(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY

(19) World Intellectual Property Organization
International Bureau

[Logo:] WIPO | PCT

(10) International publication number
WO 2013/141658 A1

(43) International publication date
September 26, 2013 (26.09.2013)

(51) International Patent Classification:
H01Q 1/38 (2006. 01) ***H01Q 1/24*** (2006.01)
H01Q 7/00 (2006.01) ***H02J 17/00*** (2006.01)

(21) International Application No: PCT/KR2013/002412

(22) International Filing Date: March 22, 2013 (22 03 2013)

(25) Filing Language: Korean

(26) Publication Language: Korean

(30) Priority Data:
10-2012-0029987 March 23, 2012 (23.03.2012) KR
10-2012-0079004 July 19, 2012 (19.07.2012) KR
10-2012-0123375 November 2, 2012 (02.11.2012) KR
10-2013-0028300 March 15, 2013 (15.03.2013) KR
10-2013-0028301 March 15, 2013 (15.03.2013) KR
10-2013-0028302 March 15, 2013 (15.03.2013) KR
10-2013-0028303 March 15, 2013 (15.03.2013) KR

(71) Applicant: LG INNOTEK CO., LTD. [KR/KR]; Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714.

(72) Inventors: AN, Jeong Wook; Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714. **LEE, Jung Oh;** Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714. **KIM, Yang Hyun;** Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714. **LEE, Ki Min;** Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714. **LEE, Hye Min;** Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714. **LEEM, Sung Hyun;** Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714. **CHANG, Ki Chul;** Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714.

(74) Agent: SEO, Kyo Jun; Seoul Square, 541, Namdaemun-ro 5-ga, Jung-gu, Seoul (KR) 100-714.

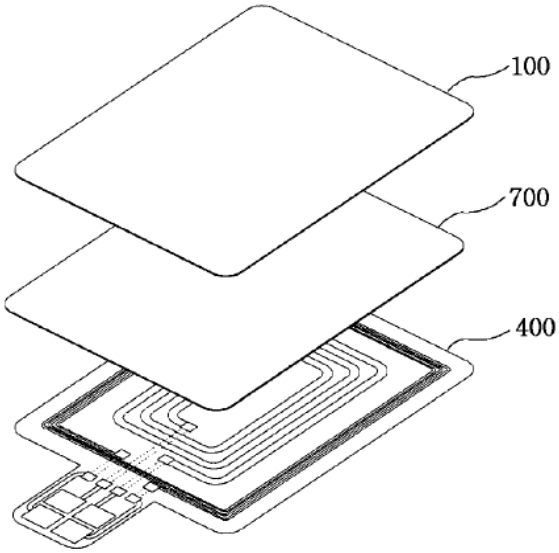
(81) Designated states (Unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated states (Unless otherwise indicated, for every kind of national protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL,

[Continued on next page]

(54) Title: ANTENNA ASSEMBLY AND METHOD FOR MANUFACTURING SAME

(54) Title of Invention: ANTENNA ASSEMBLY AND METHOD FOR MANUFACTURING THE SAME



(57) Abstract: An antenna assembly comprises: a substrate; and a wireless charging antenna pattern formed on the substrate. The cross-section of the wireless charging antenna pattern has a plurality of internal angles including two internal angles different from each other. The antenna assembly may further comprise a wireless communication antenna pattern formed on the substrate and arranged outside the wireless charging antenna pattern. The cross-section of the wireless communication antenna pattern has a plurality of internal angles, and the plurality of angle values of the plurality of internal angles of the cross-section of the wireless communication antenna pattern may correspond to the respective plurality of angle values of the plurality of internal angles of the cross section of the wireless charging antenna pattern.

(57) Abstract: An antenna assembly comprises a substrate; and a wireless charging antenna pattern formed on the substrate, wherein the cross-section of the wireless charging antenna pattern has a plurality of internal angles comprising two internal angles that are different from each other. The antenna assembly may further comprise a wireless communication antenna pattern formed on the substrate and disposed outside the wireless charging antenna pattern. The cross-section of the wireless communication antenna pattern has a plurality of internal angles, and the plurality of angle values of the plurality of internal angles of the cross-section of the wireless communication antenna pattern may correspond to the plurality of angle values of the plurality of internal angles of the cross-section of the wireless charging antenna pattern, respectively.

AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— With international search report (Article 21 (3) of the Treaty)
— Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2 (h))

Specification

Title of Invention: ANTENNA ASSEMBLY AND METHOD FOR MANUFACTURING THE SAME

Technical Field

[1] The present invention relates to an antenna assembly and a method for manufacturing the same. In particular, relates to an antenna assembly comprising a wireless charging antenna and a method for manufacturing the same.

Background Art

[2] Wireless power transmission technologies (wireless power transmission or wireless energy transfer) for wirelessly transmitting electrical energy to desired devices, such as electric motors or transformers using the principle of electromagnetic induction were already being used in the 1800s, and since then, methods for transmitting electric energy by emitting electromagnetic waves, such as radio waves or lasers, have been attempted as well. In fact, electric toothbrushes and some cordless shavers that are commonly used are charged by the principle of electromagnetic induction. Electromagnetic induction refers to a phenomenon in which a voltage is induced thereby flowing an electric current when a magnetic field is changed around a conductor. Although the electromagnetic induction method is being commercialized rapidly, specifically for small devices, there is a problem in that the distance for power transmission is short.

[3] Until now, the energy transfer method by the wireless method has included long-range transmission technology using resonance and short wavelength radio frequency, and so forth, in addition to electromagnetic induction.

[4] However, an antenna assembly built into a terminal generally has problems in that it is thick, and the manufacturing process is complicated.

Detailed Description of Invention

Technical Problem

[5] The technical problem to be solved by the present invention is to provide an antenna assembly comprising a wireless charging antenna and capable of reducing the thickness and simplifying the manufacturing process and a manufacturing method thereof.

Means to Resolve Problem

[6] In an embodiment, an antenna assembly comprises a substrate, and a wireless charging antenna pattern formed on the substrate, wherein the cross-section of the wireless charging antenna has a plurality of internal angles comprising two internal angles that are different from each other.

[7] The antenna assembly may further comprise a wireless communication antenna pattern formed on the substrate and disposed outside the wireless charging antenna pattern.

[8] The cross-section of the wireless communication antenna pattern has a plurality of inner angles, and the plurality of angle values of the plurality of inner angles of the cross-section of the wireless communication antenna pattern may correspond to the plurality of angle values of the plurality of inner angles of the cross-section of the wireless charging antenna pattern, respectively.

[9] The thickness of the wireless charging antenna pattern may be the same as the thickness of the wireless communication antenna pattern.

Effect of the Invention

[10] According to an embodiment, the antenna performance can be improved by separating the magnetic substrate and the coil unit through an adhesive layer.

[11] According to an embodiment, the manufacturing process of an antenna assembly can be simplified by directly disposing the coil unit on the upper surface of the non-magnetic insulating substrate through just laminating and etching processes.

[12] According to an embodiment, the manufacturing process of the antenna assembly can be simplified by connecting the internal terminal of the spiral-shaped antenna pattern and the connection terminal disposed outside of the antenna pattern with a conductive bridge.

[13] According to an embodiment, the manufacturing process of the antenna assembly can be simplified by electrically connecting the internal terminal of the spiral-shaped antenna pattern and the connection terminal disposed outside of the antenna pattern by cutting the extension pattern of the antenna pattern together with the substrate and folding the cut out substrate.

[14] According to an embodiment, the manufacturing process of the antenna assembly can be simplified by simultaneously forming a relatively thick wireless charging antenna pattern and a wireless communication antenna pattern through etching.

[15] According to an embodiment, maintains high power transmission efficiency by directly disposing a coil unit and a near field communication antenna on a magnetic substrate, while enabling communication with an external device at the same time.

[16] According to an embodiment, the thickness of the antenna assembly can be greatly reduced by forming a conductive pattern inside the magnetic substrate.

[17] According to an embodiment, has high power transmission efficiency by forming a conductive pattern inside a magnetic substrate, while enabling communication with an external device at the same time using a near field communication antenna.

[18] According to an embodiment, as the connection portion gets disposed inside the accommodation space of the magnetic substrate, the overall thickness of the antenna assembly can be greatly reduced as much as the thickness of the connection portion.

[19] According to an embodiment, the overall size of the antenna assembly can be reduced by using a tape substrate as the connection portion.

[20] According to an embodiment, by using a lead frame as the connection portion, the wiring layer comprised in the connection portion can be protected from heat generation, external moisture, and impact, and the effect of enabling mass production can be obtained.

[21] According to an embodiment, can improve the power transmission efficiency by changing the direction of the magnetic field from facing outward to facing the coil unit due to the conductive pattern formed in the magnetic substrate and, at the same time, minimize the effect of the magnetic field having a harmful effect on the human body by reducing the amount of magnetic field leaked to the outside.

[22] According to an embodiment of the present invention, can manufacture an antenna assembly through just the process for forming a pattern groove and the process for inserting the coil unit, thereby providing the effect of simplifying the manufacturing process.

[23] Meanwhile, various additional effects will be directly or implicitly disclosed in the detailed description according to embodiments of the present invention that will be described below.

Brief Description of Figures

[24] Fig. 1 is an exploded perspective view of the antenna assembly according to an embodiment of the present invention.
[25] Fig. 2 is a plane view of the antenna assembly according to an embodiment of the present invention.
[26] Fig. 3 is a cross-sectional view of the antenna assembly according to an embodiment of the present invention.
[27] Fig. 4 is a plane view of the antenna assembly according to an embodiment of the present invention.
[28] Fig. 5 is a cross-sectional view of the antenna assembly according to an embodiment of the present invention.
[29] Fig. 6 is a plane view of the antenna assembly according to another embodiment of the present invention.
[30] Fig. 7 is a bottom view of the antenna assembly according to another embodiment of the present invention.
[31] Fig. 8 is a cross-sectional view of the antenna assembly according to another embodiment of the present invention.
[32] Fig. 9 is a plane view of the antenna assembly according to another embodiment of the present invention.
[33] Fig. 10 is a bottom view of the antenna assembly according to another embodiment of the present invention.
[34] Fig. 11 is a cross-sectional view of the antenna assembly according to another embodiment of the present invention.
[35] Fig. 11 is a perspective view of the antenna assembly according to another embodiment another embodiment [sic] of the present invention.
[36] Fig. 13 is a plane view of the antenna assembly according to another embodiment of the present invention.
[37] Fig. 14 is a cross-sectional view of the antenna assembly when cut from A to A' along the dotted line shown on the contact portion of Fig. 13.
[38] Figs. 15 to 19 are figures for explaining a method for manufacturing the antenna assembly according to an embodiment of the present invention.
[39] Fig. 20 is a cross-sectional view of the antenna assembly according to another embodiment of the present invention, when cut from A to A' along the dotted line shown on the contact portion of Fig. 13.
[40] Fig. 21 is a plane view of the antenna assembly according to another embodiment of the present invention.
[41] Fig. 22 is a perspective view of the antenna assembly according to another embodiment of the present invention.
[42] Fig. 23 is a plane view of the antenna assembly according to another embodiment of the present invention.
[43] Fig. 24 is a cross-sectional view of the antenna assembly according to another embodiment of the present invention, when cut from B to B' along the dots shown on the contact portion of Fig. 23.
[44] Fig. 25 is a perspective view of the antenna assembly according to another embodiment of the present invention.
[45] Fig. 26 is a plane view of the antenna assembly according to another embodiment of the present invention.
[46] Fig. 27 is a cross-sectional view of the antenna assembly cut from C to C' according to another embodiment of the present invention.
[47] Figs. 28 to 32 are figures for explaining a method for manufacturing the antenna assembly according to another embodiment of the present invention.
[48] Fig. 33 is a drawing for explaining changes in inductance, resistance, and Q value of the inner antenna according to the frequency used when the coil unit is disposed on the upper surface of the magnetic substrate according to another embodiment of the present invention.

DOCKET ALARM

Explore Litigation Insights

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

Real-Time Litigation Alerts

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

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

Advanced Docket Research

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

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

Analytics At Your Fingertips

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

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

API

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

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

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

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.