또한, 비정질 리본(2a)은 플레이크 처리에 의해 미세 조각(20)의 표면적을 줄여줌에 따라 교류 자기장에 의해 생성되는 와전류(Eddy Current)에 기인한 발열 문제를 차단할 수 있다.

[0101] 플레이크 처리된 적층시트(200)는 미세 조각(20) 사이에 틈새(20a)가 존재하게 되며, 이 틈새(20a)로 수분이 침투하게 되면 비정질 리본이 산화되어 비정질 리본의 외관이 좋지 못하게 되고 차폐성능이 떨어지게 된다.

[0102] 또한, 플레이크 처리만 이루어질 경우, 미세 조각(20)의 유동에 따라 미세 조각(20)이 서로 접촉됨에 따라 미세 조각(20)의 크기가 증가하여 와전류 손실이 증가하는 문제가 발생할 수 있다.

[0103] 더욱이, 상기 플레이크 처리된 적층시트(200)는 플레이크 처리시에 시트의 표면 불균일이 발생할 수 있고, 플레이크 처리된 리본의 안정화가 필요하다.

[0104] 따라서, 플레이크 처리된 적층시트(200)는 미세 조각(20) 사이의 틈새(20a)로 접착제를 채움과 동시에 평탄화, 슬림화 및 안정화를 위한 라미네이트 공정을 실시한다(S15). 그 결과, 수분 침투를 방지함과 동시에 미세 조각(20)의 모든 면을 접착제로 둘러쌈에 의해 미세 조각(20)을 상호 분리시켜서 와전류 저감을 도모할 수 있다.

[0105] 상기 라미네이트 공정을 위한 라미네이트 장치(400,500)는 도 11과 같이 플레이크 처리된 적층시트(200)가 통과

하는 제1가압롤러(210) 및 제1가압롤러(210)와 일정 간격을 두고 배치되는 제2가압롤러(220)로 구성되는 롤 프레스 타입이 적용될 수 있고, 도 12에 도시된 바와 같이, 하부 가압부재(240)와 하부 가압부재(240)의 상측에 수직방향으로 이동 가능하게 배치되는 상부 가압부재(250)로 구성되는 유압 프레스 타입이 사용될 수 있다.

[0106] 플레이크 처리된 적층시트(200)를 상온 또는 50 내지 80℃의 온도로 열을 가한 후 라미네이트 장치(400,500)를 통과시키면 보호필름(1)의 제1접착층(12)이 가압되면서 제1접착층(12)의 일부 접착제가 틈새(20a)로 유입됨과 아울러 양면 테이프(30)가 가압되면서 제2접착층(31)의 일부 접착제가 틈새(20a)로 유입되어 틈새(20a)를 밀봉하게 된다.

[0107] 여기에서, 제1접착층(12)과 제2접착층(31)은 상온에서 가압하면 변형이 가능한 접착제가 사용되거나, 열을 가하면 변형되는 열가소성 접착재가 사용될 수 있다.

[0108] 그리고, 제1접착층(12)과 제2접착층(31)의 두께는 다수의 미세 조각들 사이의 틈새(20a)를 충분히 채울 수 있도록 비정질 리본의 두께 대비 50% 이상의 두께를 갖는 것이 바람직하다.

[0109] 또한, 제1접착층(12)과 제2접착층(31)의 접착제가 틈새(20a)로 유입될 수 있도록 제1가압롤러(210)와 제2가압롤러(220) 사이의 간격 및 상부 가압부재가 하강한 상태일 때 상부 가압부재(250)와 하부 가압부재(240) 사이의 간격은 적층시트(200) 두께의 50% 이하로 형성되는 것이 바람직하다.

[0110] 본 발명에서는 적층시트(100,200)의 압착과 플레이크 처리가 이루어질 수 있는 것이라면, 어떤 장치도 사용할 수 있다.

[0111] 상기 라미네이트 공정이 완료되면, 본 발명에 따른 전자파 흡수시트(10)는 도 13에 도시된 바와 같이, 비정질 리본(2a)이 다수의 미세 조각(20)으로 분리된 상태로 제1접착층(12)과 제2접착층(31)이 각각 부분적으로 미세 조각(20) 사이의 틈새(20a)를 충진하여 비정질 리본(2a)의 산화 및 유동을 방지하는 구조를 갖게 된다.

[0112] 끝으로, 상기 라미네이트가 이루어진 자기장 차폐시트(10)는 전자기기에 사용되는 장소와 용도에 필요한 크기와 형상으로 스탬핑 가공되어 제품화가 이루어진다(S16).

[0113] 본 발명에서는 도 3과 같이 박막 자성시트로서 6장의 비정질 리본시트(21-26)를 적층하는 경우, 라미네이팅이 이루어지기 전에 보호 필름(1) 및 릴리즈 필름(4)을 포함하여 212um의 두께를 가지며, 라미네이팅이 이루어지면 200um로 슬림화가 이루어진다.

[0114] 상기 실시예에서는 1개의 보호 필름(1)을 자성시트(2)의 일측에 부착하여 플레이크 및 라미네이트 처리하는 것을 예시하였으나, 플레이크 처리 공정을 거치면 보호 필름(1)의 손상이 발생할 수 있다. 따라서, 바람직하게는 보호 필름(1)의 상부에 보호 필름(1)을 보호하기 위한 다른 보호 필름을 부착하여 처리공정을 진행한 후 처리가 완료된 후 표면의 보호 필름을 박리하여 제거하는 것이 좋다.

[0115] (습도 테스트)

[0116] 상기에서 얻어진 본 발명에 따른 자기장 차폐시트(10)와 플레이크 처리후 라미네이트 공정을 거치지 않은 적층시트(200)에 대하여 온도 85℃, 습도 85%에서 120시간 습도 테스트를 진행하였다.

[0117] 그 결과, 플레이크 처리만 된 적층시트(200)의 경우 도 14a에 도시된 바와 같이, 비정질 리본이 다수의 미세 조각으로 분리된 상태일 때 조각들 사이의 틈새로 수분이 침투하여 비정질 리본이 산화되어 외관이 변화된 것을 알 수 있으며, 본 발명에 따른 자기장 차폐시트(10)는 도 14b와 같이 외관이 변화되지 않는 것을 알 수 있다.

[0118] 본 발명에 따른 자기장 차폐시트는 박막 자성시트로서 도 15a 및 도 15b에 도시된 이종 재료를 사용하여 구성될 수 있다.

[0119] 도 15a에 도시된 바와 같이, 박막 자성시트(35)는 고투자율의 제1자성시트(35a)와 상기 제1자성시트보다 투자율이 낮은 저 투자율의 제2자성시트(35b) 사이에 접착층(35c)을 삽입하여 조합한 하이브리드 형태로 구성할 수 있다.

[0120] 상기 제1자성시트(35a)로는 상기한 비정질 합금 또는 나노결정립 합금으로 이루어진 비정질 리본시트, 연자성 특성이 우수한 퍼멀로이(permalloy) 시트 또는 MPP(Moly Permalloy Powder) 시트 등을 적용할 수 있다.

[0121] 제2자성시트(35b)는 비정질 합금 분말, 연자성체 분말, 센더스트와 같은 고투자율의 자성분말과 수지로 이루어진 폴리머 시트를 사용할 수 있다.

[0122] 이 경우, 비정질 합금 분말은 예를 들어, Fe-Si-B, Fe-Si-B-Cu-Nb, Fe-Zr-B 및 Co-Fe-Si-B로 이루어진 군에서

선택되는 조성을 갖고 비정질인 합금을 1종 이상 포함하는 비정질 합금 분말을 사용하는 것이 바람직하다.

[0123] 또한, 휴대 단말기에 NFC와 무선 충전 기능을 동시에 채용하는 경우, 하이브리드형 박막 자성시트(35)는 제1 및 제2 자성시트(35b)로서, 비정질 리본시트와 주파수 의존도가 낮은 페라이트 시트를 라미네이팅 적층하여 사용함에 의해 NFC용 자기장 차폐에는 페라이트 시트를 사용하고 무선 충전기용으로는 비정질 리본시트를 사용하여 동시에 해결이 가능하다.

[0124] 더욱이, 휴대 단말기에 NFC와 무선 충전 기능을 동시에 채용하는 경우, 하이브리드형 박막 자성시트(35)는 도 15b에 도시된 바와 같이, 제1자성시트(35a)로서 중앙부에 일정 면적의 비정질 리본시트를 사용하고, 상기 제1자성시트(35a)의 외부에 제1자성시트(35a)를 전체적으로 둘러싸는 환형의 제2자성시트(35b)를 페라이트 루프를 조합하는 것도 가능하다. 즉, 비정질 시트에 비하여 상대적으로 투자율이 작은 페라이트를 루프 형태로 형성하여 비정질 시트의 외곽에 배치한다.

[0125] 한편 상기한 본 발명에 따른 자기장 차폐시트가 무선 충전기의 수신장치에 적용된 구조를 도 16 및 도 17을 참고하여 이하에 설명한다.

[0126] 도 16은 본 발명에 따른 자기장 차폐시트가 무선 충전기의 수신장치에 적용된 구조를 나타내는 분해 사시도, 도 17는 도 16의 무선 충전기용 수신장치가 배터리 커버에 조립되어 휴대 단말기기에 결합되는 것을 나타내는 분해 사시도이다.

[0127] 도 16을 참고하면, 본 발명에 따른 자기장 차폐시트가 무선 충전기의 수신장치에 적용될 때, 자기장 차폐시트(10)의 보호필름 상부에는 양면 테이프(30b)를 사용하여 무선 충전기의 수신측 2차 코일(6)이 부착되며, 자기장 차폐시트(10)의 하부는 릴리즈 필름(4)을 제거하고 노출된 양면 테이프의 접착층(33)에 마감재를 부착시킨다.

[0128] 또한, 상기 안테나 조립방법 대신에 자기장 차폐시트(10)의 릴리즈 필름(4)을 제거하고 양면 테이프(3)에 무선 충전기의 2차 코일(6)을 부착하는 것도 가능하다.

[0129] 상기한 2차 코일(6)과 자기장 차폐시트(10)의 조립체는 도 17과 같이 휴대 단말기기(100)의 배터리 커버(5)에 양면 테이프(30a)를 사용하여 부착된 후, 배터리 커버(5)가 휴대 단말기기(100)에 결합되면 자기장 차폐시트(10)는 배터리(7)를 커버하는 형태로 사용된다.

[0130] 상기한 자기장 차폐시트(10)의 조립 위치는 배터리 외부에 배치되는 것 이외에 주지된 다른 방법으로 배치되는 것도 물론 가능하다.

[0131] 상기 2차 코일(6)은 주지된 어떤 구조를 갖는 것도 사용 가능하다. 예를 들어, 2차 코일(6)은 도 16에 나타난 바와 같이 폴리이미드(PI)와 같은 합성수지로 이루어진 기판(6b)에 사각형, 원형, 타원형 중 어느 하나의 형상으로 이루어진 스파이럴 코일(6a)로 구성될 수도 있다.

[0132] 상기 2차 코일(6)은 합성 수지 기판(6b)과 양면 테이프(30b) 대신에 절연층 역할을 하는 하나의 접착시트, 예를 들어, 양면 테이프에 직접 스파이럴 코일(6a)을 전사방식으로 형성함에 의해 박막 구조로 조립될 수 있다.

[0133] 이 경우, 스파이럴 코일(6a)은 무선으로 전력을 수신하는 것이므로 일반 코일을 평면 인덕터 형태로 권선하여 기판에 부착시켜 사용하는 것도 가능하다.

[0134] 한편, 휴대 단말기기(100)에는 본체 내부에 2차 코일(6)의 스파이럴 코일(6a)에 발생한 교류 전압을 직류로 정류하는 정류기(도시되지 않음)를 포함하며, 정류된 직류 전압은 배터리(2차 전지)(7)에 충전된다.

[0135] 상기와 같이, 2차 코일(6)과 자기장 차폐시트(10)의 조립체가 휴대 단말기기(100)의 배터리 커버(5)에 구비되는 경우 휴대 단말기기에 무선 충전 기능을 비접촉(무선) 방식으로 구현할 때 발생되는 교류 자기장에 의해 휴대 단말기기(100)에 미치는 영향을 차단하며 무선 충전 기능을 수행하는 데 필요한 전자파를 흡수할 수 있게 된다.

[0136] 즉, 본 발명의 자기장 차폐시트(10)는 플레이크 처리되어 다수의 미세 조각(20)으로 분리된 다층의 자성시트(2)를 구비함에 의해, Q값이 상승하여 전력전송 효율이 증가하며 동시에 플레이크 처리에 의해 리본의 표면적을 줄여줌에 따라 교류 자기장에 의해 생성되는 와전류(Eddy Current)에 기인한 발열 문제를 차단할 수 있다.

[0137] 그 결과, 송신장치의 1차 코일로부터 발생한 자속이 휴대 단말기의 회로 기판 및 배터리(2차 전지)(7) 등에 쇄교하는 것을 차단하여 발열을 억제한다.

[0138] 한편, 도 18은 NFC(Near field communications) 안테나와 무선 충전기용 안테나가 FPCB를 사용하여 일체로 형성된 듀얼 안테나 구조를 보여주는 평면도이다.

[0139] NFC와 무선 충전 기능을 동시에 수행하기 위한 듀얼 안테나(40)는 양면 기판 구조를 갖는 FPCB를 사용하여 구현되는 것이 바람직하다. 그러나, 본 발명의 듀얼 안테나는 이에 제한되지 않고 다른 형태의 구조를 가질 수 있다.

[0140] 도 18을 참고하면, 듀얼 안테나(40)는 예를 들어, 기판(49) 위에 NFC 안테나 코일(41)과 무선 충전기용 안테나 코일(43)이 함께 형성되어 있다. 상기 기판(49)은 예를 들어, 양면 접착 테이프를 사용할 수 있으며, NFC 안테나 코일(41)과 무선 충전기용 안테나 코일(43)은 전사방식을 사용하여 접착기판(29)에 형성된다.

[0141] NFC 안테나 코일(41)은 무선 충전기용 안테나 코일(43) 보다 주파수 대역이 높기 때문에 기판(49)의 외곽을 따라 미세한 선폭의 직사각 형상으로 도전성 패턴으로 형성되어 있고, 무선 충전기용 안테나 코일(43)은 전력 전송이 요구되며 NFC 보다 낮은 주파수 대역을 사용하므로 NFC 안테나 코일(41)의 내측에 NFC 안테나 코일(41)의 선폭보다 넓은 선폭으로 이루어지며 대략 타원 형상의 도전성 패턴으로 형성되어 있다.

[0142] 상기 듀얼 안테나(40)는 NFC 안테나 코일(41)과 무선 충전기용 안테나 코일(43)의 일측에 연장 형성된 기판(49)의 돌출부에 각각 한쌍의 터미널 단자(41a,41b)(43a,43b)가 배치되어 있다.

[0143] 상기 NFC 안테나 코일(41)의 외측 라인은 제1터미널 단자(41a)에 직접 연결되고, 내측라인은 도전성 스루홀(45a,45b)을 통하여 기판(49)의 배면에 형성된 단자 연결용 패턴(도시되지 않음)을 통하여 제2터미널 단자(41b)에 연결된다.

[0144] 유사하게 무선 충전기용 안테나 코일(43)의 외측라인은 도전성 스루홀(47a,47b)을 통하여 접착기판(29)의 배면에 형성된 단자 연결용 패턴(도시되지 않음)을 통하여 제3터미널 단자(43a)에 연결되고, 내측라인은 도전성 스루홀(47c,47d)을 통하여 기판(49)의 배면에 형성된 단자 연결용 패턴(도시되지 않음)을 통하여 제4터미널 단자(43b)에 연결된다.

[0145] 상기 기판(49)은 표면에 예를 들어, PSR(Photo Solder Resist)과 같은 안테나 코일 패턴을 보호하기 위한 보호막이 형성되는 것이 바람직하다.

[0146] NFC와 무선 충전 기능을 동시에 채용하는 경우, 상기한 바와 같이, 도 15a 및 도 15b의 하이브리드형 자성시트를 채용한 차폐시트를 사용할 수 있다.

[0147] 이하에서는 본 발명을 실시예를 통하여 보다 구체적으로 설명한다. 그러나, 아래의 실시예는 본 발명의 예시에 불과할 뿐, 본 발명의 범위가 이에 한정되는 것은 아니다.

[0148] (실시예 1-4, 비교예 1-3)

[0149] (자기장 차폐시트의 전기적 특성)

[0150] 자기장 차폐시트를 사용하지 않은 경우(비교예 1), 열처리하지 않은 1장의 비정질 리본시트를 사용한 자기장 차폐시트(비교예 2), 열처리된 1장의 나노 결정립 리본시트를 사용한 자기장 차폐시트(비교예 3), 열처리된 1장의 나노 결정립 리본시트를 사용하며, 플레이크 처리한 자기장 차폐시트(실시예 1), 열처리된 2장의 나노 결정립 리본시트를 사용하며, 플레이크 처리한 자기장 차폐시트(실시예 2), 열처리된 3장의 나노 결정립 리본시트를 사용하며, 플레이크 처리한 자기장 차폐시트(실시예 3), 열처리된 4장의 나노 결정립 리본시트를 사용하며, 플레이크 처리한 자기장 차폐시트(실시예 4)를 각각 제조하였다.

[0151] 차폐시트에 적용된 비정질 리본은 $Fe_{73.5}Cu_1Nb_3Si_{13.5}B_9$ 합금으로 이루어진 비정질 리본을 멜트 스피닝에 의한 급냉응고법(RSP)으로 25㎛ 두께로 제조한 후, 시트 형태로 컷팅하여 580℃, N_2 분위기, 1시간 무자장 열처리하여 얻어진 비정질 리본 시트를, PET 기재를 사용하는 10um 두께의 보호필름과 PET 기재를 사용하는 10um 두께의 양면 테이프(릴리즈 필름 별도) 사이에 삽입하여 적층시트를 준비하고, 도 8의 플레이크 처리장치와 도 11의 라미네이트 장치를 사용하여 플레이크와 라미네이트 처리를 실시하였다. 2장 이상의 나노 결정립 리본시트를 적층할 때 시트 사이에 삽입된 양면 테이프는 PET 필름의 양면에 아크릴계 접착제층이 형성된 것으로 12㎛의 두께를 갖는 것을 사용하였다.

[0152] 제작된 차폐시트를 무선 충전기에 사용할 때 2차 코일에 미치는 영향을 알아보기 위해 차폐시트에 결합된 2차 코일, 즉 측정 코일로서 12.2uH의 인덕턴스와 237mΩ의 저항을 가지는 원형의 평면 코일을 사용하였다. LCR 미터에 측정 코일을 연결한 후, 차폐시트 위에 위치시키고 약 500g의 무게를 가지는 직육면체를 측정 코일 위에 올려놓아 일정한 압력을 가한 상태에서 LCR 미터의 셋팅값을 100kHz, 1V로 설정한 후 인덕턴스(Ls), 자기저항

(Rs), 임피던스(Z), 코일의 품질계수(Q)를 측정하여 하기 표 1에 나타내었다.

표 1

[0153]

사용된 리본	리본 수	Ls(uH)	Rs(mΩ)	Z(Ω)	Q
비교예 1(No Sheet)	0	12.08	245	7.59	30.9
비교예 2(비 열처리 리본)	1 EA	17.91	1020	11.3	11.03
비교예 3(열처리된 리본)	1 EA	21.74	605	13.67	22.53
실시예 1(열처리 및 플레이크 처리)	1 EA	21.52	442	13.52	30.5
실시예 2(열처리 및 플레이크 처리)	2 EA	21.54	355	13.54	38
실시예 3(열처리 및 플레이크 처리)	3 EA	21.56	327	13.55	41.4
실시예 4(열처리 및 플레이크 처리)	4 EA	21.7	308	13.64	44.2

[0154] 상기 표 1로부터 알 수 있는 바와 같이, 열처리가 이루어지지 않은 리본을 사용한 차폐시트(비교예 2)의 경우, 투자율이 낮아 2차 코일의 인덕턴스(Ls) 값은 작고, 리본의 전기 저항이 낮아 자기저항(Rs) 값은 커서 코일의 품질계수인 Q값이 현저히 낮은 것으로 나타났다.

[0155] 열처리가 이루어진 리본시트를 사용한 차폐시트(비교예 3)의 경우, 투자율이 높아져 2차 코일의 인덕턴스(Ls) 값은 커지고, 열처리에 의해 리본시트에 생성된 나노 결정립 미세조직을 통해 리본시트의 전기 저항이 커져서 자기저항(Rs) 값이 열처리 전에 비해 크게 낮아졌으며, 그로 인해 코일의 품질계수(Q) 값이 열처리 전에 비해 크게 상승한 것으로 나타났다.

[0156] 또한, 열처리가 이루어진 리본시트를 사용함과 동시에 리본시트를 플레이크(Flake)한 차폐시트(실시예 1)의 경우, 2차 코일의 인덕턴스(Ls) 값은 크게 변화되지 않고, 자기저항(Rs) 값은 플레이크 처리를 하지 않았을 때보다 훨씬 낮게 나타나, 전체적인 코일의 Q값은 더욱 상승한 것을 알 수 있다.

[0157] 더욱이, 실시예 1과 비교하여 리본시트의 적층 수를 높이면 높일수록 코일의 품질계수(Q) 값은 크게 상승하는 것으로 나타났다.

[0158] 상기와 같이, 본 발명에 따른 차폐시트를 무선 충전기에 사용하면, 2차 코일의 인덕턴스(Ls)와 Q 값이 높아지고, 자기저항(Rs) 값은 감소함에 따라 무선 충전기의 2차 코일에 대한 송신장치로부터 전송된 자속의 전송효율 증대를 도모할 수 있게 된다.

[0159] (실시예 5-8, 비교예 1)

[0160] (자기장 차폐시트의 전력전송 효율)

[0161] 실시예 5 내지 7의 자기장 차폐시트는 실시예 1 내지 4와 동일한 방법으로 사각형상으로 제조되었고, 단지 시트에 적층되는 나노 결정립 리본시트의 수가 6장, 9장, 12장으로 변경되었으며, 실시예 8의 자기장 차폐시트는 실시예 6의 자기장 차폐시트(나노 결정립 리본시트의 수: 6장)의 형상을 2차 코일의 형상과 동일한 환형으로 가공한 점에서 차이가 있다.

[0162] 비교예 1(자기장 차폐시트를 사용하지 않은 경우), 실시예 5 내지 8의 자기장 차폐시트에 대하여 각각 도 19에 도시된 바와 같이, 무선 충전기의 송신장치(8)의 상부에 0.5㎜ 두께의 간지(9)를 놓고, 리튬 이온 배터리(7)에 자기장 차폐시트(10)와 2차 코일(6)이 조립된 수신장치를 올려놓은 상태에서 송신장치(Tx)(8)의 1차 코일에 인가되는 전압(V)과 전류(mA), 수신장치(Rx)의 2차 코일(6)에 수신되는 전압(V)과 전류(mA)를 측정하여 하기 표 2에 기재하고, 이에 기초하여 전력전송 효율을 계산하였다.

표 2

[0163]

사용된 리본	Tx		Rx		효율(%)
	V	mA	V	mA	
비교예 1(No Sheet)	19	188	4.87	520	70.895857

실시예 5(사각형 리본 6장)	19	205	4.87	521	65.141720
실시예 6(사각형 리본 9장)	19	194	4.87	521	68.835323
실시예 7(사각형 리본 12장)	19	190	4.87	521	70.284488
실시예 8(코일 형상 리본 6장)	19	192	4.87	521	69.552357

[0164] 종래에는 무선 충전기의 송신장치에 영구자석이 들어가 있는 경우, 영구자석에 의한 DC 자기장으로 인해 페라이트 시트를 사용하는 차폐시트의 두께는 0.5 T 이상이 되어야 차폐시트로서 최적의 무선 충전 동작이 가능하다.

[0165] 상기 표 2를 참고하면, 실시예 5 내지 7과 같이, 차폐시트, 즉 나노 결정립 리본시트의 형상이 사각형으로 이루어진 경우, 어떤 차폐시트도 사용하지 않는 비교예 1의 수신장치와 거의 동일한 전력전송 효율을 가지기 위해서는 나노 결정립 리본시트가 12장 정도 적층되어야 하는 것을 알 수 있다.

[0166] 또한, 본 발명의 실시예 7과 같이 12장의 나노 결정립 리본시트를 사용하는 경우 자기 투자율이 높아, 종래 페라이트 시트를 사용하는 차폐시트일 때 0.5 T 보다 낮은 0.3 T 이내에서도 페라이트나 폴리머 시트와 동등한 특성을 나타낸다.

[0167] 더욱이, 실시예 8과 같이 자기장 차폐시트(나노 결정립 리본시트의 수: 6장)의 형상을 2차 코일의 형상과 동일한 환형으로 제작한 경우 사용되는 나노 결정립 리본시트의 수가 실시예 7(나노 결정립 리본시트의 수: 12장)의 1/2임에도 불구하고 실시예 7과 거의 동등한 전력전송 효율을 나타내는 것을 알 수 있다.

[0168] 그 결과 실시예 8과 같이 자기장 차폐시트의 형상을 2차 코일의 형상과 동일한 환형으로 제작한 경우, 사용되는 나노 결정립 리본시트의 수를 1/2로 줄일 수 있어, 제조원가를 낮추고, 제품의 두께를 더욱더 슬림화하는 것이 가능하게 된다.

[0169] 이러한 결과는 수신장치의 2차 코일의 형상과 이에 대응하여 자기장 차폐시트의 형상을 다른 형상으로 변경하여도 거의 동일한 결과를 나타내고 있다.

[0170] (온도 특성)

[0171] 상기 실시예 8에 따른 자기장 차폐시트를 도 19와 같이 설정하고, 충전시간이 30분에서 4시간 30분까지 30분 단위로 배터리와 자기장 차폐시트의 나노 결정립 리본시트에 대한 온도를 측정하고 그 결과를 하기 표 3에 나타내었다.

표 3

[0172]

충전 동작시간	배터리 온도(℃)	리본시트 온도(℃)
0.5시간	29.5	30
1.0시간	30	30
1.5시간	30.5	30.5
2.0시간	30.5	30.5
2.5시간	30.5	31
3.0시간	30.5	31
3.5시간	30.5	31
4.0시간	30.5	31
4.5시간	30.5	31

[0173] 일반적으로 무선 충전이 이루어질 때 리튬 이온 배터리(7)와 같은 2차 전지는 40℃ 이상을 넘기면 안전성에 문제가 발생할 수 있다.

[0174] 본 발명의 차폐시트를 무선 충전기에 적용하는 경우 상기 표 3에 기재된 바와 같이, 배터리 및 차폐시트의 온도는 시간이 경과할지라도 상승하지 않고, 30℃ 전후를 유지하고 있어 안전성을 확보하고 있는 것을 알 수 있다.

[0175] (실시예 9)

[0176] $Fe_{67}B_{14}Si_1Co_{18}$ 합금으로 이루어진 비정질 리본을 멜트 스피닝에 의한 급냉응고법(RSP)으로 25um 두께로 제조한 후, 시트 형태로 컷팅하여 각각 487℃, 459℃, 450℃에서 1시간 무자장 열처리하여 얻어진 비정질 리본 시트를 얻었다. 그 후, 열처리하여 얻어진 비정질 리본 시트를 PET 기재를 사용하는 10um 두께의 보호필름과 PET 기재를 사용하는 10um 두께의 양면 테이프(릴리즈 필름 별도) 사이에 삽입하여 적층시트를 준비하고, 도 8의 플레이

크 처리장치와 도 11의 라미네이트 장치를 사용하여 플레이크와 라미네이트 처리를 실시하였다.

[0177] 이 때, 적층시트에 사용된 비정질 리본 시트의 수를 열처리 온도별로 각각 1장 내지 9장 사용하고, 비정질 리본 시트 사이에는 양면 테이프를 삽입하였으며, 각 비정질 리본 시트의 열처리 온도별로 인덕턴스(투자율)와 충전 효율을 측정하여 하기 표 4에 나타내었다.

표 4

[0178]

인덕턴스 (투자율)	충전 효율(%)								
	1장	2장	3장	4장	5장	6장	7장	8장	9장
13uH	56	61	65.6	65.8	67.1	68.4	68.9	69.1	동작불가
15uH	59.2	65.8	68	68.4	68.6	69.1	69.1	69.3	68.9
18uH	57	63.6	66.3	68	68.2	68.9	69.1	69.1	68.9

[0179] 비정질 리본 시트를 각각 487℃, 459℃, 450℃에서 1시간 무자장 열처리한 결과, 각 시트의 인덕턴스(투자율)는 13uH, 15uH, 18uH로 열처리 온도의 증가에 따라 감소하는 결과가 얻어졌다.

[0180] 각 시트의 인턱턴스별 충전 효율은 459℃에서 열처리한 인덕턴스(투자율)가 15uH인 경우가 가장 높게 나타났으며, 적층되는 비정질 리본 시트의 수가 1장에서 8장까지 증가함에 따라 충전 효율도 이에 비례하여 증가하는 경향을 나타냈으며, 대략 4장을 적층한 경우 포화되는 현상을 나타내었고, 8장을 초과하는 경우 충전 효율은 감소하는 경향을 나타내었다.

[0181] (실시예 10)

[0182] 상기 인덕턴스(투자율)가 15uH인 비정질 리본 시트를 사용하여 적층되는 시트의 층수별 최대 충전 효율을 측정하여 그 결과를 하기 표 5에 나타내었다.

[0183] 상기 최대 충전 효율은 무선 충전기의 수신장치, 즉 2차 코일의 인덕턴스 값을 기준으로 수신장치의 시정수 값을 조정하여 효율을 최대치로 조정한 상태에서 얻어진 값이다.

표 5

[0184]

투자율	최대 충전 효율(%)			
	1장	2장	3장	4장
15uH	61.3	68.7	71.1	71.9

[0185] 표 5를 참고하면, 적층되는 비정질 리본 시트의 수에 따라 효율이 증가하였고, 4장일 때 최대 충전 효율은 71.9%로 가장 높게 나타났다.

[0186] 상기한 바와 같이, 본 발명에서는 비정질 리본의 플레이크 처리에 의해 와전류(Eddy Current)에 의한 손실을 크게 줄여줌에 의해 휴대 단말기기 등의 본체 및 배터리에 미치는 자기장 영향을 차단함과 동시에 2차 코일의 품질계수(Q)를 증가시켜 전력전송 효율이 우수하다.

[0187] 또한, 본 발명에서는 비정질 리본의 플레이크 처리 후 압착 라미네이팅 처리에 의해 비정질 리본의 미세 조각 사이의 틈새를 접착제를 채워서 수분 침투를 방지함과 동시에 미세 조각의 모든 면을 접착제(유전체)로 둘러쌈에 의해 미세 조각을 상호 절연(isolation)시켜서 와전류 저감을 도모하여 차폐성능이 떨어지는 것을 방지할 수 있다.

[0188] 더욱이, 본 발명에서는 차폐시트의 형상을 수신기 코일과 유사한 형상으로 설정함에 의해 적은 수의 나노 결정립 리본을 사용하면서도 높은 전력전송 효율을 갖거나 또는 동등한 전력전송 효율을 나타내면서 시트의 두께를 0.3㎜ 이하로 낮출 수 있게 된다.

[0189] 또한, 본 발명에서는 롤-투-롤 방법으로 플레이크와 라미네이팅 처리를 순차적으로 수행함에 의해 시트 성형이 이루어질 수 있어 시트의 원래 두께를 유지하면서 생산성이 높고 제조비용이 저렴하다.

[0190] 상기한 실시예 설명에서는 휴대 단말기기에 무선 충전기가 적용된 것을 예시하였으나, 이와 동일하게 비접촉(무선) 방식으로 무선 충전 기능을 제공하는 모든 포터블 전자기기에 본 발명을 적용할 수 있다.

[0191] 이상에서는 본 발명을 특정의 바람직한 실시예를 예를 들어 도시하고 설명하였으나, 본 발명은 상기한 실시예에

한정되지 아니하며 본 발명의 정신을 벗어나지 않는 범위내에서 당해 발명이 속하는 기술분야에서 통상의 지식을 가진 자에 의해 다양한 변경과 수정이 가능할 것이다.

산업상 이용가능성

[0192] 본 발명의 무선 충전기용 자기장 차폐시트는 휴대 단말기를 포함한 각종 포터블 전자기기에 적용되어 비접촉(무선) 방식으로 무선 충전을 구현할 때 발생되는 교류 및 직류 자기장에 의해 휴대 단말기기 등에 미치는 영향을 차단하며 무선 충전에 필요한 전자파를 흡수하는 것을 도와주는 무선 충전기의 자기장 차폐시트에 적용될 수 있다.

부호의 설명

[0193]

1,1a: 보호 필름	100: 휴대 단말기기
2,35: 박판 자성시트	2a: 비정질 리본
3-3f,30-30b: 양면 테이프	4-4b: 릴리즈 필름
5: 배터리 커버	6: 2차 코일
6a: 스파이럴 코일	6b: 기판
7: 배터리	8: 송신장치
9: 간지	10-10c: 자기장 차폐시트
11: 수지 필름	12,31,33,35c: 접착층
20: 미세 조각	20a: 틈새
21-26: 비정질 리본시트	32: 기재
35a,35b: 자성시트	100,200: 적층시트
110,120: 플래이크 장치	112,122: 금속롤러
114,124: 고무롤러	116: 요철
126: 구형 볼	210,220: 가압롤러
240,250: 가압부재	400,500: 라미네이트 장치

도면

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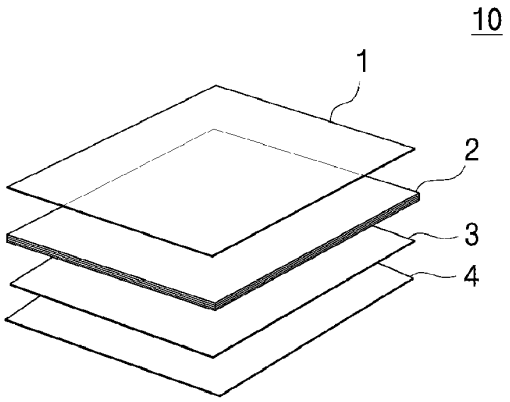

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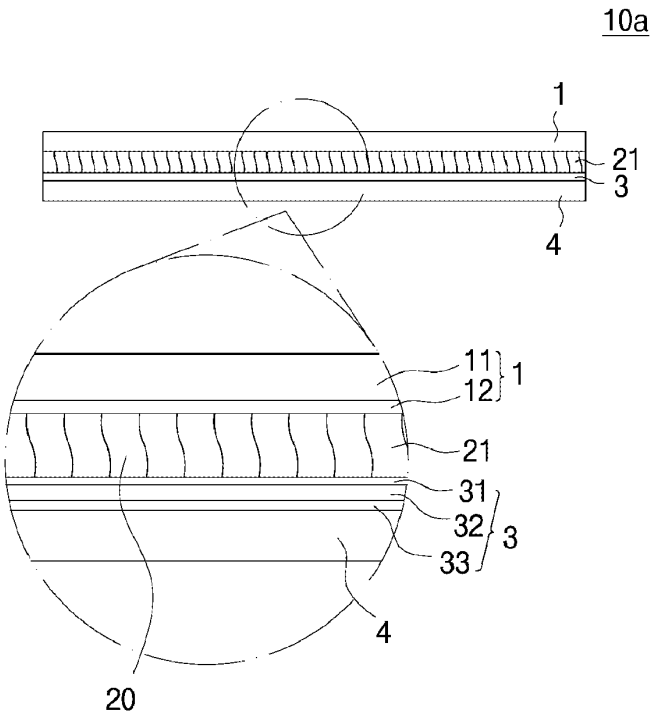
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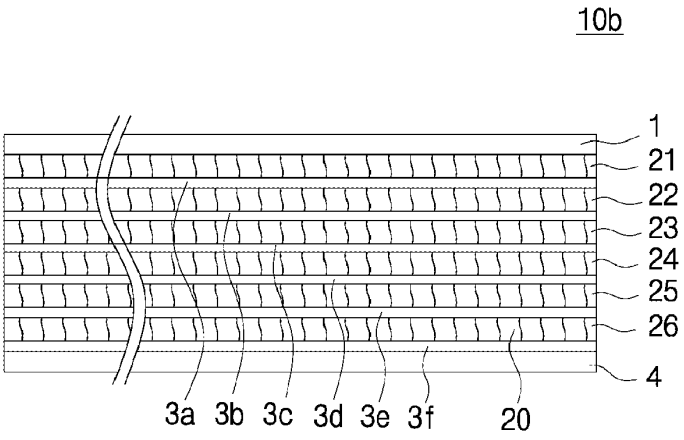
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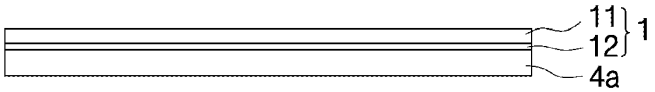
도면4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12
1
4a

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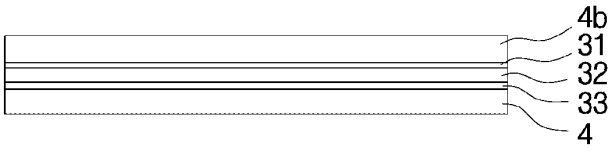

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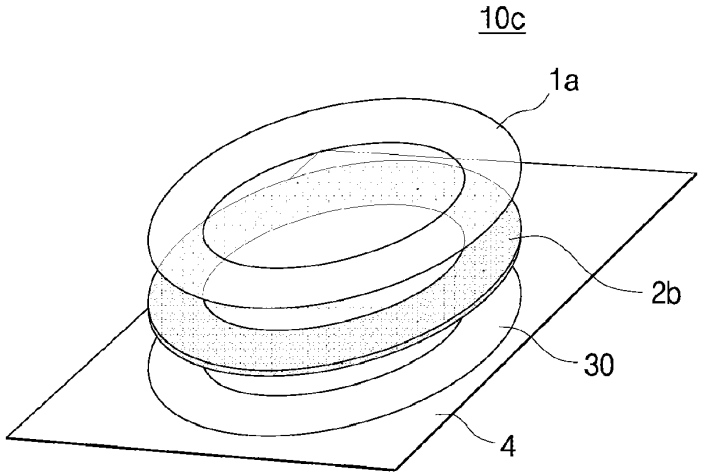

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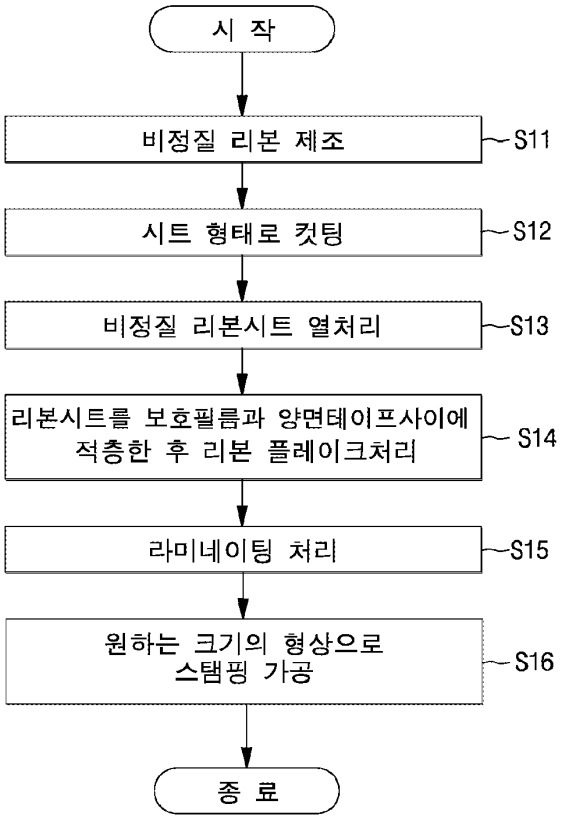
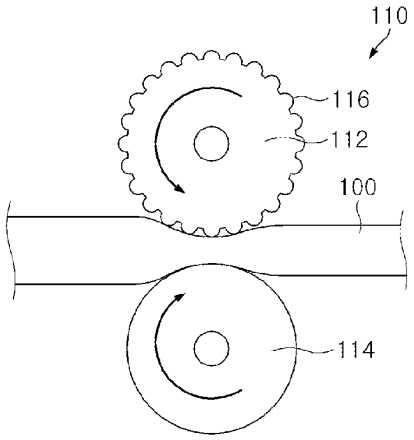

시 작
비정질 리본 제조
S11
시트 형태로 컷팅
S12
비정질 리본시트 열처리
S13
리본시트를 보호필름과 양면테이프사이에 적층한 후 리본 플레이크처리
S14
라미네이팅 처리
S15
원하는 크기의 형상으로 스탬핑 가공
S16
종 료

도면8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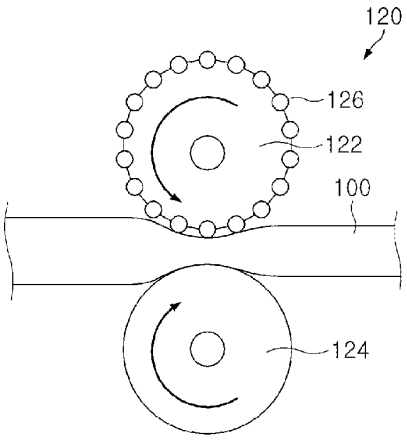
도면9



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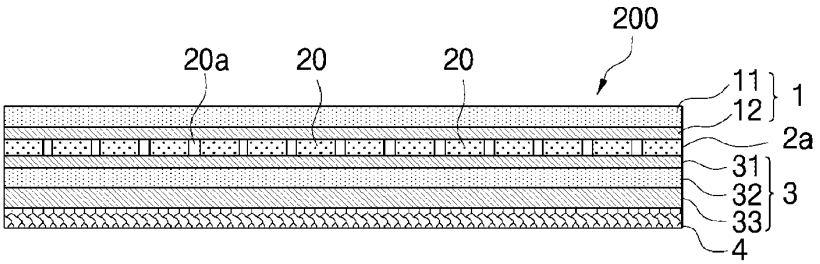

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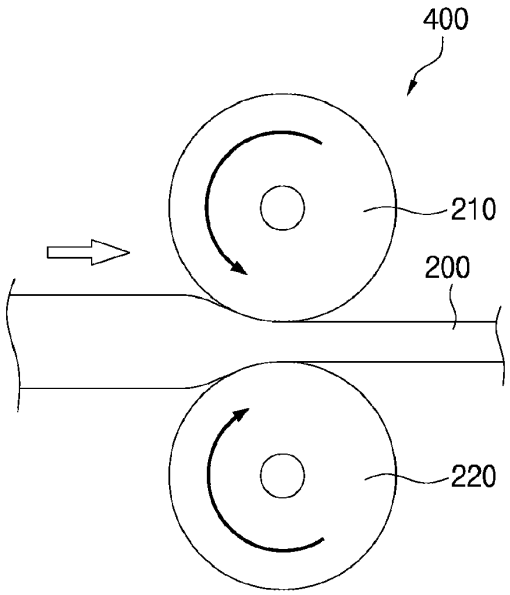

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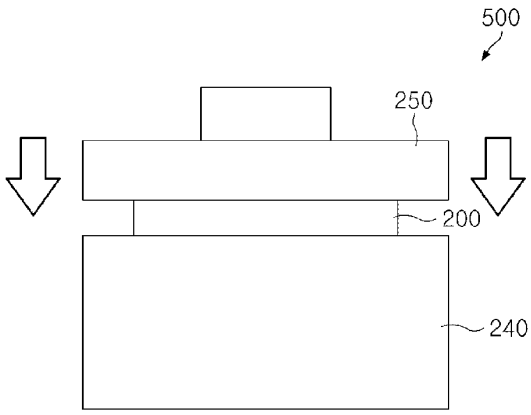

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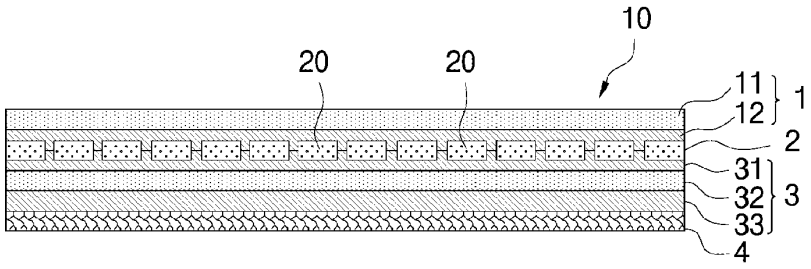

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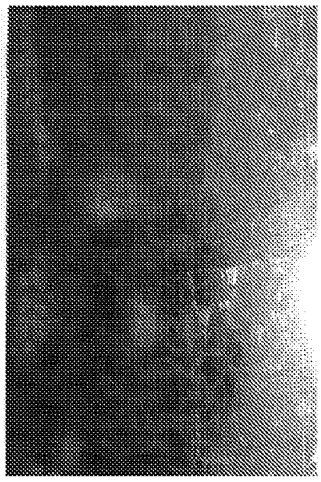

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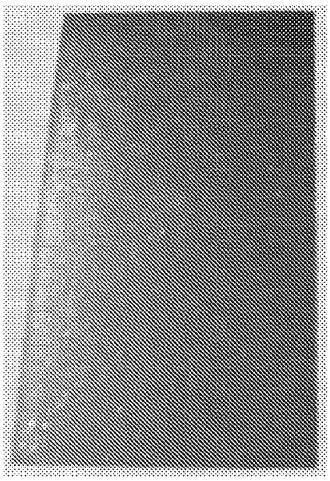

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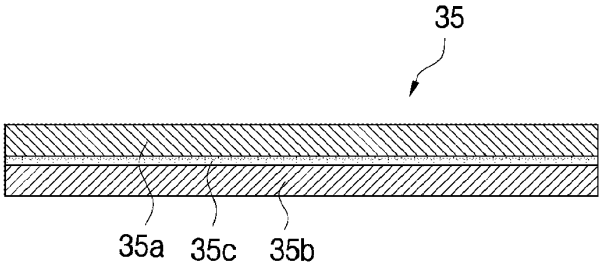

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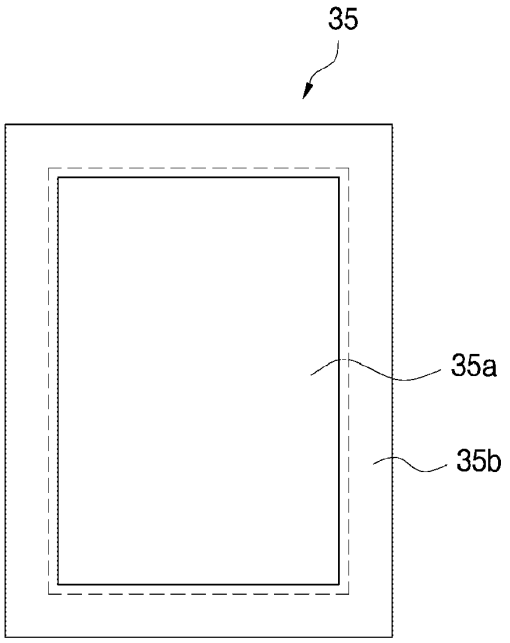

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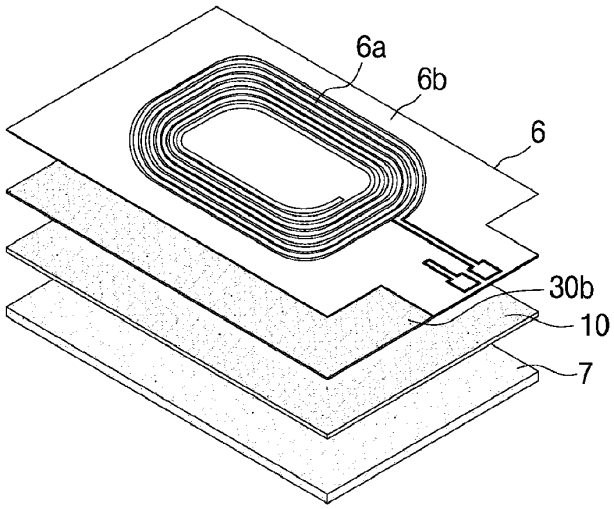

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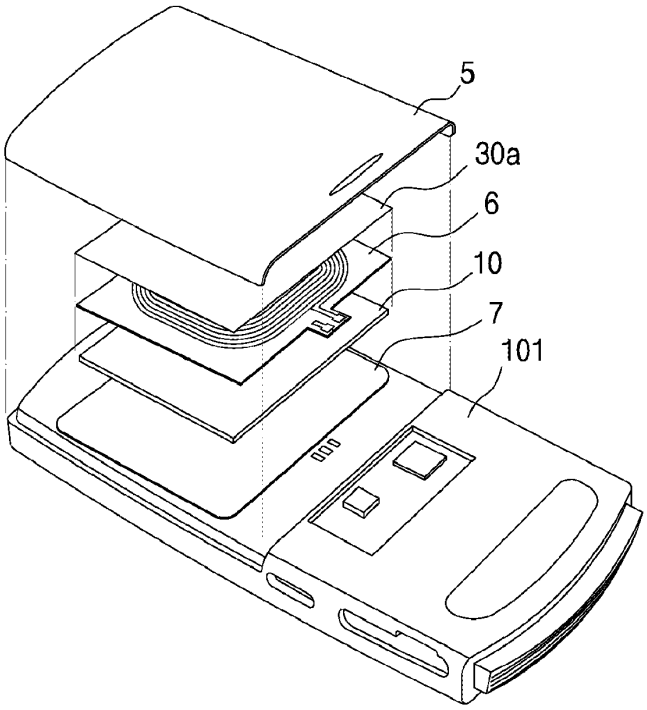

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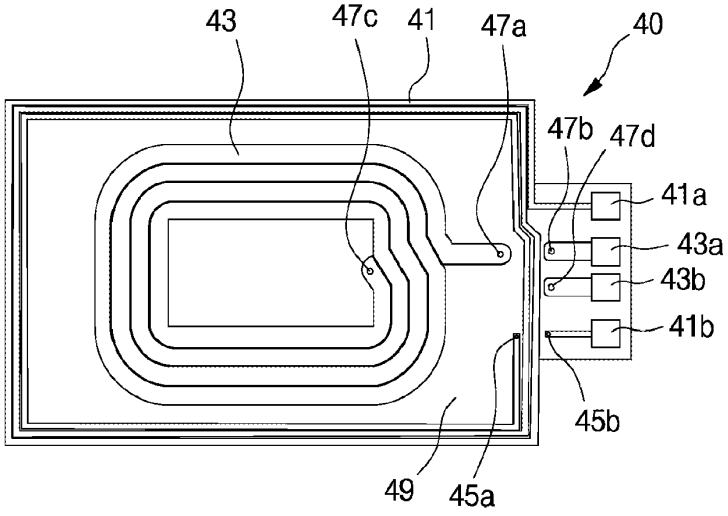

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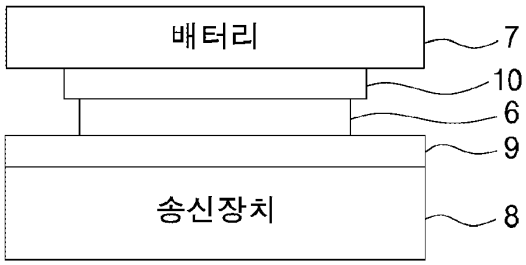

Electronic Acknowledgement Receipt

EFS ID:	23944182
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Radmila Percy
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	30-OCT-2015
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Time Stamp:	14:15:28
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	Transmittal.pdf	300984 7cf67b648a7d8d4f3b7ed8f981d97e9029accd2f	no	2
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Information:					

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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.

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Confirmation No.: **9944**
Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE	Group Art Unit: **2859**
Serial No.: **14/636,347**	Examiner: **Drew A. DUNN**
Filed: **March 3, 2015**	Customer No.: **34610**

For: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

INFORMATION DISCLOSURE STATEMENT

U.S. Patent and Trademark Office
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, Virginia 22314

Sir:

Pursuant to 37 C.F.R. §1.56, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO-1449. One copy of each non-U.S. reference is attached. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the reference(s) be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

Applicants have listed publication dates on the attached PTO-1449 based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the indicated date. Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered. This statement should not be construed as a representation that a search has been made, that information cited in the statement is considered to be and/or is material to patentability, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith. It is further understood that the Examiner will consider information that was cited or submitted to the U.S. Patent and Trademark Office in a prior application relied on under 35 U.S.C. §120. 1138 OG 37, 38 (May 19, 1992).

☒ 1. This Information Disclosure Statement is being filed (i) within three months of the U.S. filing date of a U.S. application other than a CPA continued prosecution application under §1.53(d) OR (ii) within three months of the date of entry of the national stage as set forth in §1.491 in an international application OR (iii) before the mailing date of a first Office Action on the merits OR (iv) before the mailing of a first Office Action after the filing of a Request for continued examination under §1.114. No certification or fee is required. 37 C.F.R. §1.97(b).

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Respectfully submitted,
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14/636,347	03/03/2015	Jai Hoon YEOM	CJL-0028

CONFIRMATION NO. 9944

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PUBLICATION NOTICE

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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 : 10-2014-0025290
Application Number

출 원 년 월 일 : 2014년 03월 04일
Filing Date MAR. 04, 2014

출 원 인 : 엘지이노텍 주식회사
Applicant(s) LG INNOTEK CO., LTD.

2015년 06월 25일

특 허 청
COMMISSIONER

제출 일자 : 2014-03-04

【서지사항】

【서류명】 특허출원서

【참조번호】 0823

【출원구분】 특허출원

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【대리인코드】 9-2000-000185-7

【포괄위임등록번호】 2009-053761-1

【발명의 국문명칭】 무선 충전 및 통신 기판 그리고 무선 충전 및 통신 장치

【발명의 영문명칭】 WIRELESS COMMUNICATION AND CHARGE SUBSTRATE AND WIRELESS COMMUNICATION AND CHARGE DEVICE

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【국적】 KR

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 김인한 (서명 또는 인)

대리인 김희곤 (서명 또는 인)

대리인 박용순 (서명 또는 인)

【수수료】

제출 일자 : 2014-03-04

【출원료】	0	면	46,000 원
【가산출원료】	28	면	0 원
【우선권주장료】	0	건	0 원
【심사청구료】	0	항	0 원
【합계】	46,000 원		

제출 일자 : 2014-03-04

【명세서】

【발명의 명칭】

무선 충전 및 통신 기판 그리고 무선 충전 및 통신 장치{WIRELESS COMMUNICATION AND CHARGE SUBSTRATE AND WIRELESS COMMUNICATION AND CHARGE DEVICE}

【기술분야】

<1> 본 발명의 실시예는 무선 충전 및 통신 기판 그리고 무선 충전 및 통신 장치에 관한 것이다.

【배경기술】

<2> NFC(Near Field Communication)는 무선태그(RFID) 기술 중 하나로 13.56MHz의 주파수 대역을 사용하는 스마트 카드식 비접촉식 통신 기술이며, WPC(Wireless Power Conversion)는 무선 충전 기술로서 근거리에서 전기적 접촉 없이 자기 결합을 이용하여 배터리를 충전하는 비접촉식 충전 기술이다.

<3> NFC는 근거리에서 낮은 전력으로 전자 기기 간의 무선 통신을 가능하게 하며, 통신거리가 짧기 때문에 상대적으로 보안이 우수하고 가격이 저렴해 주목 받는 차세대 근거리 통신 기술로서, 스마트 카드에 비하여 양방향성을 가지며, 저장 메모리 공간이 크고, 적용 가능한 서비스의 폭이 넓은 장점이 있으며, WPC는 별도의 전기적 접촉 없이 자기 결합을 통해 배터리를 충전할 수 있어 다양한 분야의 배터리 충전에 적용이 가능한 장점이 있다.

<4> NFC와 WPC 시스템에서의 안테나는 일정한 면적의 코일을 포함하여 구성되어, 마이크로 칩의 동작을 위해 필요한 에너지를 리더로부터 제공받는다. 1차 코일에서 발생한 교류 전력 에너지에 의해 자기장이 형성되어 안테나의 코일을 관통하여 전류가 유기되고, 안테나의 인덕턴스에 의해 전압이 발생한다. 이와 같이 발생한 전압은 데이터 전송을 위한 전력으로 사용되거나 배터리의 충전에 사용된다.

<5> 최근에는 스마트 단말이 널리 보급됨에 따라 NFC와 WPC를 모두 제공하는 장치의 필요성이 높아지고 있으며, 그에 따라 충전 효율이 높으며 데이터 통신 시의 인식 거리가 충분히 긴 장치에 대한 요구가 높아지고 있다.

【발명의 내용】

【해결하려는 과제】

<6> 본 발명은 전술한 문제를 해결하기 위해 안출된 것으로서, 무선 전력 송수신(Wireless Power Conversion, WPC)과 근거리 무선 통신(Near Field Communication, NFC)이 가능하도록 하고자 한다.

<7> 또한, 본 발명은 연자성층이 대기 중에 노출되는 부분을 최소화 함으로써, 외부로부터 이물질이 유입되는 것을 최소화하고, 본 발명의 일실시예에 따르면 연자성층이 리드 프레임으로부터 일정한 간격으로 둘러싸도록 배치하여, 리드 프레임의 배치시에도 충전시의 전송 효율이 떨어지거나 데이터 통신 시의 인식거리가 줄어드는 문제점을 해결하고자 한다.

<8> 또한, 본 발명은 연자성층의 추가를 통하여 충전시의 전송 효율을 조절하거

나 또는 향상시키고, 데이터 통신 시의 인식거리를 조절하고자 한다.

【과제의 해결 수단】

<9> 전술한 문제를 해결하기 위한 본 실시예에 따른 무선 충전 및 통신 기판은 연자성층; 상기 연자성층의 일면 및 타면에 배치되어, 상기 연자성층의 노출부 보다 연장되는 고분자 물질층; 및 상기 고분자 물질층에 배치되는 코일 패턴;을 포함한다.

<10> 본 발명의 다른 일실시예에 따르면, 상기 고분자 물질층은 상기 연자성층의 일면에 배치되는 제1 고분자 물질층; 및 상기 연자성층의 타면에 배치되는 제2 고분자 물질층;을 포함할 수 있다.

<11> 본 발명의 다른 일실시예에 따르면, 상기 제1 고분자 물질층 및 상기 제2 고분자 물질층을 연결하며, 상기 연자성층의 노출부를 감싸는 고분자 물질 접속단;을 더 포함할 수 있다.

<12> 본 발명의 다른 일실시예에 따르면, 상기 고분자 물질층은 폴리에틸렌, 폴리아크릴, 폴리이미드, 폴리아미드, 폴리우레탄 중에서 어느 하나의 재료를 포함할 수 있다.

<13> 본 발명의 다른 일실시예에 따르면, 상기 고분자 물질층을 상기 연자성층에 접착시키는 접착층;을 더 포함할 수 있다.

<14> 본 발명의 다른 일실시예에 따르면, 상기 연자성층과 상기 고분자 물질층을 관통하는 가공 홀;을 더 포함할 수 있다.

<15> 본 발명의 다른 일실시예에 따르면, 상기 연자성층은 제1 연자성층; 및 상기 제1 연자성층이 배치되는 동일 평면 상에서 상기 제1 연자성층을 둘러싸도록 배치되는 제2 연자성층;을 포함할 수 있다.

<16> 본 발명의 다른 일실시예에 따르면, 상기 코일 패턴은 상기 고분자 물질층 상에서 상기 제1 연자성층에 대응되는 영역에 배치되는 제1 코일 패턴; 및 상기 고분자 물질층 상에서 상기 제2 연자성층에 대응되는 영역에 배치되는 제2 코일 패턴;을 포함할 수 있다.

<17> 본 발명의 다른 일실시예에 따르면, 상기 코일 패턴과 연결되는 리드 프레임;을 더 포함할 수 있다.

<18> 본 발명의 다른 일실시예에 따르면, 상기 제2 연자성층은 상기 리드 프레임을 일정한 간격으로 둘러싸도록 배치될 수 있다.

<19> 본 발명의 다른 일실시예에 따르면, 상기 연자성층은 비정질 합금, 결정질 합금, 비정질 합금 리본, 나노결정질 리본, 규소 강판 중에서 어느 하나로 구성될 수 있다.

<20> 본 발명의 다른 일실시예에 따르면, 상기 고분자 물질층은 흑색 필름(black film)일 수 있다.

<21> 본 발명의 다른 일실시예에 따르면, 상기 코일 패턴으로부터의 열을 방열하는 하우징;을 더 포함할 수 있다.

<22> 본 발명의 일실시예에 따른 무선 충전 및 통신 장치는 상기와 같이 구성된

무선 충전 및 통신 기판을 포함한다.

【발명의 효과】

<23> 본 발명의 일실시예에 따르면 무선 전력 송수신(Wireless Power Conversion, WPC)과 근거리 무선 통신(Near Field Communication, NFC)이 가능하다.

<24> 또한, 본 발명의 일실시예에 따르면 연자성층이 대기 중에 노출되는 부분을 최소화 함으로써, 외부로부터 이물질이 유입되는 것을 최소화하고, 본 발명의 일실시예에 따르면 연자성층이 리드 프레임으로부터 일정한 간격으로 둘러싸도록 배치하여, 리드 프레임의 배치시에도 충전시의 전송 효율이 떨어지거나 데이터 통신 시의 인식거리가 줄어드는 문제점을 해결할 수 있다.

<25> 그뿐만 아니라, 본 발명의 다른 일실시예에 따르면 연자성층의 추가를 통하여 충전시의 전송 효율을 조절하거나 또는 향상시키고, 데이터 통신 시의 인식거리를 조절할 수 있다.

【도면의 간단한 설명】

<26> 도 1은 본 발명의 일실시예에 따른 무선 충전 및 통신 장치의 단면도이다.

도 2는 본 발명의 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

도 3은 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

도 4 및 도 5는 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

도 6은 본 발명의 일실시예에 따른 코일 패턴을 도시한 상면도이다.

도 7은 본 발명의 일실시예에 따른 연자성층을 도시한 상면도이다.

도 8은 본 발명의 일실시예에 따른 고분자 물질층을 도시한 상면도이다.

도 9 및 도 10은 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

도 11 내지 도 13는 본 발명의 일실시예에 따른 전송 효율 및 인식거리를 설명하기 위한 도면이다.

【발명을 실시하기 위한 구체적인 내용】

<27> 이하에서는 첨부한 도면을 참조하여 바람직한 본 발명의 일실시예에 대해서 상세히 설명한다. 다만, 실시형태를 설명함에 있어서, 관련된 공지 기능 혹은 구성에 대한 구체적인 설명이 본 발명의 요지를 불필요하게 흐릴 수 있다고 판단되는 경우 그에 대한 상세한 설명은 생략한다. 또한, 도면에서의 각 구성요소들의 크기는 설명을 위하여 과장될 수 있으며, 실제로 적용되는 크기를 의미하는 것은 아니다.

<28> 도 1은 본 발명의 일실시예에 따른 무선 충전 및 통신 장치의 단면도이다.

<29> 도 1을 참조하여 본 발명의 일실시예에 따른 무선 충전 및 통신 장치를 설명하기로 한다.

<30> 본 발명의 일실시예에 따른 무선 충전 및 통신 장치는 무선 전력 송수신(Wireless Power Conversion, WPC)과 근거리 무선 통신(Near Field Communication,

NFC)에 포함될 수 있다.

<31> 도 1에 도시된 바와 같이, 본 발명의 일실시예에 따른 무선 충전 및 통신 장치는 수신 장치(100)를 구성할 수 있다.

<32> 상기 수신 장치(100)와 송신 장치(500)는 무선 전력 송수신(Wireless Power Conversion, WPC)과 근거리 무선 통신(Near Field Communication, NFC)이 가능하다.

<33> 수신 장치(100)는 수신 코일 패턴(120, 130)을 포함하며, 제1 수신 코일 패턴(120)은 무선 전력 송수신(WPC)을 위한 코일 패턴이며, 제2 수신 코일 패턴(130)은 근거리 무선 통신(NFC)을 위한 코일 패턴이다.

<34> 또한, 송신 장치(500)는 송신 코일 패턴(520, 530)을 포함하며, 제1 송신 코일 패턴(520)은 무선 전력 송신(WPC)을 위한 코일 패턴이며, 제2 송신 코일 패턴(530)은 근거리 무선 통신(NFC)을 위한 코일 패턴이다.

<35> 제1 송신 코일 패턴(520)은 전력 소스(미도시)와 연결되며, 제1 수신 코일 패턴(120)은 회로부(미도시)와 연결된다.

<36> 전력 소스는 소정 주파수의 교류 전력을 제공하는 교류 전력 소스일 수 있으며, 제1 송신 코일 패턴(520)에는 전력 소스(미도시)로부터 공급받은 전력에 의해 교류 전류가 흐른다.

<37> 상기 제1 송신 코일 패턴(520)에 교류 전류가 흐르면, 전자기 유도에 의해 물리적으로 이격 되어 있는 제1 수신 코일 패턴(120)에도 교류 전류가 유도된다.

<38> 수신 코일 패턴(120)로 유도된 전류는 별도의 회로부(미도시)로 전달된 후 정류된다.

<39> 한편, 본 발명의 일실시예에 따른 송신 장치(500)는 송신 패드(pad)로 구성될 수 있으며, 수신 장치(100)는 무선 전력 송수신 기술이 적용되는 휴대 단말, 가정용/개인용 전자제품, 운송 수단 등의 일부 구성으로 구성되거나, 무선 전력 송수신 기술이 적용되는 휴대 단말, 가정용/개인용 전자제품, 운송 수단 등은 무선 전력 수신 장치만을 포함하거나, 또 달리 무선 전력 송신 장치와 무선 전력 수신 장치를 모두 포함하도록 구성될 수 있다.

<40> 즉, 송신 장치(500)는 리더(Reader)의 역할을 하고, 상기 수신 장치(100)는 태그(Tag)의 역할도 가능하다.

<41> 수신 장치(100)는 무선 충전 및 통신 기판과 상기 무선 충전 및 통신 기판을 수납하는 하우징(400)을 포함하며, 상기 하우징(400)은 상기 코일 패턴(120, 130)으로부터 발생하는 열을 외부로 방열 할 수 있다.

<42> 한편, 상기 무선 충전 및 통신 기판은 연자성층(220, 230), 상기 연자성층(220, 230)의 일면 및 타면에 배치되어, 상기 연자성층(220, 230)의 노출부 보다 연장되는 고분자 물질층(310, 312), 상기 고분자 물질층(310, 312)에 배치되는 코일 패턴(120, 130)을 포함하며, 상기 무선 충전 및 통신 기판을 관통하는 가공 홀(311)이 형성되어 제조 시의 얼라인(align)을 맞추는 데에 사용될 수 있다.

<43> 또한, 상기 고분자 물질층(310)은 상기 연자성층(220, 230)의 일면에 배치되

는 제1 고분자 물질층(310) 및 상기 연자성층(220, 230)의 타면에 배치되는 제2 고분자 물질층(312)을 포함할 수 있다.

<44> 이때, 상기 고분자 물질층(310, 312)은 흑색 필름(black film)으로 구성될 수 있으며, 상기 고분자 물질층(310, 312)은 접착층(315)에 의해 상기 연자성층(220, 230)에 접착될 수 있으며, 상기 고분자 물질층(310, 312)은 폴리에틸렌, 폴리아크릴, 폴리이미드, 폴리아미드, 폴리우레탄 중에서 어느 하나의 재료를 포함할 수 있다.

<45> 한편, 상기 연자성층(220, 230)은 제1 연자성층(220) 및 상기 제1 연자성층(220)이 배치되는 동일 평면 상에서 상기 제1 연자성층(220)을 둘러싸도록 배치되는 제2 연자성층(230)을 포함할 수 있다.

<46> 또한, 코일 패턴(120, 130)은 상기 제2 고분자 물질층(312) 상에서 상기 제1 연자성층(220)에 대응되는 영역에 배치되는 제1 코일 패턴(120) 및 상기 제2 고분자 물질층(312) 상에서 상기 제2 연자성층(230)에 대응되는 영역에 배치되는 제2 코일 패턴(130)을 포함할 수 있다.

<47> 상기 송신 장치(500)는 연자성층(550), 접착층(535)에 의해 상기 연자성층(550)에 부착되는 송신 코일 패턴(520, 530) 및 하우징(600)을 포함하여 구성된다.

<48> 따라서, 본 발명의 일실시예에 따르면 제1 연자성층(220)과 제1 코일 패턴(120)을 포함하는 무선 전력 송수신(WPC)이 가능한 구성과, 제2 연자성층(230)과 제2 코일 패턴(130)을 포함하는 근거리 무선 통신(NFC)이 구성을 모두 포함하며,

무선 전력 송수신(WPC)과 근거리 무선 통신(NFC)을 모두 제공할 수 있다.

<49> 한편, 또 다른 실시예에서는 상기 제1 송신 코일 패턴(520)이 근거리 무선 통신(NFC)을 위한 코일 패턴으로 구성되고, 제2 송신 코일 패턴(530)이 무선 전력 송수신(WPC)을 위한 코일 패턴으로 구성될 수 있다.

<50> 도 2는 본 발명의 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

<51> 도 2에 도시된 바와 같이, 본 발명의 일실시예에 따른 무선 충전 및 통신 기판은 연자성층(220, 230), 상기 연자성층(220, 230)의 일면 및 타면에 배치되어, 상기 연자성층(220, 230)의 노출부 보다 연장되는 고분자 물질층(310, 312), 상기 고분자 물질층(310, 312)에 배치되는 코일 패턴(120, 130)을 포함한다.

<52> 또한, 상기 고분자 물질층(310)은 제1 고분자 물질층(310) 및 제2 고분자 물질층(312)으로 구성되며, 상기 연자성층(220, 230)은 제1 연자성층(220) 및 제2 연자성층(230)으로 구성되며, 상기 코일 패턴(120, 130)은 제1 코일 패턴(120) 및 제2 코일 패턴(130)으로 구성된다.

<53> 또한, 상기 고분자 물질층(310, 312)의 연장된 길이(l)은 상기 연자성층(220, 230)의 두께(h)는 다음의 수학식 1의 관계를 갖도록 형성될 수 있다.

<54> [수학식 1]

<55> $l = A \times h$

<56> 이때, l은 상기 고분자 물질층(310, 312)의 연장된 길이이고, h는 상기 연자성층(220, 230)의 두께이고, A는 0.6 내지 10의 상수로서, 상기 A 값이 0.6 미만인 경우에는 상기 고분자 물질층(310, 312)이 상기 연자성층(220, 230)을 감싸기에 충분하지 못하여 수분이 침투할 수 있으며, 상기 A 값이 10을 초과하는 경우에는 고분자 물질층(310, 312)이 과다하게 연장되어 외부의 충격으로부터 쉽게 꺾여 쉽게 손상되거나 별도의 수납부를 추가하여야 하므로 두께가 증가하는 문제점이 발생할 수 있다.

<57> 또한, 제1 연자성층(220)과 제2 연자성층(230)은 서로 상이한 재료로 구성될 수 있으며, 예를 들어 제1 연자성층(220)은 비정질 리본으로 구성될 수 있으며, 제2 연자성층(230)은 컴포지트(composite), 페라이트(frerrite), Ni-Zn, Mn-Zn 중에서 어느 하나의 재료로 구성될 수 있다.

<58> 상기 제1 연자성층(220)을 비정질 리본으로 구성하면 동작 주파수인 100 내지 200 kHZ에서 고 투자율의 구현이 가능하며, 제2 연자성층(230)을 컴포지트(composite), 페라이트(frerrite), Ni-Zn, Mn-Zn 중에서 어느 하나의 재료로 구성하면 데이터 통신의 손실이 낮아지는 효과가 있다.

<59> 상기 연자성 층(120)이 페라이트(ferrite) 소재로 이루어진 경우에는 소결체(pellet), 플레이트(plate), 리본, 호일(foil), 필름(film) 등의 다양한 형태로 구

현될 수 있으며, Fe, Ni, Co, Mn, Al, Zn, Cu, Ba, Ti, Sn, Sr, P, B, N, C, W, Cr, Bi, Li, Y 및 Cd 중에서 적어도 어느 하나를 포함하여 구성될 수도 있다.

<60> 상기 코일 패턴(120, 130)은 상기 고분자 물질층(310) 상에서 상기 제1 연자성층(220)에 대응되는 영역에 배치되는 제1 코일 패턴(120) 및 상기 고분자 물질층(310) 상에서 상기 제2 연자성층(230)에 대응되는 영역에 배치되는 제2 코일 패턴(130)을 포함할 수 있다.

<61> 이때, 상기 코일 패턴(120, 130)은 도 2에서와 같이 접착층(135)에 의해 상기 고분자 물질층(310)에 접착되도록 구성될 수 있다.

<62> 도 3은 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

<63> 도 3에 도시된 바와 같이, 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판은 연자성층(220, 230), 상기 연자성층(220, 230)의 일면 및 타면에 배치되어, 상기 연자성층(220, 230)의 노출부 보다 연장되는 고분자 물질층(310, 312), 상기 고분자 물질층(310, 312)에 배치되는 코일 패턴(120, 130)을 포함한다.

<64> 그러나, 도 3의 실시예에서는 제1 고분자 물질층(310) 및 제2 고분자 물질층(312)을 연결하며, 상기 연자성층(220)의 노출부를 감싸는 고분자 물질 접속단(313)을 더 포함하여 구성된다.

<65> 따라서, 도 3의 실시예에서는 상기 노출부는 가공 홀(311)에 의해 노출되는

단부이고, 상기와 같이 연자성층(220)의 노출부를 감싸는 고분자 물질 접속단(313)에 의하여 외부로부터 수분이 침투하는 것을 차단할 수 있다.

<66> 도 4 및 도 5는 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

<67> 도 4 및 도 5에 도시된 일실시에 따르면 고분자 물질층(310, 312)을 연자성층(220, 230)에 접착하기 위한 접착층(315)의 구성없이, 고분자 물질층(310, 312)이 연자성층(220, 230)에 직접 형성된다.

<68> 이때, 열압착을 통해 고분자 물질층(310, 312)을 연자성층(220, 230)에 직접 형성할 수 있다.

<69> 도 4 및 도 5에 실시예에서와 같이 고분자 물질층(310, 312)을 연자성층(220, 230)에 직접 형성하면, 접착층을 사용할 필요가 없으므로 보다 공정이 단순화되어 제조 비용을 절감하면서도 보다 얇은 무선 충전 및 통신 기판을 제조할 수 있다.

<70> 한편, 도 2 내지 도 6의 실시예는 무선 충전 및 통신 기판에 가공 홀의 단면의 예를 들어 설명하였으나, 리드 프레임을 결합하기 위한 단부의 노출부도 동일하게 구성될 수 있다.

<71> 도 6은 본 발명의 일실시예에 따른 코일 패턴을 도시한 상면도로서, 보다 상

세하게 설명하면 본 발명의 일실시예에 따른 수신 장치에 포함되는 무선 충전 및 통신 기판을 도시한 도면이다.

<72> 또한, 도 7은 본 발명의 일실시예에 따른 연자성층을 도시한 상면도이며, 도 8은 본 발명의 일실시예에 따른 고분자 물질층을 도시한 상면도이다.

<73> 상기 코일 패턴(120, 130)은 상기 도 2에서와 같이 접착층(135)에 의해 상기 고분자 물질층(310)에 접착되도록 구성되거나, 도 6에 도시된 바와 같이 별도의 기판(110) 상에 배치될 수 있다.

<74> 도 6에 도시된 바와 같이 기판(110) 상에는 무선 충전 및 통신 기판의 제조 시에 얼라인(align)을 맞추기 위한 얼라인 마크(115, 116)가 형성될 수 있다.

<75> 또한, 무선 충전 및 통신 기판은 도 7 및 도 8에 도시된 바와 같이 코일 패턴(120, 130)과 연결되는 리드 프레임(140)을 더 포함하며, 제2 연자성층(230)은 상기 리드 프레임(140)을 둘러싸도록 배치될 수 있다.

<76> 보다 상세하게 설명하면, 상기 제2 연자성층(230)은 도 4에서와 같이 리드 프레임(140)으로부터 1 ㎜ 내지 3 ㎜의 일정한 간격으로 둘러싸도록 배치될 수 있으며, 이와 같이 제2 연자성층(230)이 리드 프레임(140)으로부터 일정한 간격으로 둘러싸도록 배치하면, 리드 프레임(140)의 배치시에도 충전시의 전송 효율이 떨어지거나 데이터 통신 시의 인식거리가 줄어드는 문제점이 발생하지 않는다.

<77> 또한, 상기 리드 프레임(140)을 접속하기 위한 단부의 노출부에는 도 2에서와 같이 연자성층(220, 230) 보다 연장되는 고분자 물질층(310, 312)을 더 포함하

여 구성되거나, 도 3에 도시된 바와 같이 고분자 물질층(310, 312)의 단부를 감싸는 고분자 물질 접속단(313)을 더 포함하여 구성될 수 있다.

<78> 도 8의 고분자 물질층(310, 312)은 제1, 2 연자성층(220, 230)의 일면 및 타면에 배치되며, 고분자 물질층(310, 312)은 접착층(315)에 의하여 제1, 2 연자성층(220, 230)에 접착되어 배치될 수 있다.

<79> 또한, 상기 고분자 물질층(310, 312)과 상기 연자성층(220)에는 가공 홀(311)이 형성될 수 있다.

<80> 상기 가공 홀(311)은 무선 충전 및 통신 기판의 제조시에 도 6의 얼라인 마크(115, 116)와의 얼라인을 맞출 수 있다.

<81> 도 9 및 도 10은 본 발명의 다른 일실시예에 따른 무선 충전 및 통신 기판의 단면도이다.

<82> 도 9 및 도 10의 일실시예에 따른 무선 충전 및 통신 기판은 접착층(223)의 일면과 타면에 각각 연자성층(220, 230)이 부착되는 형태로 구성될 수 있다.

<83> 도 9 및 도 10의 일실시예에 따르면 이와 같은 연자성층(220, 230) 복수개로 추가하여 충전시의 전송 효율을 조절 또는 향상시키거나, 데이터 통신 시의 인식거리를 조절할 수 있다.

<84> 도 11 내지 도 13은 본 발명의 일실시예에 따른 전송 효율 및 인식거리를 설

명하기 위한 도면이다.

<85> 보다 상세하게 설명하면, 도 11은 종래 기술과 본 발명의 일실시예에 따른 전송 효율 및 인식 거리의 변화를 비교한 표이고, 도 12는 본 발명의 일실시예에 따른 가공 홀의 직경의 변화에 따른 전송 효율의 변화를 도시한 그래프이며, 도 13은 본 발명의 일실시예에 따른 연자성층의 간격에 따른 전송 효율의 변화를 도시한 그래프이다.

<86> 본 발명에 따르면 도 11 도시된 바와 같이, 리드 프레임의 주변을 제2 연자성층으로 둘러싸지 않고 가공 홀을 형성하지 않는 A의 실시예에 비교하여, 리드 프레임의 주변을 제2 연자성층으로 둘러싸고 가공 홀을 형성하는 B의 실시예에서도 전송 효율의 차이는 거의 없으며 인식 거리의 차이는 변화가 없다.

<87> 또한, 도 12에 도시된 바와 같이 가공 홀의 직경(hole radius)을 1 ㎜ 내지 3 ㎜로 변화 시키는 경우에는 오히려 일부 전송 효율이 상승하는 효과가 발생하였으며, 도 13에 도시된 바와 같이 리드 프레임의 주변을 연자성층(제2 연자성층)으로 둘러싸는 경우에 전송 효율이 매우 미미하게 감소하므로 전송 효율에는 큰 차이가 없다.

<88> 전술한 바와 같은 본 발명의 상세한 설명에서는 구체적인 실시예에 관해 설명하였다. 그러나 본 발명의 범주에서 벗어나지 않는 한도 내에서는 여러 가지 변형이 가능하다. 본 발명의 기술적 사상은 본 발명의 전술한 실시예에 국한되어 정해져서는 안 되며, 특허청구범위뿐만 아니라 이 특허청구범위와 균등한 것들에 의해 정해져야 한다.

【부호의 설명】

<89> 100: 수신 장치

120: 제1 수신 코일 패턴

130: 제2 수신 코일 패턴

220: 제1 연자성층

221: 제1 가공 홀

223: 접착층

230: 제2 연자성층

310: 고분자 물질층

311: 제2 가공 홀

315: 접착층

400: 하우징

500: 송신 장치

520: 제1 송신 코일 패턴

530: 제2 송신 코일 패턴

550: 연자성층

600: 하우징

【특허청구범위】

【청구항 1】

연자성층;

상기 연자성층의 일면 및 타면에 배치되어, 상기 연자성층의 노출부 보다 연장되는 고분자 물질층; 및

상기 고분자 물질층에 배치되는 코일 패턴;

을 포함하는 무선 충전 및 통신 기판.

【청구항 2】

청구항 1에 있어서,

상기 고분자 물질층은,

상기 연자성층의 일면에 배치되는 제1 고분자 물질층; 및

상기 연자성층의 타면에 배치되는 제2 고분자 물질층;

을 포함하는 무선 충전 및 통신 기판.

【청구항 3】

청구항 2에 있어서,

상기 제1 고분자 물질층 및 상기 제2 고분자 물질층을 연결하며, 상기 연자성층의 노출부를 감싸는 고분자 물질 접속단;

을 더 포함하는 무선 충전 및 통신 기판.

【청구항 4】

청구항 1에 있어서,

상기 고분자 물질층은,

폴리에틸렌, 폴리아크릴, 폴리이미드, 폴리아미드, 폴리우레탄 중에서 어느 하나의 재료를 포함하는 무선 충전 및 통신 기판.

【청구항 5】

청구항 1에 있어서,

상기 고분자 물질층을 상기 연자성층에 접착시키는 접착층;

을 더 포함하는 무선 충전 및 통신 기판.

【청구항 6】

청구항 1에 있어서,

상기 연자성층과 상기 고분자 물질층을 관통하는 가공 홀;

을 더 포함하는 무선 충전 및 통신 기판.

【청구항 7】

청구항 1에 있어서,

상기 연자성층은,

제1 연자성층; 및

상기 제1 연자성층이 배치되는 동일 평면 상에서 상기 제1 연자성층을 둘러싸도록 배치되는 제2 연자성층;

을 포함하는 무선 충전 및 통신 기판.

【청구항 8】

청구항 7에 있어서,

상기 코일 패턴은,

상기 고분자 물질층 상에서 상기 제1 연자성층에 대응되는 영역에 배치되는 제1 코일 패턴; 및

상기 고분자 물질층 상에서 상기 제2 연자성층에 대응되는 영역에 배치되는 제2 코일 패턴;

을 포함하는 무선 충전 및 통신 기판.

【청구항 9】

청구항 7에 있어서,

상기 코일 패턴과 연결되는 리드 프레임;

을 더 포함하는 무선 충전 및 통신 기판.

【청구항 10】

청구항 7에 있어서,

상기 제2 연자성층은,

상기 리드 프레임을 일정한 간격으로 둘러싸도록 배치되는 무선 충전 및 통신 기판.

【청구항 11】

청구항 1에 있어서,

상기 연자성층은,

비정질 합금, 결정질 합금, 비정질 합금 리본, 나노결정질 리본, 규소 강판 중에서 어느 하나로 구성되는 무선 충전 및 통신 기판.

【청구항 12】

청구항 1에 있어서,

상기 고분자 물질층은,

흑색 필름(black film)인 무선 충전 및 통신 기판.

【청구항 13】

청구항 1에 있어서,

상기 코일 패턴으로부터의 열을 방열하는 하우징;

을 더 포함하는 무선 충전 및 통신 기판.

【청구항 14】

청구항 1 내지 청구항 13 중 어느 한 항의 무선 충전 및 통신 기판을 포함하는 무선 충전 및 통신 장치.

제출 일자 : 2014-03-04

【요약서】

【요약】

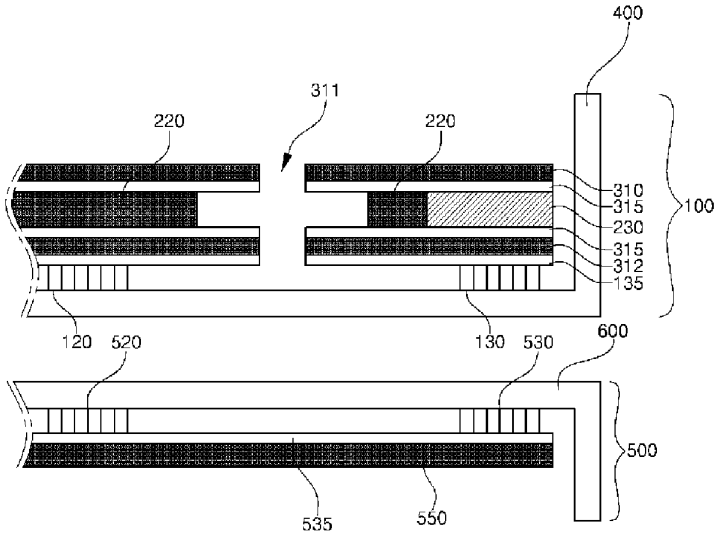
본 발명은 무선 충전 및 통신 기판 그리고 무선 충전 및 통신 장치에 관한 것으로, 본 발명의 일실시예에 따른 무선 충전 및 통신 기판은 연자성층; 상기 연자성층의 일면 및 타면에 배치되어, 상기 연자성층의 노출부 보다 연장되는 고분자 물질층; 및 상기 고분자 물질층에 배치되는 코일 패턴;을 포함한다.

【대표도】

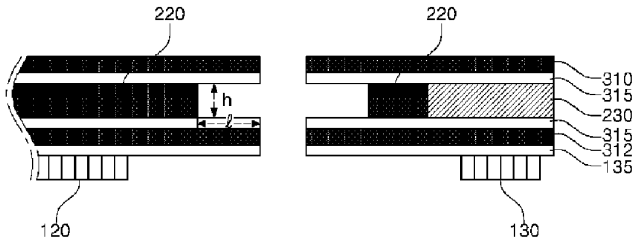
도 1

【도면】

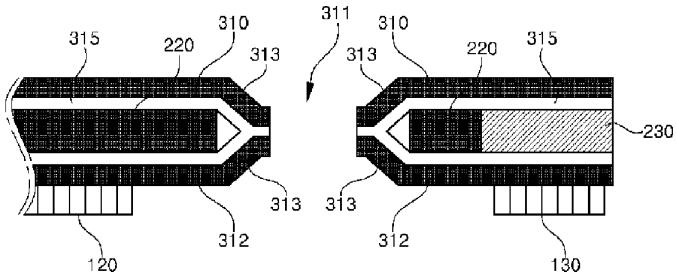
【도 1】


400
311
220
220
310
315
230
315
312
135
100
120
520
130
530
600
500
535
550

【도 2】


220
220
h
310
315
230
315
312
135
120
130

【도 3】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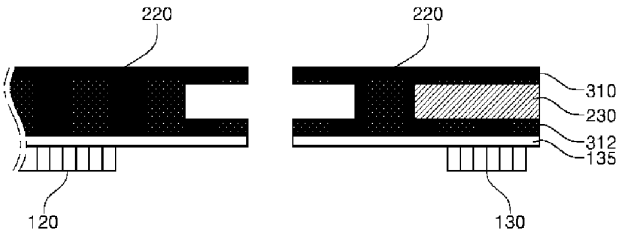
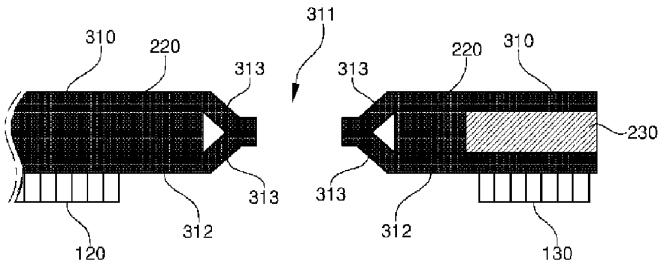
220
310
313
311
310
313
220
315
230
313
313
312
312
120
130

【도 4】


220
220
310
230
312
135
120
130

【도 5】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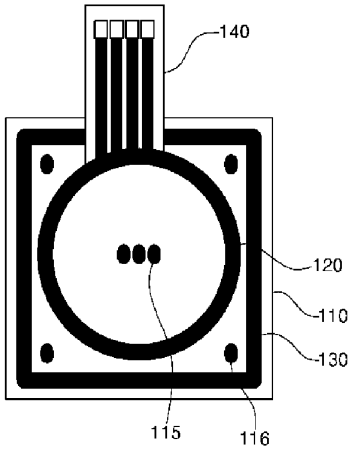

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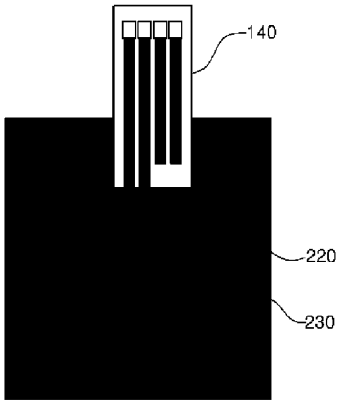

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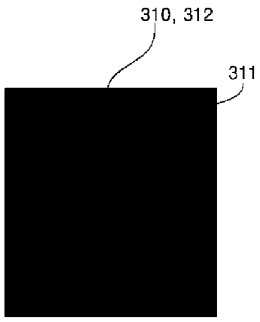
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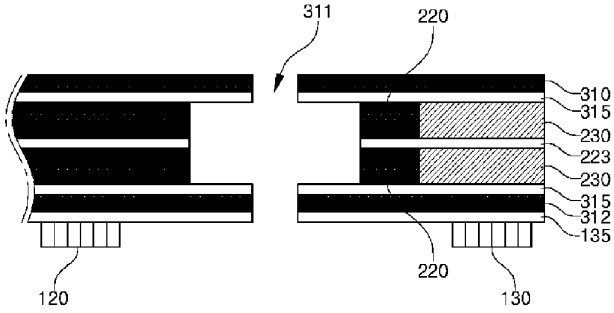
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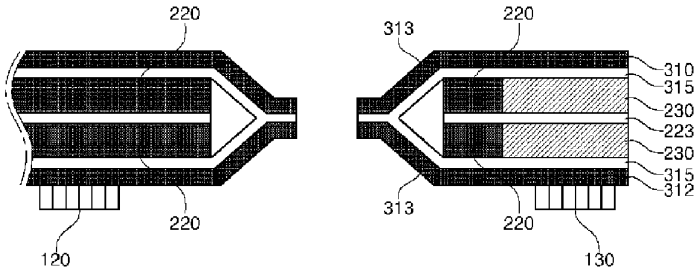
【도 10】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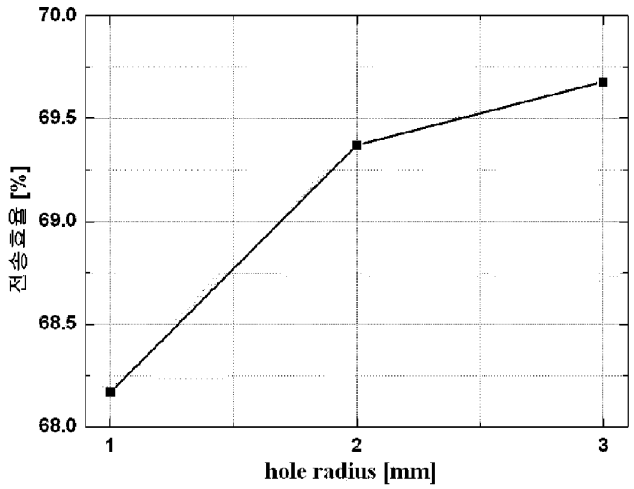
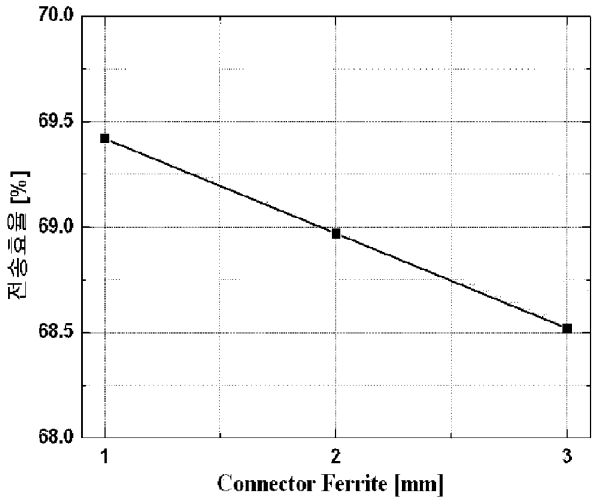
【도 11】

신뢰성 테스트 전		신뢰성 테스트 후	
전송 효율 (%)	인식 거리 (mm)	전송 효율 (%)	인식 거리 (mm)
69.42	35	69.38	35

【도 12】



【도 13】



PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/636,347

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))	17 minus 20 =	*			OR	x 80 =	0.00
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	1600

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.

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United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/636,347	03/03/2015	2859	1600	CJL-0028	17	1

CONFIRMATION NO. 9944

34610
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

FILING RECEIPT

OC000000073981699

Date Mailed: 03/17/2015

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)

Jai Hoon YEOM, Seoul, KOREA, REPUBLIC OF;
Sang Won LEE, Seoul, KOREA, REPUBLIC OF;
Seok BAE, Seoul, KOREA, REPUBLIC OF;
So Yeon KIM, Seoul, KOREA, REPUBLIC OF;
Jin Mi NOH, Seoul, KOREA, REPUBLIC OF;
Ji Yeon SONG, Seoul, KOREA, REPUBLIC OF;
Hee Jung LEE, Seoul, KOREA, REPUBLIC OF;

Applicant(s)

LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF

Assignment For Published Patent Application

LG INNOTEK CO., LTD.

Power of Attorney: The patent practitioners associated with Customer Number 34610

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

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 10-2014-0025290 03/04/2014

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: 03/13/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/636,347**

Projected Publication Date: 09/10/2015

Non-Publication Request: No

Early Publication Request: No

Title

WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

Preliminary Class

320

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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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.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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UTILITY PATENT APPLICATION TRANSMITTAL UNDER 37 C.F.R. §1.53(b)

U.S. Patent and Trademark Office
Customer Service Window, **MAIL STOP PATENT APPLICATION**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Docket No.: **CJL-0028**

Sir:

Transmitted herewith for filing is the patent application of
INVENTORS: **Jai Hoon YEOM, Sang Won LEE, Seok BAE, So Yeon KIM, Jin Mi NOH, Ji Yeon SONG and Hee Jung LEE**

FOR: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

Enclosed are:

1. ☒ 22 pages of specification, claims, abstract
2. ☒ 6 sheets of FORMAL drawings
3. ☒ 7 pages of newly executed Declaration
4. ☒ Priority claimed
5. ☐ Applicant claims Small Entity Status
6. ☐ Information Disclosure Statement, Form PTO-1449 and _____ references
7. ☒ Authorization under 37 C.F.R. §1.136(a)(3)
8. ☒ Application Data Sheet under 37 C.F.R. §1.76
9. ☒ Statement Under 37 C.F.R. §3.73(c) with copy of Assignment for LG INNOTEK CO., LTD.
10. ☒ Power of Attorney
11. ☐ a) ☐ Stamp & Return with Courier
    b) ☐ Prepaid postcard-stamped filing date & returned with unofficial Serial Number
12. ☐ Other: _____

CLAIMS AS FILED					
For	**No. Filed**		**No. Extra**	**Rate**	**Fee**
Total Claims	17	- 20	0	X $80.00	**$0.00**
Independent Claims	1	- 3	0	X $420.00	**$0.00**
Multiple Dependent Claims (If applicable)				X $780.00	**$0.00**
APPLICATION SIZE FEE					
Number of Pages	X .75 =	0 - 100=	/50 =	*$400.00	**$0.00**
				BASIC FILING FEE	**$280.00**
				UTILITY SEARCH FEE	**$600.00**
				UTILITY EXAMINATION FEE	**$720.00**
				TOTAL FILING FEE	**$1,600.00**

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☒ The Commissioner is hereby authorized to charge payment of following fees during the pendency of this application or credit any overpayment to Deposit Account No. 16-0607.

☒ Any additional filing fees required under 37 C.F.R. §1.16.

☒ Any patent application processing fees under 37 C.F.R. §1.17.

☒ Any filing fees under 37 C.F.R. §1.16 for presentation of extra claims.

Respectfully submitted,
KED & ASSOCIATES, LLP

/Daniel Y.J. Kim/

Daniel Y.J. Kim
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
703 766-3777 DYK/dak:fj

Please direct all correspondence to Customer Number 34610

Q:\Documents\2417-028\501018

Docket No.: **CJL-0028** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Customer No.: **34610**

Jai Hoon YEOM, Sang Won LEE, Seok BAE,
So Yeon KIM, Jin Mi NOH, Ji Yeon SONG
and Hee Jung LEE

Serial No.: **New U.S. Patent Application**

For: **WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE**

AUTHORIZATION TO TREAT A REPLY AS INCORPORATING AN EXTENSION OF TIME UNDER 37 C.F.R. §1.136(a)(3)

U.S. Patent and Trademark Office
Customer Service Window, **MAIL STOP PATENT APPLICATION**
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

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Respectfully submitted,
KED & ASSOCIATES, LLP

/Daniel Y.J. Kim/

Daniel Y.J. Kim
Registration No. 36,186

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PTO/AIA/14 (12-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CJL-0028
	Application Number	
Title of Invention	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE	

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
	Jai Hoon		YEOM	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Postal Code	100-714	**Country** i	KR

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Sang Won		LEE	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Address 2			
City	Seoul	**State/Province**	
Postal Code	100-714	**Country** i	KR

Inventor 3 Remove

Legal Name

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CJL-0028
	Application Number	
Title of Invention	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Seok		BAE	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Address 2			
City	Seoul	**State/Province**	
Postal Code	100-714	**Country** i	KR

Inventor 4 Remove

Legal Name

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	So Yeon		KIM	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Seoul	Country of Residence i	KR

Mailing Address of Inventor:

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Address 2			
City	Seoul	**State/Province**	
Postal Code	100-714	**Country** i	KR

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jin Mi		NOH	

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	Seoul Square, 416, Hangang-daero, Jung-gu		
Address 2			
City	Seoul	**State/Province**	
Postal Code	100-714	**Country** i	KR

PTO/AIA/14 (12-13)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CJL-0028
	Application Number	
Title of Invention	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE	

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ji Yeon		SONG	

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	Seoul Square, 416, Hangang-daero, Jung-gu		
Address 2			
City	Seoul	**State/Province**	
Postal Code	100-714	**Country** i	KR

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Hee Jung		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	Seoul Square, 416, Hangang-daero, Jung-gu		
Address 2			
City	Seoul	**State/Province**	
Postal Code	100-714	**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:

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	34610		
Email Address	ked-docket@ked-iplaw.com	Add Email	Remove Email

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CJL-0028
	Application Number	
Title of Invention	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE	

Application Information:

Title of the Invention	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE		
Attorney Docket Number	CJL-0028	**Small Entity Status Claimed** ☐	
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	**Suggested Figure for Publication (if any)**	

Filing By Reference :

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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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CJL-0028
	Application Number	
Title of Invention	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE	

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WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority under 35 U.S.C. §119 to Korean Application No. 10-2014-0025290, filed on March 4, 2014, in the Korean Intellectual Property Office, whose entire disclosure is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field

[0002] Embodiments of the present application relate to a wireless charging and communication board and a wireless charging and communication device.

2. Background

[0003] As one of radio frequency tag identification (RFID) technologies, near field communication (NFC) is a smart card type contactless communication technology using a frequency band of 13.56 MHz. As a wireless charging technology, wireless power conversion (WPC) is a contactless charging technology for charging a battery using magnetic coupling at a short range without electrical contact.

[0004] NFC is a next-generation near field communication technology which receives attention because NFC enables wireless communication between electrical devices at a short range with low power and has relatively excellent security due to the

short communication range and a low price. Furthermore, it is advantageous in that NFC has a bidirectional property and a large storage memory space compared to a smart card, and the range of applicable services is wide. Also, it is advantageous in that WPC can be applied to various fields regarding battery charging because WPC enables battery charging via magnetic coupling without electrical contact.

[0005] An antenna used in the NFC or WPC system includes a coil having a fixed area and receives necessary energy for the operation of a microchip from a reader. A magnetic field is formed by alternating current power energy generated from a primary coil so that electrical currents passing through the coil of the antenna can be abandoned, and a voltage is generated by an inductance of the antenna. The voltage is used as power for data transmission or is used in charging a battery.

[0006] As a smart terminal has widely come into wide use, the need of a device capable of providing both the NFC and WPC has been increased. Thus, the development of a device having high charging efficiency and a sufficient long recognition distance upon data communication has been required.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

[0008] FIG. 1 is a cross-sectional view of a wireless charging and communication device according to one embodiment of the present application;

[0009] FIG. 2 is a cross-sectional view of a wireless charging and communication board according to one embodiment of the present application;

[0010] FIG. 3 is a cross-sectional view of a wireless charging and communication board according to another embodiment of the present application;

[0011] FIGs. 4 and 5 are cross-sectional views of a wireless charging and communication board according to a further embodiment of the present application;

[0012] FIG. 6 is a top view illustrating coil patterns according to one embodiment of the present application;

[0013] FIG. 7 is a top view illustrating a soft magnetic layer according to one embodiment of the present application;

[0014] FIG. 8 is a top view illustrating a polymeric material layer according to one embodiment of the present application;

[0015] FIGs. 9 and 10 are cross-sectional views of a wireless charging and communication board according to yet another embodiment of the present application;

[0016] FIGs. 11 to 13 are view illustrated for explaining transmission efficiency and a recognition distance of the wireless charging and communication board according to one embodiment of the present application.

DETAILED DESCRIPTION

[0017] Hereinafter, the embodiments of the present application that an ordinary person skilled in the art can implement will be described with reference to the accompanying drawings. The embodiments in the specification and the constructions shown in the drawings are provided as a preferred embodiment of the present application, and it should be understood that there may be various equivalents and modifications which could substitute at the time of filing. In addition, when it comes to the operation principle of the preferred embodiments of the present application, when

the known functions or functions are seemed to make unclear the subject matters of the present application, they will be omitted from the descriptions of the invention. The terms below are defined in consideration of the functions of the present application, and the meaning of each term should be interpreted by judging the whole parts of the present specification, and the elements having the similar functions and operations of the drawings are given the same reference numerals. As used herein, the singular forms are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[0018] FIG. 1 is a cross-sectional view of a wireless charging and communication device according to one embodiment of the present application.

[0019] A wireless charging and communication device according to one embodiment of the present application will be hereinafter described with reference to FIG. 1.

[0020] The wireless charging and communication device according to the present embodiment of the invention may be included for wireless power conversion (WPC) and near field communication (NFC).

[0021] As illustrated in FIG. 1, the wireless charging and communication device according to the present embodiment of the invention may include a receiver 100 and a transmitter 500.

[0022] The receiver 100 and the transmitter 500 may enable wireless power conversion (WPC) and near field communication (NFC).

[0023] The receiver 100 may include a reception coil pattern 120, 130, wherein the first reception coil pattern 120 is a coil pattern for wireless power conversion (WPC),

and the second reception coil pattern 130 is a coil pattern for near field communication (NFC).

[0024] Also, the transmitter 500 may include a transmission coil pattern 520, 530, wherein the first transmission coil pattern 520 is a coil pattern for wireless power conversion (WPC), and the second transmission coil pattern 530 is a coil pattern for near field communication (NFC).

[0025] The first transmission coil pattern 520 is connected to a power source (not drawn), and the first reception coil patterns120 is connected to a circuit part (not drawn).

[0026] The power source may be an alternating current power source providing an alternating current having a predetermined frequency. An alternating current flows through the first transmission coil patterns 520 by power supplied from the power source (not drawn).

[0027] When the alternating current flows through the first transmission coil pattern 520, the alternating current is also induced to the first reception coil pattern 120 spaced apart from the first transmission coil pattern 520 by electromagnetic induction.

[0028] The current induced to the reception coil pattern 120 is transmitted to the separate circuit part (not drawn) and is then rectified.

[0029] Meanwhile, the transmitter 500 according to the present embodiment of the invention may be composed of a transmission pad, and the receiver 100 may be constituted as an element for a portable terminal, a home/personnel electronic product, a transportation means and the like to which wireless power conversion is applied. The portable terminal, the home/personnel electronic product, the transportation means and the like to which wireless power conversion is applied may include only a wireless

power receiver or may include both a wireless power transmitter and a wireless power receiver.

[0030] That is, the transmitter 500 may serve as a reader, and the receiver 100 may serve as a tag.

[0031] The receiver 100 may include a wireless charging and communication board and a housing 400 in which the wireless charging and communication board is received. The housing 400 may radiate heat generated from the coil pattern 120, 130 to the outside.

[0032] Meanwhile, the wireless charging and communication board may include: a soft magnetic layer 220, 230; a polymeric material layer 310, 312 disposed on one surface and the other surface of the soft magnetic layer 220, 230 and extending longer than an exposed portion of the soft magnetic layer 220, 230; the coil pattern 120, 130; and a processing hole 311 passing through the wireless charging and communication board and used in performing aligning.

[0033] Also, the polymeric material layer 310, 312 may include a first polymeric material layer 310 arranged on one surface of the soft magnetic layer 220, 230, and a second polymeric material layer 321 arranged on the other surface of the soft magnetic layer 220, 230.

[0034] At this time, the polymeric material layer 310, 312 may be made with a black film. The polymeric material layer 310, 312 may be adhered to the soft magnetic layer 220, 230 via an adhesive layer 315. The polymeric material layer 310, 312 may contain any one material of polyethylene, polyacrylic, polyimide, polyamide, and polyurethane.

[0035] Meanwhile, the soft magnetic layer 220, 230 may be configured such that, on the same plane on which the first soft magnetic layer 220 and the second soft magnetic layer 230 are arranged, the second soft magnetic layer 230 is arranged around the first soft magnetic layer 220, more specifically, the second soft magnetic layer 230 is disposed to surround the first soft magnetic layer 220.

[0036] Also, the coil pattern 120, 130 may include the first coil pattern 120 arranged in a region on the second polymeric material layer 312 corresponding to the first soft magnetic layer 220, and second coil pattern 130 arranged in a region on the second polymeric material layer 312 corresponding to the second soft magnetic layer 230.

[0037] The transmitter 500 may include: a soft magnetic layer 550; a transmission coil pattern 520, 530 attached to the soft magnetic layer 550 via an adhesive layer 535; and a housing 600.

[0038] Accordingly, according to the present embodiment of the invention, both the constitution including the first soft magnetic layer 220 and the first coil pattern (120) and capable of enabling wireless power conversion (WPC) and the constitution including the second soft magnetic layer 230 and the second coil pattern 130 and capable of enabling near field communication (NFC) may be included, and both the WPC and NFC may be provided.

[0039] Meanwhile, in another embodiment, the first transmission coil pattern 520 may be composed of a coil pattern for near field communication (NFC), and the second transmission coil pattern 530 may be composed of a coil pattern for wireless power conversion (WPC).

[0040] FIG. 2 is a cross-sectional view of a wireless charging and communication board according to one embodiment of the present application.

[0041] As illustrated in FIG. 2, a wireless charging and communication board according to one embodiment of the present application may include: a soft magnetic layer 220, 230; a polymeric material layer 310 312 arranged on one surface and the other surface of the soft magnetic layer 220, 230 and extending longer than an exposed portion of the soft magnetic layer 220, 230; and a coil pattern 120, 130 arranged on the polymeric material layer 310, 312.

[0042] Also, the polymeric material layer 310, 312 may include a first polymeric material layer 310 and a second polymeric material layer 312; the soft magnetic layer 220, 230 may include a first soft magnetic layer 220 and a second magnetic layer 230; and the coil pattern 120, 130 may include a first coil pattern 120 and a second coil pattern 130.

[0043] Also, an extension length l of the polymeric material layer 310, 312 and a thickness h of the magnetic soft material layer 220, 230 may be formed to have a relation of the following Equation 1.

[Equation 1]

$$l = A \times h$$

[0044] At this time, l represents an extension length of the polymeric material layer, h represents a thickness of the soft magnetic layer 220, 230, and A represents a constant of 0.6 to 10. When the value of A is less than 0.6, the polymeric material layer 310, 312 may not sufficiently surround the soft magnetic layer 220, 230, so that moisture can penetrate. When the value of A is more than 10, the polymeric material layer 310, 312 may excessively extend so that the polymeric material layer can be

easily bent and damaged by an external impact, or a thickness can be increased because a separate receiving part should be added.

[0045] Also, the first soft magnetic layer 220 and the second soft magnetic layer 230 may be made of different materials. For example, the first soft magnetic layer 220 may be made with an amorphous ribbon, and the second soft magnetic layer 230 may be made of any one material of a composite, a ferrite, a Ni-Zn material, and a Mn-Zn material.

[0046] When the first soft magnetic layer 220 is made with an amorphous ribbon, high permeability can be implemented in an operating frequency of 100 to 200 kHZ. When the second soft magnetic layer 230 is made of any one material of a composite, a ferrite, a Ni-Zn material, and a Mn-Zn material, data loss generated during communication can be reduced.

[0047] When the soft magnetic layer 120 is made of a ferrite material, the soft magnetic layer may be implemented in various forms such as a pellet form, a plate form, a ribbon form, a foil form, a film form and the like. Also, the soft magnetic layer 120 may contain at least one of Fe, Ni, Co, Mn, Al, Zn, Cu, Ba, Ti, Sn, Sr, P, B, N, C, W, Cr, Bi, Li, Y and Cd.

[0048] The coil pattern 120, 130 may include the first coil pattern 120 arranged in a region on the polymeric material layer 310 corresponding to the first soft magnetic layer 220, and the second coil pattern 130 arranged in a region on the polymeric material layer 310 corresponding to the second soft magnetic layer 230.

[0049] At this time, as illustrated in FIG. 2, the coil pattern 120, 130 may be adhered to the polymeric material layer 310 via an adhesive layer 135.

[0050] FIG. 3 is a cross-sectional view of a wireless charging and communication board according to another embodiment of the present application.

[0051] As illustrated in FIG. 3, a wireless charging and communication board according to the present embodiment of the invention includes: a soft magnetic layer 220, 230; a polymeric material layer 310, 312 arranged on one surface and the other surface of the soft magnetic layer 220, 230, and extending longer than an exposed portion of the soft magnetic layer 220, 230; and a coil pattern 120, 130 arranged on the polymeric material layer 310, 312.

[0052] However, in the embodiment of FIG. 3, the wireless charging and communication board further includes a polymeric material connector 313 intended for connecting the first polymeric material layer 310 and the second polymeric material layer 312 and surrounding the exposed portion of the soft magnetic layer 220.

[0053] Accordingly, in the embodiment of FIG. 3, the exposed portion may refer to an end exposed by a processing hole 311, and the polymeric material connector 313 surrounding the exposed portion of the soft magnetic layer 220 may prevent water penetration from the outside.

[0054] FIGs. 4 and 5 are cross-sectional views of a wireless charging and communication board according to a further embodiment of the present application.

[0055] According to the embodiment of FIGs. 4 and 5, the polymeric material layer 310, 312 may be directly formed on the soft magnetic layer 220, 230 without forming an adhesive layer 315 for adhering the polymeric material layer 310, 312 to the soft magnetic layer 220, 230.

[0056] At this time, the polymeric material layer 310, 312 may be directly formed on the soft magnetic layer 220, 230 via thermal compression bonding.

[0057] Like the embodiment of FIGs. 4 and 5, when the polymeric material layer 310, 312 is directly formed on the soft magnetic layer 220, 230, there is no need to use an adhesive layer so that a process can be simplified, a production cost can be reduced, and the wireless charging and communication board can be more thinly produced.

[0058] Meanwhile, in the embodiments of FIGs. 2 to 6, a cross section of the processing hole of the wireless charging and communication board has been explained as an example, but the exposed portion of an end for connecting the lead frame may be also identically configured.

[0059] FIG. 6 is a top view illustrating coil patterns according to one embodiment of the present application, more specifically, a view illustrating wireless charging and communication board included in a receiver according to one embodiment of the present application.

[0060] FIG. 7 is a top view illustrating a soft magnetic layer according to one embodiment of the present application and FIG. 8 is a top view illustrating a polymeric material layer according to one embodiment of the present application.

[0061] The coil pattern 120, 130 may be adhered to the polymeric material layer 310 via the adhesive layer 135 as shown in FIG. 2, or may be disposed on a separate substrate 110 as shown in FIG. 6.

[0062] As illustrated in FIG. 6, align marks 115, 116 for enabling aligning upon the wireless charging and communication board may be formed on the substrate 110.

[0063] Also, as illustrated in FIGs. 7 and 8, the wireless charging and communication board may further include a lead frame 140 connected to the coil pattern 120, 130, and the second soft magnetic layer 230 may be disposed to surround the lead frame 140.

[0064] More specifically, as shown in FIG. 4, the second soft magnetic layer 230 may be disposed to surround the lead frame 140 at a regular interval of 1 to 3 mm. As such, when the second soft magnetic layer 230 is disposed to surround the lead frame 140 at the regular interval, even though the lead frame 140 is disposed, the problem of a reduction in transmission efficiency upon charging or a reduction in a recognition distance upon data communication can be prevented.

[0065] Also, in the exposed portion of an end for connecting the lead frame 140, the polymeric material layer 310, 312 extending longer than the soft magnetic layer 220, 230 may be formed as shown in FIG. 2, or the polymeric material connector 313 surrounding an end of the polymeric material layer 310, 312 may be formed as shown in FIG. 3.

[0066] The polymeric material layer 310, 312 of FIG. 8 may be disposed on one surface and the other surface of the first and second soft magnetic layers 220, 230. The polymeric material layer 310, 312 may be disposed to be adhered to the first and second magnetic layer 220, 230 via the adhesive layer 315.

[0067] Also, the processing hole 311 may be formed in the polymeric material layer 310, 312 and the soft magnetic layer 220.

[0068] The processing hole 311 may perform aligning with the align marks 115, 116 of FIG. 6 upon manufacturing the wireless charging and communication board.

[0069] FIGs. 9 and 10 are cross-sectional views of a wireless charging and communication board according to yet another embodiment of the present application.

[0070] The wireless charging and communication board according to the present embodiment of the invention of FIGs. 9 and 10 may be configured such that the soft

magnetic layer 220, 230 is adhered onto one surface and the other surface of the adhesive layer 223, respectively.

[0071] According to the embodiment of the invention of FIGs. 9 and 10, the soft magnetic layer 220, 230 may be added in plural numbers so that transmission efficiency upon charging can be adjusted or improved, a recognition distance upon data communication can be adjusted.

[0072] FIGs. 11 to 13 are view illustrated for explaining transmission efficiency and a recognition distance of the wireless charging and communication board according to one embodiment of the present application.

[0073] More specifically, FIG. 11 is a table showing the comparison of charges in transmission efficiency and a recognition distance according to a conventional art and the embodiment of the present application, FIG. 12 is a graph illustrating a charge in transmission efficiency resulting from a change in a diameter of the processing hole according to the embodiment of the present application, and FIG. 13 is a graph illustrating a change in transmission efficiency resulting from a distance of the soft magnetic layers according to the embodiment of the present application.

[0074] According to the present embodiment of the invention, as illustrated in FIG. 11, comparing embodiment A in which the second soft magnetic layer does not surround around the lead frame, and a processing hole is not formed, and embodiment B in which the second soft magnetic layer surrounds around the lead frame, and the processing hole is formed, there is a slight difference in transmission efficiency and there is no difference in a recognition distance.

[0075] Also, as illustrated in FIG. 12, when a diameter of the processing hole is changed to the range of 1 to 3 mm, the effect of an increase in transmission efficiency is

generated. As illustrated in FIG. 13, when the soft magnetic layer (the second soft magnetic layer) surrounds around the lead frame, transmission efficiency is slight reduced, so there is no large difference in transmission efficiency.

[0076] As set forth above, according to some embodiments of the present application, the wireless charging and communication board may enable both the wireless power conversion (WPC) and near field communication (NFC).

[0077] According to some embodiments of the present application, the a portion of the soft magnetic layer exposed to the atmosphere is minimized so that the inflow of a foreign substance to the outside can be minimized, and the soft magnetic layer is disposed to surround the lead frame at a regular interval so that the problems of a reduction in transmission efficiency upon charging and a reduction in a recognition distance upon data communication can be overcome even though the lead frame is disposed.

[0078] Furthermore, according to some embodiments of the present application, the soft magnetic layer is added so that transmission efficiency upon charging can be adjusted or improved, and a recognition distance upon data communication can be adjusted.

[0079] An aspect of embodiments of the present application provides a wireless charging and communication board that enables wireless power conversion (WPC) and near field communication (NFC).

[0080] Also, another aspect of embodiments of the present application provides a wireless charging and communication board which is configured such that a portion of a soft magnetic layer exposed to the atmosphere is minimized so that the inflow of a foreign substance to the outside can be minimized, and the soft magnetic layer is

disposed to surround a lead frame at a regular interval so that the problems of a reduction in transmission efficiency upon charging and a reduction in a recognition distance upon data communication can be overcome even though the lead frame is disposed.

[0081] Also, a further aspect of embodiments of the present application provides a wireless charging and communication board to which a soft magnetic layer is added so that transmission efficiency upon charging can be adjusted or improved, and a recognition distance upon data communication can be adjusted, and a wireless charging and communication device including the wireless charging and communication board.

[0082] According to an aspect of embodiments of the present application, a wireless charging and communication board may include: a soft magnetic layer; a polymeric material layer arranged on one surface and the other surface of the soft magnetic layer and extending longer than an exposed portion of the soft magnetic layer; and a coil pattern arranged on the polymeric material layer.

[0083] The polymeric material layer may include a first polymeric material layer arranged on one surface of the soft magnetic layer, and a second polymeric material layer arranged on the other surface of the soft magnetic layer.

[0084] The wireless charging and communication board may further include a polymeric material connector intended for connecting the first polymeric material layer and the second polymeric material layer and surrounding the exposed portion of the soft magnetic layer.

[0085] The polymeric material layer may contain any one material of polyethylene, polyacrylic, polyimide, polyamide, and polyurethane.

[0086] The wireless charging and communication board may further include an adhesive layer intended for adhering the polymeric material layer to the soft magnetic layer.

[0087] The wireless charging and communication board may further include a processing hole passing through the soft magnetic layer and the polymeric material layer.

[0088] The soft magnetic layer may include: a first soft magnetic layer; and a second soft magnetic layer arranged at a periphery portion of the first soft magnetic layer on the same plane on which the first soft magnetic layer is arranged.

[0089] The first soft magnetic layer and the second soft magnetic layer may be made of different materials.

[0090] The coil pattern may include: a first coil pattern arranged in a region on the polymeric material layer corresponding to the first soft magnetic layer; and a second coil pattern arranged in a region on the polymeric material layer corresponding to the second soft magnetic layer;

[0091] The wireless charging and communication board may further include a lead frame connected to the coil pattern.

[0092] The second soft magnetic layer may be arranged to surround the lead frame at a regular interval.

[0093] The soft magnetic layer may be made with any one of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, and a silicon steel plate.

[0094] The soft magnetic layer may be made of a ferrite material and may be formed in a pellet form, a plate form, a ribbon form, a foil form, or a film form.

[0095] The soft magnetic layer may contain at least one of Fe, Ni, Co, Mn, Al, Zn, Cu, Ba, Ti, Sn, Sr, P, B, N, C, W, Cr, Bi, Li, Y and Cd.

[0096] The polymeric material layer may be a black film.

[0097] The wireless charging and communication board may further include a housing radiating heat from the coil pattern.

[0098] According to another aspect of embodiments of the present application, a wireless charging and communication device may include the wireless charging and communication board configured as described above.

[0099] As previously described, in the detailed description of the invention, having described the detailed exemplary embodiments of the invention, it should be apparent that modifications and variations can be made by persons skilled without deviating from the spirit or scope of the invention. Therefore, it is to be understood that the foregoing is illustrative of the present application and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed embodiments, as well as other embodiments, are intended to be included within the scope of the appended claims and their equivalents.

[0100] Any reference in this specification to “one embodiment,” “an embodiment,” “example embodiment,” etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is

submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

[0101] 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.

WHAT IS CLAIMED IS:

1. A wireless charging and communication board, comprising:

a soft magnetic layer;

a polymeric material layer arranged on one surface and the other surface of the soft magnetic layer and extending longer than an exposed portion of the soft magnetic layer; and

a coil pattern arranged on the polymeric material layer.

2. The wireless charging and communication board of claim 1, wherein the polymeric material layer comprises a first polymeric material layer arranged on one surface of the soft magnetic layer, and a second polymeric material layer arranged on the other surface of the soft magnetic layer.

3. The wireless charging and communication board of claim 2, further comprising a polymeric material connector intended for connecting the first polymeric material layer and the second polymeric material layer and surrounding the exposed portion of the soft magnetic layer.

4. The wireless charging and communication board of claim 1, wherein the polymeric material layer contains any one material of polyethylene, polyacrylic, polyimide, polyamide, and polyurethane.

5. The wireless charging and communication board of claim 1, further comprising an adhesive layer intended for adhering the polymeric material layer to the soft magnetic layer.

6. The wireless charging and communication board of claim 1, further comprising a processing hole passing through the soft magnetic layer and the polymeric material layer.

7. The wireless charging and communication board of claim 1, wherein the soft magnetic layer comprises: a first soft magnetic layer; and a second soft magnetic layer arranged at a periphery portion of the first soft magnetic layer on the same plane on which the first soft magnetic layer is arranged.

8. The wireless charging and communication board of claim 7, wherein the first soft magnetic layer and the second soft magnetic layer are made of different materials.

9. The wireless charging and communication board of claim 7, wherein the coil pattern comprises: a first coil pattern arranged in a region on the polymeric material layer corresponding to the first soft magnetic layer; and a second coil pattern arranged in a region on the polymeric material layer corresponding to the second soft magnetic layer.

10. The wireless charging and communication board of claim 7, further comprising a lead frame connected to the coil pattern.

11. The wireless charging and communication board of claim 7, wherein the second soft magnetic layer is arranged to surround the lead frame at a regular interval.

12. The wireless charging and communication board of claim 1, wherein the soft magnetic layer is made with any one of an amorphous alloy, a crystalline alloy, an amorphous alloy ribbon, a nanocrystalline ribbon, and a silicon steel plate.

13. The wireless charging and communication board of claim 1, wherein the soft magnetic layer is made of a ferrite material and is formed in a pellet form, a plate form, a ribbon form, a foil form, or a film form.

14. The wireless charging and communication board of claim 1, wherein the soft magnetic layer contains at least one of Fe, Ni, Co, Mn, Al, Zn, Cu, Ba, Ti, Sn, Sr, P, B, N, C, W, Cr, Bi, Li, Y and Cd.

15. The wireless charging and communication board of claim 1, wherein the polymeric material layer is a black film.

16. The wireless charging and communication board of claim 1, further comprising a housing radiating heat from the coil pattern.

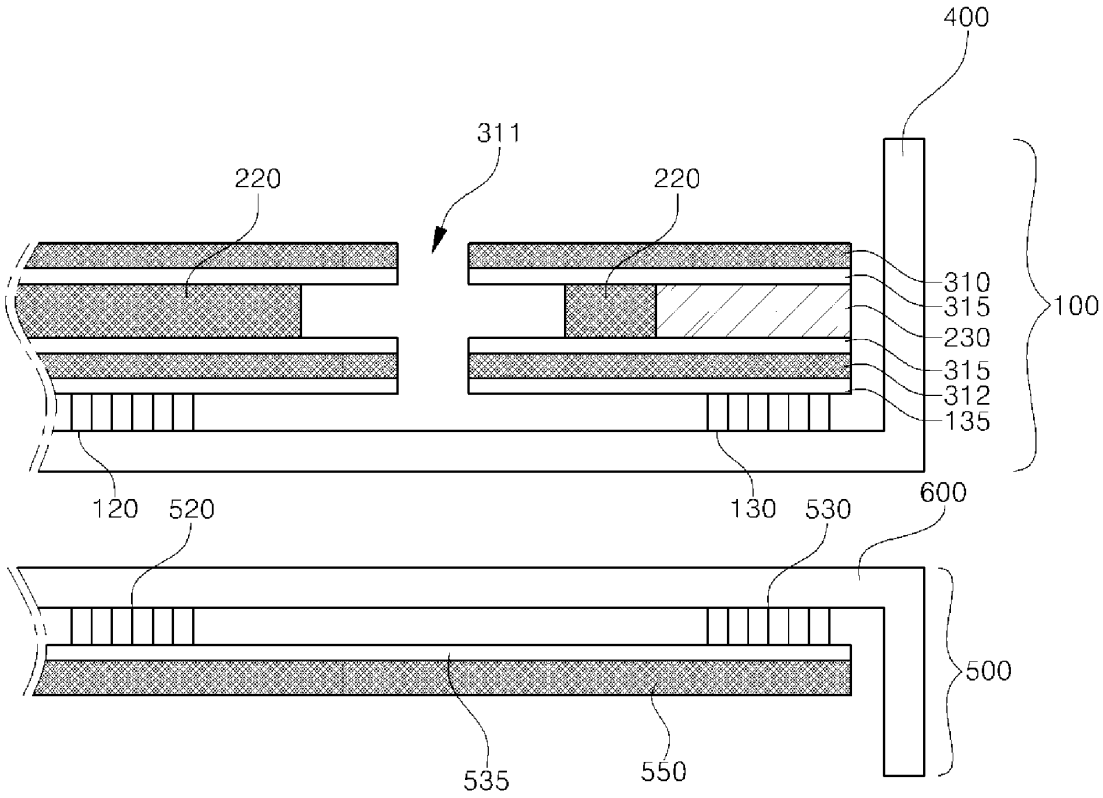
17. A wireless charging and communication device, comprising

a wireless charging and communication board of claim 1.

ABSTRACT

Provided are a wireless charging and communication board, and a wireless charging and communication device, the wireless charging and communication board including: a soft magnetic layer; a polymeric material layer arranged on one surface and the other surface of the soft magnetic layer and extending longer than an exposed portion of the soft magnetic layer; and a coil pattern arranged on the polymeric material layer.

FIG. 1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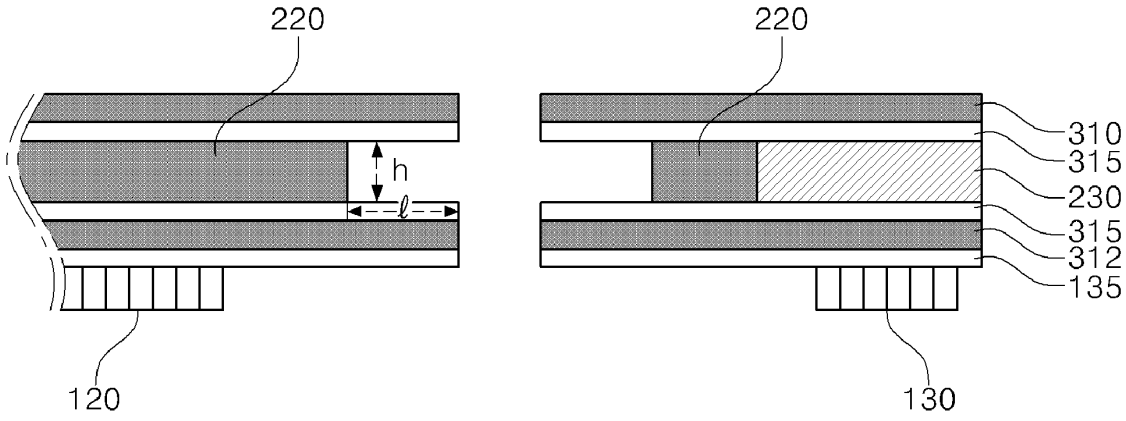
600
500
535
550

FIG. 2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135
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FIG. 3

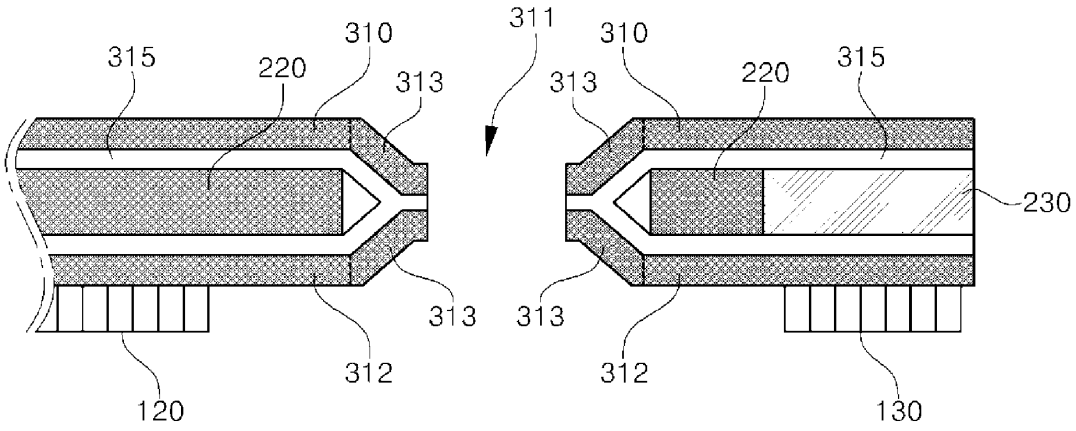


FIG. 4

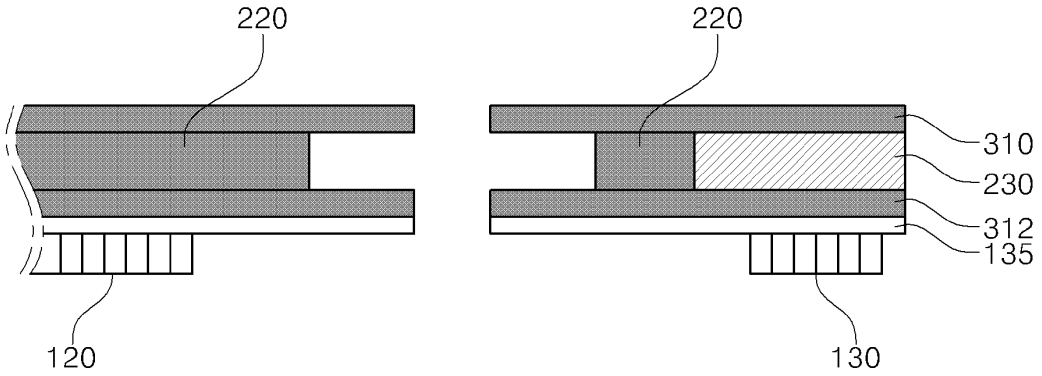


FIG. 5

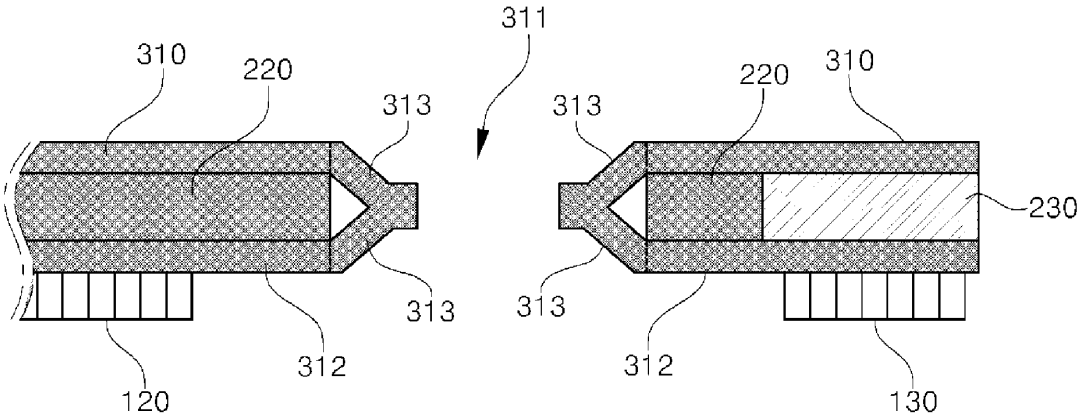


FIG. 6

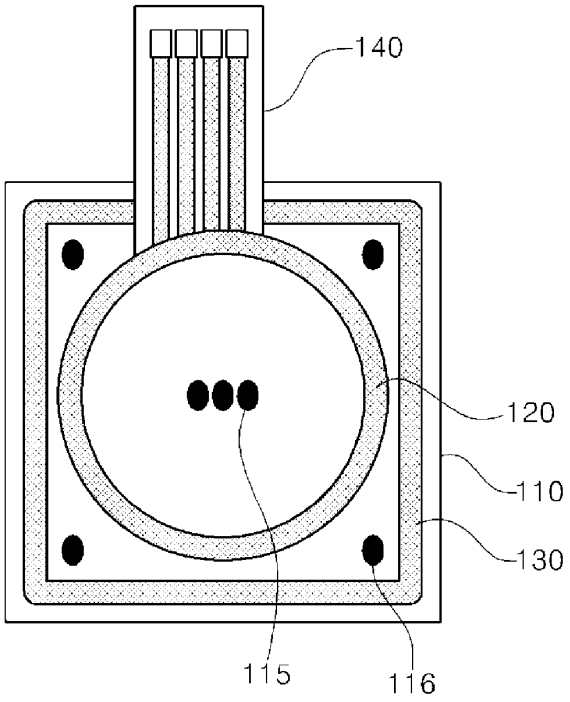


FIG. 7

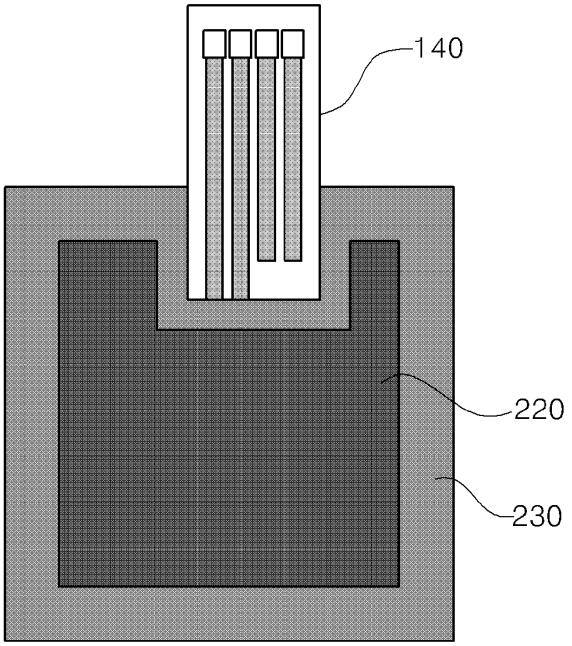


FIG. 8

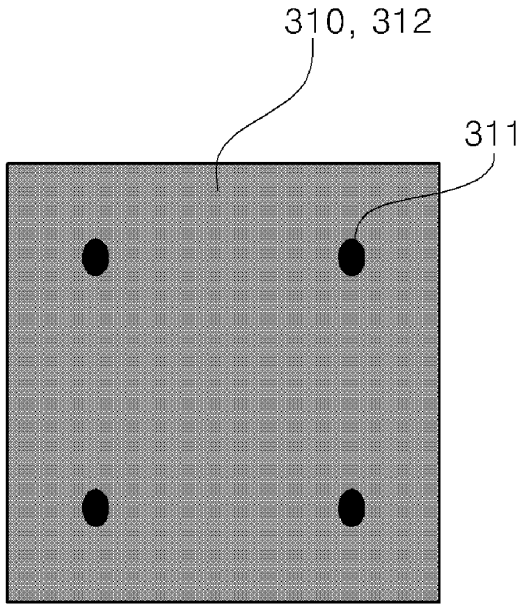


FIG. 9

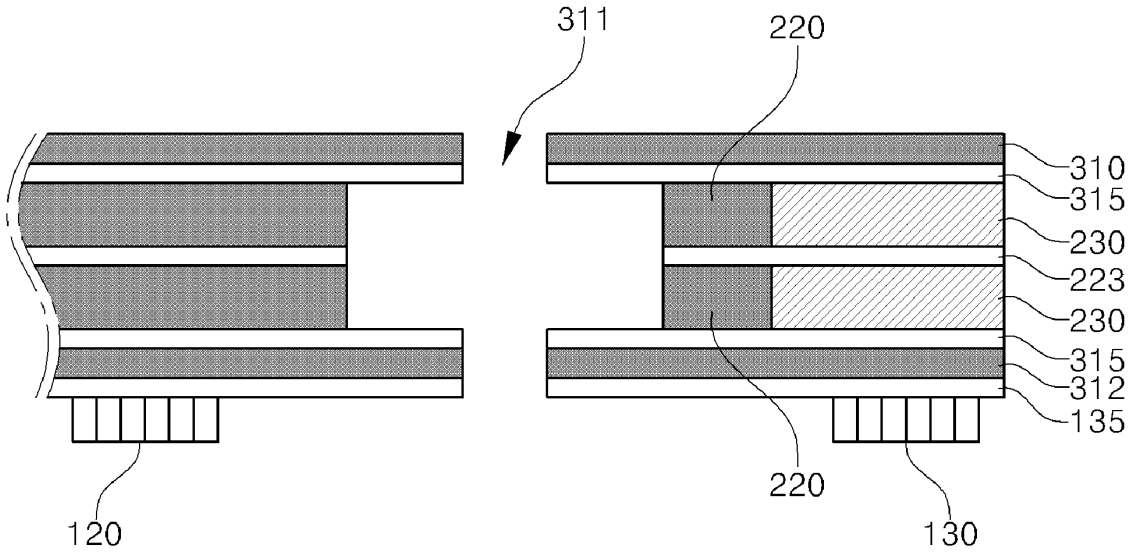


FIG. 10

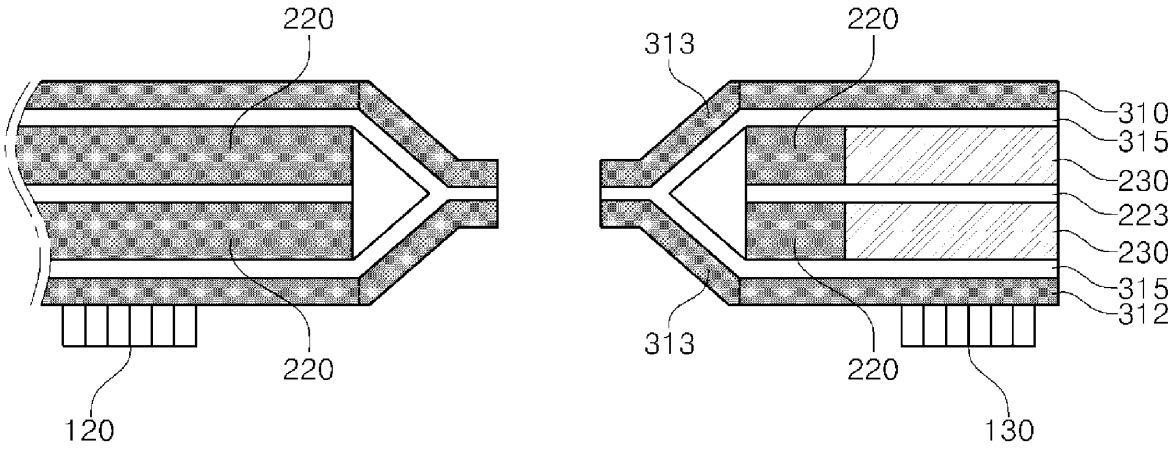


FIG. 11

BEFORE TEST FOR RELIABILITY		AFTER TEST FOR RELIABILITY	
TRANSMISSION EFFICIENCY(%)	RECOGNITION DISTANCE(mm)	TRANSMISSION EFFICIENCY(%)	RECOGNITION DISTANCE(mm)
69.42	35	69.38	35

FIG. 12

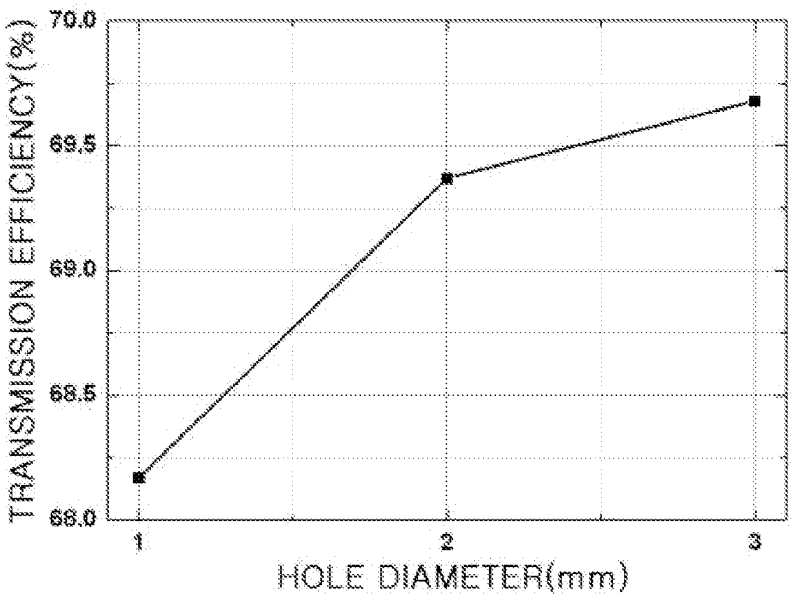
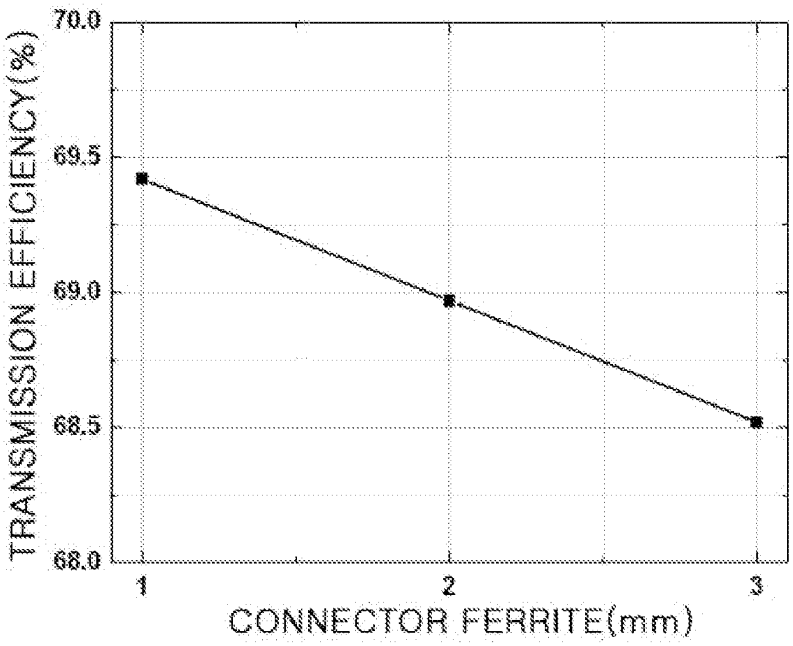

TRANSMISSION EFFICIENCY(%)
70.0
69.5
69.0
68.5
68.0
1
2
3
HOLE DIAMETER(mm)

FIG. 13


TRANSMISSION EFFICIENCY(%)
70.0
69.5
69.0
68.5
68.0
1
2
3
CONNECTOR FERRITE(mm)

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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 CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] 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.

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LEGAL NAME OF INVENTOR

Inventor: Jai Hoon YEOM Date (Optional): March. 2. 2015

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Sang Won LEE Date (Optional): Feb 27, 2015

Signature: _____

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LEGAL NAME OF INVENTOR

Inventor: Seok BAE Date (Optional): March. 2 . 2015

Signature: _____

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LEGAL NAME OF INVENTOR

Inventor: So Yeon KIM Date (Optional): Feb 27 2015

Signature: _____

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LEGAL NAME OF INVENTOR

Inventor: Jin Mi NOH Date (Optional): Feb. 27. 2015

Signature: _____

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LEGAL NAME OF INVENTOR

Inventor: Ji Yeon SONG Date (Optional): Feb. 27. 2015

Signature: Ji Yeon Song

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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: Hee Jung LEE Date (Optional): Feb. 27, 2015

Signature: 이희정

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/80 (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 TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 34610

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 34610

OR

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

Assignee Name and Address: LG Innotek CO., Ltd.
Seoul Square, 416, Hangang-Daero, Jung-gu
Seoul 100-714 Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record
The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	[signature]	Date	June 18th, 2014
Name	Mr. Gyung Rae KIM	Telephone	+82-31-436-7871
Title	Senior Manager		

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: LG INNOTEK CO., LTD.

Application No./Patent No.: _____ Filed/Issue Date: March 3, 2015

Titled: WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

LG INNOTEK CO., LTD., 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: _____ To: _____

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

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

   2. 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.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. 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.

/Daniel Y.J. Kim/	March 3, 2015
Signature	Date
Daniel Y.J. Kim	36,186
Printed or Typed Name	Title or Registration Number

Docket No.: CJL-0028

ASSIGNMENT

In consideration of the premises and other good and valuable consideration in hand paid, the receipt and sufficiency of which is hereby acknowledged, the undersigned,

(1) **Jai Hoon YEOM**
(2) **Sang Won LEE**
(3) **Seok BAE**
(4) **So Yeon KIM**
(5) **Jin Mi NOH**
(6) **Ji Yeon SONG**
(7) **Hee Jung LEE**

who have made a certain new and useful invention, hereby sell, assign and transfer unto

LG INNOTEK CO., LTD.
Seoul Square, 416, Hangang-daero, Jung-gu
Seoul, 100-714 Republic of Korea

its successors and assigns (hereinafter designated "ASSIGNEE") the entire right, title and interest for the United States of America as defined in 35 U.S.C. 100 in the invention entitled

WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE

(a) for which an application for United States Letters Patent was filed on_____, and identified by United States Serial No._____; or

(b) for which an application for United States Letters Patent was executed on February 27, 2015 / March 2, 2015,

and the undersigned hereby authorize and request the United States Commissioner of Patents and Trademarks to issue any and all United States Letters Patent which may be granted therefor and/or that claim priority thereto and any and all extensions, divisions, reissues, substitutes, renewals, continuations, or continuations-in-part thereof and/or that claim priority thereto, and the right to all benefits under the International Convention for the Protection of Industrial Property to the said ASSIGNEE, for its interest as ASSIGNEE, its successors, assigns and legal representatives; the undersigned agree that the attorneys of record in said application shall hereafter act on behalf of said ASSIGNEE;

AND the undersigned hereby agree to transfer a like interest, and to render all necessary assistance in making application for and obtaining original, divisional, reissued or extended Letters Patent of the United States, upon request of the said ASSIGNEE, its successors, assigns and legal representatives, and without further remuneration, in and to any improvements, and applications for patent based thereon, growing out of or related to the said invention; and to execute any papers by the said ASSIGNEE, its successors, assigns and legal representatives, deemed essential to ASSIGNEE's full protection and title in and to the invention hereby transferred.

AND the undersigned hereby grants the firm of KED & ASSOCIATES, LLP the power to insert on this assignment any further identification that may be necessary or desirable in order to comply with the rules of any issuing authority, including the United States Patent and Trademark Office, for recordation of this document.

SIGNED on the dates indicated aside our signatures:

INVENTORS	DATE SIGNED
1) _____ Name: **Jai Hoon YEOM**	March. 2. 2015
2) _____ Name: **Sang Won LEE**	Feb. 27, 2015
3) _____ Name: **Seok BAE**	March. 2. 2015
4) _____ Name: **So Yeon KIM**	Feb. 27. 2015
5) _____ Name: **Jin Mi NOH**	Feb. 27. 2015

6) Ji YeonSong — Feb. 27. 2015

Name: **Ji Yeon SONG**

7) 이 희정 — Feb. 27, 2015

Name: **Hee Jung LEE**

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Filer:	Daniel Y.J. Kim/Fei Ji
Attorney Docket Number:	CJL-0028

Filed as Large Entity

Filing Fees for Utility 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
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1600**

Electronic Acknowledgement Receipt	
EFS ID:	21651256
Application Number:	14636347
International Application Number:	
Confirmation Number:	9944
Title of Invention:	WIRELESS CHARGING AND COMMUNICATION BOARD AND WIRELESS CHARGING AND COMMUNICATION DEVICE
First Named Inventor/Applicant Name:	Jai Hoon YEOM
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Fei Ji
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	CJL-0028
Receipt Date:	03-MAR-2015
Filing Date:	
Time Stamp:	12:26:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1600
RAM confirmation Number	13025
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	AppTransmittal.pdf	188992 94ff01dbc068b5aeb7f761e5b9e2269beee66664	no	1
Warnings:					
Information:					
2	Authorization for Extension of Time all replies	Authorization.pdf	95923 28154b49b5754b0bda02eccda4463b77b2c78d34	no	1
Warnings:					
Information:					
3	Application Data Sheet	ADS.pdf	1565994 5997d62c385f711f1269681709ed3090076860e1	no	9
Warnings:					
Information:					
4		Application.pdf	215625 0684de9fdc4df3d95eeeed918ae1d3b2c15fdde3	yes	22

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	18
Claims	19	21
Abstract	22	22

Warnings:					
Information:					
5	Drawings-only black and white line drawings	Drawings.pdf	205999 c8f1b263e09243f383ae54ebbe160c8628613615	no	6
Warnings:					
Information:					
6	Oath or Declaration filed	Declarations.pdf	1497042 8919e935f393e922d30f487a9084d55aeb1f53d5	no	7

Warnings:					
Information:					
7	Power of Attorney	POA.pdf	293691 e3c55e7d1c5a61473ddb60734cbe0ec15ed4c3ad	no	1
Warnings:					
Information:					
8	Assignee showing of ownership per 37 CFR 3.73.	373andAssignment.pdf	497328 7d8458f1fd8d85f3a8edfe3e96bd4aa222d9bbde	no	4
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	35148 4a724b013d5a106d3a835c651df4fc3cc8fd8844	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	4595742	

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.