국제조사기관의 견해서

국제출원번호
PCT/KR2014/005258

제1기재란 본 견해서의 기초

1. **언어**와 관련하여, 본 견해서는 아래에 기초하여 작성되었습니다.

   ☒ 출원시의 언어로 된 국제출원

   ☐ 국제조사를 위하여 _____ 로 번역되어 제출된 국제출원의 번역문
   (PCT규칙 12.3(a) 및 23.1(b))

2. ☐ 본 견해서는 PCT규칙 91에 따라 당해 기관이 허가하였거나 당해 기관에 통보된 **명백한 잘못의 정정**을 고려하여 작성되었습니다(PCT규칙 43의2.1(a)).

3. 국제출원에 개시된 **핵산염기 서열 및/또는 아미노산 서열**과 관련하여, 본 견해서는 아래에 기초하여 작성되었습니다.

   a. 출원시 또는 추후 제출된 서열목록
   ☐ 서면
   ☐ 전자적 형태

   b. 제출시기
   ☐ 출원시 국제출원에 포함
   ☐ 국제출원과 함께 전자적 형태로 제출
   ☐ 조사를 위해 본 기관에 추후 제출

4. ☐ 추가로 서열목록에 대하여 하나 이상의 버전이나 사본이 제출된 경우, 후속 버전 또는 추가된 사본에 기재되어 있는 정보가 출원시의 정보와 동일하거나 또는 출원시의 개시범위를 벗어나지 않는다는 진술서가 제출되었습니다.

5. 추가 의견:

국제조사기관의 견해서

국제출원번호
PCT/KR2014/005258

제5기재란 신규성, 진보성 또는 산업상이용가능성에 관한 견해(PCT규칙 43의2.1(a)(i)), 이를 뒷받침하는 인용문헌 및 설명

1. 견해

신규성 (N)	청구항	1-13	있음
	청구항	없음	없음
진보성 (IS)	청구항	없음	있음
	청구항	1-13	없음
산업상 이용가능성 (IA)	청구항	1-13	있음
	청구항	없음	없음

2. 인용문헌 및 설명:

참고한 인용문헌은 다음과 같습니다.

D1: KR 10-2012-0057636 A (액세스 비지니스 그룹 인터내셔날 엘엘씨) 2012.06.05
D2: KR 10-2010-0111409 A (주식회사 아모텍) 2010.10.15
D3: KR 10-2011-0124695 A (삼성전기주식회사) 2011.11.17

1. 신규성 및 진보성

1.1 청구항 1-8

1.1.1 독립항 1

청구항 1 발명과 가장 근접한 인용문헌 D1에는 연자성체로 구성된 자속 집중기(400); 및 자속 집중기(400) 내부로 매립되는 코일(402)을 포함하는 무선 전력 모듈 (D1의 문단부호 [0035], 청구항 21, 도면 4 참조)이 제시되어 있습니다. 다만, 청구항 1 발명은 연자성층과 수신 코일 사이에 형성된 절연층을 포함하는 점에서 인용문헌 D1과 차이가 있습니다. 그러나 이는 인용문헌 D2의 자성시트(12)와 와선형 형상의 방사체 패턴(20) 사이에 형성되는 절연층(13) (D2의 문단부호 [0072], 도면 3-5 참조)으로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 1 발명은 진보성이 없습니다 (PCT 제33조(3)).

1.1.2 종속항 2-8

청구항 2 발명은 연자성층과 절연층 사이에 형성되는 제1접착층, 그리고 절연층과 수신코일 사이에 형성되는 제2접착층을 포함하는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D2에 제시된 안테나와 자성시트 사이에 접착층을 구성하거나, 절연층(13)의 상부면에 도전성 제1패턴(14)을 접착 형성하는 내용 (D2의 문단부호 [0010], [0084] 참조)으로부터

추가 기재란에 계속

추가 기재란

이전 기재란의 공간이 충분하지 아니한 경우.
제5 기재란의 연속

충분히 시사되어 있습니다.

청구항 3 발명은 절연층은 PET(polyethylene terephthalate) 소재를 포함하는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D2에 제시된 절연층(13)은 에폭시, PE(Polyethylene) 또는 PI(Polyamide) 등의 조성으로 형성되는 내용 (D2의 문단부호 [0078] 참조)으로부터 충분히 시사되어 있습니다.

청구항 4 발명은 연자성층은 연자성 금속분말 및 고분자수지를 포함하는 복수의 시트가 적층되는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D1에 제시된 자속 집중기는 철 분말 연자성체와 열경화성 에폭시 폴리머를 포함하는 내용 (D1의 문단부호 [0015]-[0018] 참조)으로부터 충분히 시사되어 있습니다.

청구항 7 발명은 수신코일 상에 적층된 지지수단을 포함하는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D1에 제시된 코일을 매립한 자속 집중기의 표면에 강화 물질층(706)을 적층하는 내용 (D1의 문단부호 [0047], 도면 7 참조)으로부터 충분히 시사되어 있습니다.

청구항 8 발명은 수신코일은 연자성층의 한 면에 매립되는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D1에 제시된 코일(402)은 자속 집중기(400) 내부로 매립되는 내용 (D1의 청구항 21, 도면 4 참조)으로부터 충분히 시사되어 있습니다.

따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 2-4, 7-8 발명은 진보성이 없습니다 (PCT 제33조(3)).

청구항 5-6 발명은 연자성층은 홈부를 포함하고, 홈부 내에 수신코일이 수용되는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D3에 제시된 자성체 방사체 프레임(210)의 일면(210a) 상에 형성되는 음각의 위치 결정 홈(212) 상에 전도성 물질이 도포되어 안테나 패턴부(222)를 형성하는 내용 (D3의 문단부호 [0073], [0113], 도면 5 참조)으로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2, D3에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 5-6 발명은 진보성이 없습니다 (PCT 제33조(3)).

다음 페이지에 계속

추가 기재란

이전 기재란의 공간이 충분하지 아니한 경우.
이전 기재란의 연속

1.2 청구항 9-10

1.2.1 독립항 9

청구항 9 발명과 가장 근접한 인용문헌 D1에는 철 분말 연자성체와 열경화성 에폭시 폴리머를 포함하는 연자성체 혼합물을 압축성형하는 단계; 연자성체 혼합물과 코일을 몰드 캐비티 내에 위치시키는 단계; 연자성체 혼합물과 코일을 압축성형하여 자속집중기에 코일을 매립시키는 단계를 포함하는 자속집중기 제조방법 (D1의 문단부호 [0015]-[0018], [0031]-[0035], 도면 1-4 참조)이 제시되어 있습니다. 다만, 청구항 9 발명은 복수의 시트의 상면에 절연층을 형성하는 단계를 포함하는 점에서 인용문헌 D1과 차이가 있습니다. 그러나 이는 인용문헌 D2의 자성시트의 일면에 절연층을 형성하는 단계 (D2의 청구항 16 참조)로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 9 발명은 진보성이 없습니다 (PCT 제33조(3)).

1.2.2 종속항 10

청구항 10 발명은 연자성 금속분말은 Fe-실리콘계의 합금을 포함하며, 고분자수지는 러버계 고분자수지, 에폭시계 고분자수지 및 실리콘계 고분자 수지 중 적어도 하나를 포함하는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D1에 제시된 자속 집중기는 철 분말 연자성체와 열경화성 에폭시 폴리머를 포함하는 내용 (D1의 문단부호 [0015]-[0018] 참조)으로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 10 발명은 진보성이 없습니다 (PCT 제33조(3)).

1.3 청구항 11-12

1.3.1 독립항 11

청구항 11 발명과 가장 근접한 인용문헌 D1에는 연자성체로 구성된 자속 집중기(400); 및 자속 집중기(400) 내부로 매립되는 코일(402)을 포함하는 무선 전력 모듈 (D1의 문단부호 [0035], 청구항 21, 도면 4 참조)이 제시되어 있습니다. 다만, 청구항 11 발명은 연자성층과 수신 코일 사이에 형성된 접착층을 포함하는 점에서 인용문헌 D1과 차이가 있습니다. 그러나 이는 인용문헌 D2의 안테나와 자성시트 사이에 구성되는 접착층 (D2의 문단부호 [0010]

다음 페이지에 계속

추가 기재란

이전 기재란의 공간이 충분하지 아니한 경우.
이전 기재란의 연속

참조)으로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 11 발명은 진보성이 없습니다 (PCT 제33조(3)).

1.3.2 종속항 12

청구항 12 발명은 접착층은 연자성층 상에 형성되는 제1접착층, 제1접착층 상에 형성되는 절연층, 그리고 절연층 상에 형성되는 제2접착층을 포함하는 기술적 특징을 더 포함하고 있습니다. 그러나 이는 인용문헌 D2에 제시된 안테나와 자성시트 사이에 접착층을 구성하거나, 절연층(13)의 상부면에 도전성 제1패턴(14)을 접착 형성하는 내용 (D2의 문단부호 [0010], [0084] 참조)으로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 12 발명은 진보성이 없습니다 (PCT 제33조(3)).

1.4 청구항 13

1.4.1 독립항 13

청구항 13 발명과 가장 근접한 인용문헌 D1에는 연자성체로 구성된 자속 집중기(400); 및 자속 집중기(400) 내부로 매립되는 코일(402)을 포함하는 무선 충전 시스템에 사용되는 무선 전력 모듈 (D1의 문단부호 [0006], [0035], 청구항 21, 도면 4 참조)이 제시되어 있습니다. 다만, 청구항 13 발명은 연자성층과 수신 코일 사이에 형성된 절연층을 포함하는 점에서 인용문헌 D1과 차이가 있습니다. 그러나 이는 인용문헌 D2의 자성시트(12)와 와선형 형상의 방사체 패턴(20) 사이에 형성되는 절연층(13) (D2의 문단부호 [0072], 도면 3-5 참조)으로부터 충분히 시사되어 있습니다. 따라서 인용문헌 D1에 기재된 발명과 인용문헌 D2에 기재된 상기 특징을 결합하는 것은 통상의 기술자에게 자명하므로, 청구항 13 발명은 진보성이 없습니다 (PCT 제33조(3)).

2. 산업상 이용가능성

청구항 1-13 발명은 산업상 이용 가능합니다 (PCT 제33조 (4)).

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference X14B11B0069	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/KR2014/005258	International filing date *(day/month/year)* 16 June 2014 (16.06.2014)	Priority date *(day/month/year)* 27 June 2013 (27.06.2013)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant LG INNOTEK CO., LTD.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 11 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 29 December 2015 (29.12.2015)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Kihwan Moon e-mail: pt01.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	18.09.2014
Applicant's or agent's file reference X14B11B0069	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/KR2014/005258	16.06.2014	27.06.2013

International Patent Classification (IPC) or both national classification and IPC
H01Q 1/38(2006.01)i, H01Q 1/24(2006.01)i, H02J 17/00(2006.01)i

Applicant
LG INNOTEK CO., LTD.

1. This opinion contains indications relating to the following items:

- [x] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [x] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR	Date of completion of this opinion	Authorized officer
Facsimile No.		Telephone No.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/KR2014/005258

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/KR2014/005258

Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-13	YES
	Claims	None	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-13	NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims	None	NO

2. Citations and explanations:

Reference is made to the following documents:

D1: KR 10-2012-0057636 A (ACCESS BUSINESS GROUP INTERNATIONAL LLC) 05 June 2012

D2: KR 10-2010-0111409 A (AMOTECH CO., LTD.) 15 October 2010

D3: KR 10-2011-0124695 A (SAMSUNG ELECTRO-MECHANICS CO., LTD.) 17 November 2011

1. Novelty and Inventive Step

1.1. Claims 1 to 8

1.1.1. Independent Claim 1

Document D1, which is considered to be the most relevant prior art to the invention as in claim 1, discloses a wireless power module (see D1, paragraph [0035], claim 21, and figure 4), comprising: a flux concentrator (400) made of a soft magnetic material; and a coil (402) buried in the inside of the flux concentrator (400). The

invention as in claim 1 only differs from the invention of document D1 in that the former comprises an insulating layer formed between a soft magnetic layer and a reception coil. However, this difference is sufficiently suggested in an insulating layer (13) formed between a magnetic sheet (12) and a spiral radiator pattern (20), in document D2 (see D2, paragraph [0072], and figures 3 to 5). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claim 1 lacks an inventive step (PCT Article 33(3)).

1.1.2. Dependent Claims 2 to 8

The invention as in claim 2 further comprises the technical feature of comprising: a first adhesive layer formed between the soft magnetic layer and the insulating layer; and a second adhesive layer formed between the insulating layer and the reception coil. However, this technical feature is sufficiently suggested in the feature disclosed in document D2, wherein an adhesive layer is formed between an antenna and the magnetic sheet or a first conductive pattern (14) is bonded and formed on an upper surface of the insulating layer (13) (see D2 and paragraphs [0010] and [0084]).

The invention as in claim 3 further comprises the technical feature, wherein the insulating layer comprises a polyethylene terephthalate (PET) material. However, this technical feature is sufficiently suggested in the feature disclosed in document D2, wherein the insulating

layer (13) is formed by a composition of epoxy, polyethylene (PE) or polyamide (PI) and the like (see D2 and paragraph [0078]).

The invention as in claim 4 further comprises the technical feature, wherein the soft magnetic layer is formed by stacking a plurality of sheets, comprising: soft magnetic metal powder and a polymer resin. However, this technical feature is sufficiently suggested in the feature disclosed in document D1, wherein the flux concentrator comprises: a soft magnetic material of iron powder; and a thermosetting epoxy polymer (see D1 and paragraphs [0015] to [0018]).

The invention as in claim 7 further comprises the technical feature of comprising a supporting means which is stacked on the reception coil. However, this technical feature is sufficiently suggested in the feature disclosed in document D1, wherein a reinforcing material layer (706) is stacked on a surface of the flux concentrator in which a coil is buried (see D1 and paragraph [0047], and figure 7).

The invention as in claim 8 further comprises the technical feature, wherein the reception coil is buried in one surface of the soft magnetic layer. However, this technical feature is sufficiently suggested in the feature disclosed in document D1, wherein a coil (402) is buried in the inside of the flux concentrator (400) (see D1, claim 21, and figure 4).

Therefore, since it would be obvious to a person skilled

in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claims 2 to 4 and 7 to 8 lacks an inventive step (PCT Article 33(3)).

The invention as in claims 5 and 6 further comprises the technical feature, wherein the soft magnetic layer comprises a groove part, and a reception coil is accommodated in the groove part. However, this technical feature is sufficiently suggested in the feature disclosed in document D3, wherein an antenna pattern part (222) is formed by applying a conductive material on an intagliated location determination groove (212) formed on one surface (210a) of a magnetic material radiator frame (210) (see D3, paragraphs [0073] and [0113], and figure 5). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the features disclosed in documents D2 and D3, the invention as in claims 5 and 6 lacks an inventive step (PCT Article 33(3)).

1.2. Claims 9 to 10

1.2.1. Independent Claim 9

Document D1, which is considered to be the most relevant prior art to the invention as in claim 9, discloses a method for manufacturing a flux concentrator, comprising: a step for compression-molding a soft magnetic material mixture including a soft magnetic material of iron powder and a thermosetting epoxy polymer; a step for positioning the soft magnetic material mixture and a coil within a

mold cavity; and a step for burying the coil in the flux concentrator by compressing-molding the soft magnetic material mixture and the coil (see D1, paragraphs [0015] to [0018] and [0031] to [0035], and figures 1 to 4). The invention as in claim 9 only differs from the invention of document D1 in that the former comprises a step for forming an insulating layer on upper surfaces of a plurality of sheets. However, this difference is sufficiently suggested in a step of document D2 of forming the insulating layer on one surface of the magnetic sheet (see D2 and claim 16). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claim 9 lacks an inventive step (PCT Article 33(3)).

1.2.2. Dependent Claim 10

The invention as in claim 10 further comprises the technical feature, wherein the soft magnetic metal powder comprises a Fe-silicon-based alloy, and a polymer resin comprises at least one of a rubber-based polymer resin, an epoxy-based polymer resin, and a silicon-based polymer resin. However, this difference is sufficiently suggested in the feature disclosed in document D1, wherein the flux concentrator comprises the soft magnetic material of iron powder and the thermosetting epoxy polymer (see D1 and paragraphs [0015] to [0018]). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claim 10 lacks an inventive step (PCT Article 33(3)).

Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1.3. Claims 11 to 12

1.3.1. Independent Claim 11

Document D1, which is considered to be the most relevant prior art to the invention as in claim 11, discloses the wireless power module (see D1, paragraph [0035], claim 21, and figure 4), comprising: the flux concentrator (400) made of the soft magnetic material; and the coil (402) buried in the inside of the flux concentrator (400). The invention as in claim 11 only differs from the invention of document D1 in that the former comprises an adhesive layer formed between a soft magnetic layer and a reception coil. However, this difference is sufficiently suggested in the adhesive layer formed between the antenna and the magnetic sheet, in document D2 (see D2 and paragraph [0010]). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claim 11 lacks an inventive step (PCT Article 33(3)).

1.3.2. Dependent Claim 12

The invention as in claim 12 further comprises the technical feature, wherein the adhesive layer comprises: the first adhesive layer formed on the soft magnetic layer; the insulating layer formed on the first adhesive layer; and the second adhesive layer formed on the insulating layer. However, this technical feature is sufficiently suggested in the feature disclosed in

document D2, wherein the adhesive layer is formed between the antenna and the magnetic sheet or the first conductive pattern (14) is formed to be bonded to the upper surface of the insulating layer (13) (see D2 and paragraphs [0010] and [0084]). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claim 12 lacks an inventive step (PCT Article 33(3)).

1.4. Claim 13

1.4.1. Independent Claim 13

Document D1, which is considered to be the most relevant prior art to the invention as in claim 13, discloses the wireless power module (see D1, paragraphs [0006] and [0035], claim 21, and figure 4), comprising: the flux concentrator (400) made of the soft magnetic material; and the coil (402) buried in the inside of the flux concentrator (400). The invention as in claim 13 only differs from the invention of document D1 in that the former comprises an insulating layer formed between a soft magnetic layer and a reception coil. However, this difference is sufficiently suggested in the insulating layer (13) formed between the magnetic sheet (12) and the spiral radiator pattern (20), in document D2 (see D2, paragraph [0072], and figures 3 to 5). Therefore, since it would be obvious to a person skilled in the art to combine the invention disclosed in document D1 with the feature disclosed in document D2, the invention as in claim 13 lacks an inventive step (PCT Article 33(3)).

Box No. V **Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

2. Industrial Applicability

The invention as in claims 1 to 13 is industrially applicable (PCT Article 33(4)).

(12) 특허협력조약에 의하여 공개된 국제출원

(19) 세계지식재산권기구
국제사무국

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(30) 우선권정보:
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(71) 출원인: **엘지이노텍 주식회사 (LG INNOTEK CO., LTD.)** [KR/KR]; 100-714 서울시 중구 한강대로 416 서울스퀘어, Seoul (KR).

(72) 발명자: **배석 (BAE, Seok)**; 100-714 서울시 중구 한강대로 416 서울스퀘어, Seoul (KR). **최돈철 (CHOI, Don-chul)**; 100-714 서울시 중구 한강대로 416 서울스퀘어, Seoul (KR). **현순영 (HYUN, Soon Young)**; 100-714 서울시 중구 한강대로 416 서울스퀘어, Seoul (KR).

(74) 대리인: **특허법인 다나 (DANA PATENT LAW FIRM)**; 135-936 서울시 강남구 역삼로 3 길 11 광성빌딩 신관 4~6 층, Seoul (KR).

(81) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): 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, IR, IS, JP, KE, KG, 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, SA, 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.

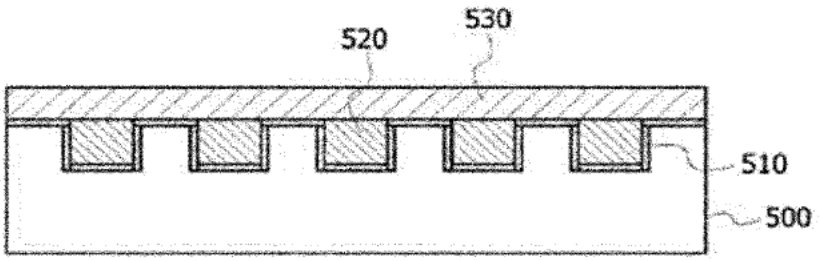
(84) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 역내 권리의 보호를 위하여): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), 유라시아 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 유럽 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

공개:
— 국제조사보고서와 함께 (조약 제 21 조(3))

(54) **Title**: RECEPTION ANTENNA AND WIRELESS POWER RECEPTION DEVICE COMPRISING SAME

(54) **발명의 명칭** : 수신 안테나 및 이를 포함하는 무선 전력 수신 장치

[Fig. 5]



(57) **Abstract**: A reception antenna of a wireless power reception device for wirelessly charging power, according to one embodiment of the present invention, comprises: a substrate; a flexible magnetic layer stacked on the substrate; and a reception coil receiving electromagnetic energy radiated from a wireless power transmission device, and rolled in parallel to the plane of the flexible magnetic layer and formed inside the flexible magnetic layer, wherein an insulating layer is formed between the flexible magnetic layer and the reception coil.

(57) **요약서**: 본 발명의 한 실시예에 따른 무선으로 전력을 충전하는 무선 전력 수신 장치의 수신 안테나는 기판, 상기 기판 상에 적층되는 연자성층, 그리고 무선 전력 송신 장치로부터 방사되는 전자기 에너지를 수신하며, 상기 연자성층의 평면과 평행하게 감겨지고, 상기 연자성층의 내부에 형성된 수신 코일을 포함하며, 상기 연자성층과 상기 수신 코일 사이에는 절연층이 형성된다.

WO 2014/208914 A1

명세서

발명의 명칭: 수신 안테나 및 이를 포함하는 무선 전력 수신 장치

기술분야

[1] 본 발명은 무선 충전에 관한 것으로, 보다 상세하게는 무선 충전을 위한 수신 안테나 및 이를 포함하는 무선 전력 수신 장치에 관한 것이다.

배경기술

[2] 무선 통신 기술의 발달에 따라, 전자기기에게 전력을 무선으로 공급하는 무선 전력 송수신 기술에 대한 관심이 높아지고 있다. 이러한 무선 전력 송수신 기술은 휴대 단말의 배터리 충전뿐만 아니라, 가정용 전자제품에 대한 전력 공급, 전기자동차나 지하철에 대한 전력 공급 등에도 다양하게 적용될 수 있다.

[3] 일반적인 무선 전력 송수신 기술은 자기 유도 또는 자기 공진의 원리를 이용한다. 예를 들어, 무선 전력 송신 장치의 송신 안테나에 전기 에너지를 인가하면, 송신 안테나는 전기 에너지를 전자기 에너지로 변환하여 주변으로 방사할 수 있다. 그리고, 무선 전력 수신 장치의 수신 안테나는 송신 안테나로부터 방사된 전자기 에너지를 수신하고, 이를 전기 에너지로 변환할 수 있다.

[4] 이때, 전력 송수신 효율을 높이기 위하여, 무선 전력 송신 장치와 무선 전력 수신 장치 간의 에너지 손실을 최소화할 필요가 있다. 이를 위하여, 송신 안테나와 수신 안테나를 유효 거리 이내에서 상호 정렬시킬 필요가 있다. 또한, 송신 안테나와 수신 안테나 주변에 연자성 소재를 배치하여, 송신 안테나가 방사하는 전자기 에너지를 수신 안테나의 방향으로 집속시킬 필요가 있다.

[5] 이를 위하여, 연자성층 상에 수신 코일을 형성한다. 이때, 연자성층과 수신 코일 사이에 공기층이 형성되어 연자성층의 자기장 안내 효과가 줄어드는 문제가 발생할 수 있다.

발명의 상세한 설명

기술적 과제

[6] 본 발명이 이루고자 하는 기술적 과제는 무선 전력 수신 장치의 무선 전력 수신 효율을 개선하기 위한 수신 안테나의 구조를 제공하는 데 있다.

과제 해결 수단

[7] 본 발명의 한 실시예에 따른 무선으로 전력을 충전하는 무선 전력 수신 장치의 수신 안테나는 기판, 상기 기판 상에 적층되는 연자성층, 그리고 상기 연자성층의 평면과 평행하게 감겨지고, 상기 연자성층의 내부에 형성된 수신 코일을 포함하며, 상기 연자성층과 상기 수신 코일 사이에는 절연층이 형성된다.

[8] 상기 연자성층과 상기 절연층 사이에 형성되는 제1 접착층, 그리고 상기 절연층과 상기 수신 코일 사이에 형성되는 제2 접착층을 더 포함할 수 있다.

[9] 상기 절연층은 PET(polyethylene terephthalate) 소재를 포함할 수 있다.

[10] 상기 연자성층은 연자성 금속 분말 및 고분자 수지를 포함하는 복수의 시트(sheet)가 적층될 수 있다.

[11] 상기 연자성층은 홈부를 포함할 수 있다.

[12] 상기 수신 코일 상에 적층된 지지 수단을 더 포함할 수 있다.

[13] 본 발명의 한 실시예에 따른 수신 안테나의 제조 방법은 연자성 금속 분말과 고분자 수지를 포함하는 복수의 시트를 적층하는 단계, 상기 복수의 시트의 상면에 절연층을 형성하는 단계, 상기 절연층 상에 수신 코일을 배치하는 단계, 그리고 상기 복수의 시트, 상기 절연층 및 상기 수신 코일을 압착하여 상기 수신 코일을 상기 복수의 시트 내부에 형성하는 단계를 포함한다.

[14] 본 발명의 한 실시예에 따른 무선으로 전력을 충전하는 무선 전력 수신 장치는 기판, 상기 기판 상에 적층되는 연자성층, 상기 연자성층의 평면과 평행하게 감겨지고, 상기 연자성층의 내부에 형성되는 수신 코일, 상기 수신 코일과 연결되며, 상기 전자기 에너지를 전기 에너지로 변환하는 회로부, 그리고 상기 전기 에너지를 저장하는 저장부를 포함하며, 상기 연자성층과 상기 수신 코일 사이에는 절연층이 형성된다.

발명의 효과

[15] 본 발명의 실시예에 따르면, 무선 전력 수신 장치에서 수신 안테나의 전자기 에너지 집속 성능을 높일 수 있어, 무선 전력 송수신 효율을 최대화할 수 있다. 특히, 수신 코일과 연자성층 간의 공기층을 제거하여 연자성층의 자기장 안내 효과를 높이며, 수신 안테나의 두께를 줄이고 송신 안테나와 수신 안테나 간의 거리를 줄여 개선된 전력 전송 효율을 얻을 수 있다.

[16] 이에 따라, 얇은 두께에서도 요구되는 수준의 전자기 에너지 집속 효과를 얻을 수 있어, 슬림화 추세의 다양한 전자기기(예, TV, 휴대 단말, 노트북, 테블릿 PC 등) 기술에 적용이 가능하다.

[17] 그리고, 전자기 에너지 집속 성능이 우수하고, 재료의 가격이 저렴하므로, 전기자동차, 지하철, 전철 등의 대형 응용 분야에도 적용이 가능하다.

[18] 또한, 연자성층과 수신 코일 간의 전기적인 단락 가능성을 줄여, 수신 안테나의 신뢰성을 높일 수 있다.

도면의 간단한 설명

[19] 도 1은 본 발명의 한 실시예에 따른 무선 전력 송수신 시스템을 나타내는 블록도이다.

[20] 도 2는 무선 전력 송신 장치의 일부를 나타내는 도면이고, 도 3은 무선 전력 수신 장치의 일부를 나타내는 도면이다.

[21] 도 4는 연자성층과 수신 코일의 단면도를 나타낸다.

[22] 도 5는 본 발명의 한 실시예에 따른 연자성층과 수신 코일의 단면도를 나타낸다.

[23] 도 6은 본 발명의 한 실시예에 따른 접착층의 단면도이다.

[24] 도 7은 본 발명의 한 실시예에 따라 연자성층에 수신 코일을 배립하는 방법을 나타내는 순서도이다.

[25] 도 8은 복수의 시트를 고온 압착 후 수신 코일을 상면에 배치하여 압착한 예의 단면도를 나타낸다.

[26] 도 9는 비교예 및 실시예에 따른 연자성층과 수신 코일의 단면도이고, 도 10은 비교예 및 실시예의 전송 효율 측정 결과를 나타내는 그래프이다.

발명의 실시를 위한 최선의 형태

[27] 본 발명은 다양한 변경을 가할 수 있고 여러 가지 실시예를 가질 수 있는 바, 특정 실시예들을 도면에 예시하고 설명하고자 한다. 그러나, 이는 본 발명을 특정한 실시 형태에 대해 한정하려는 것이 아니며, 본 발명의 사상 및 기술 범위에 포함되는 모든 변경, 균등물 내지 대체물을 포함하는 것으로 이해되어야 한다.

[28] 제2, 제1 등과 같이 서수를 포함하는 용어는 다양한 구성요소들을 설명하는데 사용될 수 있지만, 상기 구성요소들은 상기 용어들에 의해 한정되지는 않는다. 상기 용어들은 하나의 구성요소를 다른 구성요소로부터 구별하는 목적으로만 사용된다. 예를 들어, 본 발명의 권리 범위를 벗어나지 않으면서 제2 구성요소는 제1 구성요소로 명명될 수 있고, 유사하게 제1 구성요소도 제2 구성요소로 명명될 수 있다. 및/또는 이라는 용어는 복수의 관련된 기재된 항목들의 조합 또는 복수의 관련된 기재된 항목들 중의 어느 항목을 포함한다.

[29] 어떤 구성요소가 다른 구성요소에 "연결되어" 있다거나 "접속되어" 있다고 언급된 때에는, 그 다른 구성요소에 직접적으로 연결되어 있거나 또는 접속되어 있을 수도 있지만, 중간에 다른 구성요소가 존재할 수도 있다고 이해되어야 할 것이다. 반면에, 어떤 구성요소가 다른 구성요소에 "직접 연결되어" 있다거나 "직접 접속되어" 있다고 언급된 때에는, 중간에 다른 구성요소가 존재하지 않는 것으로 이해되어야 할 것이다.

[30] 본 출원에서 사용한 용어는 단지 특정한 실시예를 설명하기 위해 사용된 것으로, 본 발명을 한정하려는 의도가 아니다. 단수의 표현은 문맥상 명백하게 다르게 뜻하지 않는 한, 복수의 표현을 포함한다. 본 출원에서, "포함하다" 또는 "가지다" 등의 용어는 명세서상에 기재된 특징, 숫자, 단계, 동작, 구성요소, 부품 또는 이들을 조합한 것이 존재함을 지정하려는 것이지, 하나 또는 그 이상의 다른 특징들이나 숫자, 단계, 동작, 구성요소, 부품 또는 이들을 조합한 것들의 존재 또는 부가 가능성을 미리 배제하지 않는 것으로 이해되어야 한다.

[31] 다르게 정의되지 않는 한, 기술적이거나 과학적인 용어를 포함해서 여기서 사용되는 모든 용어들은 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자에 의해 일반적으로 이해되는 것과 동일한 의미를 가지고 있다. 일반적으로 사용되는 사전에 정의되어 있는 것과 같은 용어들은 관련 기술의 문맥 상 가지는 의미와 일치하는 의미를 가지는 것으로 해석되어야 하며, 본 출원에서 명백하게

정의하지 않는 한, 이상적이거나 과도하게 형식적인 의미로 해석되지 않는다.

[32] 이하, 첨부된 도면을 참조하여 실시예를 상세히 설명하되, 도면 부호에 관계없이 동일하거나 대응하는 구성 요소는 동일한 참조 번호를 부여하고 이에 대한 중복되는 설명은 생략하기로 한다.

[33] 도 1은 본 발명의 한 실시예에 따른 무선 전력 송수신 시스템을 나타내는 블록도이다.

[34] 도 1을 참조하면, 무선 전력 송수신 시스템은 무선 전력 송신 장치(100)와 무선 전력 수신 장치(200)를 포함한다. 전원에 연결된 무선 전력 송신 장치(100)는 송신 안테나에 전기 에너지를 인가하고, 송신 안테나는 전기 에너지를 전자기 에너지로 변환하여 주변으로 방사한다. 무선 전력 수신 장치(200)는 송신 안테나로부터 방사된 전자기 에너지를 수신 안테나를 이용하여 수신하고, 이를 전기 에너지로 변환하여 충전한다.

[35] 여기서, 무선 전력 송신 장치(100)는, 예를 들면 송신 패드(pad)이다. 그리고, 무선 전력 수신 장치(200)는 무선 전력 송수신 기술이 적용되는 휴대 단말, 가정용/개인용 전자제품, 운송 수단 등의 일부 구성일 수 있다. 무선 전력 송수신 기술이 적용되는 휴대 단말, 가정용/개인용 전자제품, 운송 수단 등은 무선 전력 수신 장치(200)만을 포함하거나, 무선 전력 송신 장치(100)와 무선 전력 수신 장치(200)를 모두 포함하도록 설정될 수 있다.

[36] 이때, 무선 전력 송신 장치(100)는 전자기 유도(electromagnetic induction) 방식 또는 공진(resonance) 방식을 이용하여 전력을 송신할 수 있다. 이와 마찬가지로, 무선 전력 수신 장치(200)는 전자기 유도(electromagnetic induction) 방식 또는 공진(resonance) 방식을 이용하여 전력을 수신할 수 있다.

[37] 한편, 무선 전력 수신 장치(200)는 무선 전력 송수신(Wireless Power Conversion, WPC) 기능과 근거리 무선 통신(Near Field Communication, NFC) 기능을 동시에 가지는 모듈을 포함하도록 구성될 수도 있다. 이때, 무선 전력 수신 장치(200)는 NFC 모듈을 포함하는 외부 장치(300)와 근거리 무선 통신을 수행할 수도 있다.

[38] 도 2는 무선 전력 송신 장치의 일부를 나타내는 도면이고, 도 3은 무선 전력 수신 장치의 일부를 나타내는 도면이다.

[39] 도 2를 참조하면, 무선 전력 송신 장치(100)는 송신 회로(미도시), 연자성 코어(110), 송신 안테나(120) 및 영구 자석(130)을 포함한다.

[40] 연자성 코어(110)는 수 mm 두께의 연자성 소재로 이루어질 수 있다. 그리고, 송신 안테나(120)는 송신 코일로 이루어지며, 영구 자석(130)은 송신 안테나(120)에 의하여 둘러싸일 수 있다. 영구 자석(130)은 사양에 따라 생략될 수도 있다.

[41] 도 3을 참조하면, 무선 전력 수신 장치(200)는 수신 회로(미도시), 연자성층(210) 및 수신 코일(220)을 포함한다. 연자성층(210)은 기판(미도시) 상에 형성될 수 있다. 기판은 여러 겹의 고정 시트로 이루어질 수 있고, 연자성층(210)과 접합하여, 연자성층(210)을 고정시킬 수 있다.

[42] 연자성층(210)은 무선 전력 송신 장치(100)의 송신 안테나(120)로부터 방사되는 전자기 에너지를 집속한다.

[43] 연자성층(210)은 금속 재료 또는 페라이트(ferrite) 소재로 이루어질 수 있으며, 연자성층(210)은 소결체(pellet), 플레이트(plate), 리본, 호일(foil), 필름(film) 등의 다양한 형태로 구현될 수 있다. 일 예로, 연자성층(210)은 연자성을 띄는 단일 금속 또는 합금 분말(이하, 연자성 금속 분말이라 한다) 및 고분자 수지를 포함하는 복수의 시트가 적층된 형태일 수 있다. 다른 예로, 연자성층(210)은 Fe, Co, Ni 중 적어도 하나를 포함하는 합금 리본, 적층 리본, 호일 또는 필름일 수 있다. 또 다른 예로, 연자성층(210)은 FeSiCr 플레이크를 90wt% 이상 포함하고, 고분자 수지를 10wt% 이하 포함하는 컴포지트일 수 있다. 또 다른 예로, 연자성층(210)은 Ni-Zn 계 페라이트를 포함하는 시트, 리본, 호일 또는 필름일 수 있다.

[44] 연자성층(210) 상에는 수신 코일(220)이 형성된다. 수신 코일(220)은 연자성층(210) 상에서 연자성층(210)의 평면과 평행한 방향으로 감겨질 수 있다. 스마트폰에 적용되는 수신 코일을 예로 들면, 외경 50mm 이내, 내경 20mm 이상의 나선형 코일(spiral coil)의 형태일 수 있다. 수신 회로는 수신 코일(220)을 통하여 수신된 전자기 에너지를 전기 에너지로 변환하며, 변환한 전기 에너지를 배터리(미도시)에 충전한다.

[45] 도시되지 않았으나, 연자성층(210)과 수신 코일(220) 사이에는 방열층이 더 포함될 수 있다. 본 명세서에서, 연자성층(210)과 수신 코일(220)을 수신 안테나라고 지칭할 수 있다.

[46] 무선 전력 수신 장치(200)가 WPC 기능과 NFC 기능을 동시에 가지는 경우, 연자성층(210) 상에는 NFC 코일(230)이 더 적층될 수 있다. NFC 코일(230)은 수신 코일(220)의 바깥을 둘러싸도록 형성될 수 있다.

[47] 그리고, 수신 코일(220)과 NFC 코일(230) 각각은 단자(240)를 통하여 전기적으로 연결될 수 있다.

[48] 도 4는 연자성층과 수신 코일의 단면도를 나타낸다.

[49] 도 4를 참조하면, 연자성층(400) 상에 접착층(410)이 형성되고, 접착층(410) 상에 수신 코일(420)이 형성되며, 수신 코일 (420) 상에 지지 필름(430)이 형성된다. 지지 필름은 수신 코일(420)을 지지하기 위한 것으로, PET(polyethylene terephthalate) 소재를 포함할 수 있다.

[50] 이와 같이, 연자성층(400)과 수신 코일(420)이 접착층(410)을 통하여 접착되는 경우, 수신 코일(420) 사이에 공기층(A)이 만들어져 연자성층(400)의 자기장 안내 효과가 줄어들 수 있다.

[51] 본 발명의 실시예에 따르면, 무선 전력 수신 장치의 수신 안테나에서 공기층을 제거하여 전력 전송 효율을 높이고자 한다.

[52] 도 5는 본 발명의 한 실시예에 따른 연자성층과 수신 코일의 단면도를 나타낸다.

[53] 도 5를 참조하면, 연자성층(500) 상에 접착층(510)이 형성되고, 접착층(510) 상에 수신 코일(520)이 형성되며, 수신 코일(520) 상에 지지 수단(530)이 형성된다. 지지 수단은 수신 코일(520)을 지지하기 위한 것으로, PET(polyethylene terephthalate) 소재를 포함할 수 있으며, 필름의 형태일 수 있다. 여기서, 수신 코일(520)은 연자성층(500)의 내부에 형성된다. 예를 들여, 수신 코일(520)은 연자성층(500)의 상면에 매립될 수 있다. 이에 따라, 수신 코일(520)과 연자성층(500) 사이에 형성되던 공기층이 제거되어, 전력 전송 효율을 높일 수 있다.

[54] 이를 위하여, 연자성층(500)은 내부에 수신 코일(520)을 수용하기 위한 홈부를 포함하며, 접착층(510)을 이용하여 홈부 내에 수신 코일(520)을 접착할 수 있다.

[55] 또는, 연자성층(500)의 상면에 수신 코일(520)을 배치한 후 연자성층(500) 및 수신 코일(520)을 압착하면, 수신 코일(520)이 연자성층(500)의 내부에 매립될 수도 있다. 연자성층(500) 및 수신 코일(520)의 압착 및 매립을 용이하게 하기 위하여, 연자성층(500)은 연자성 금속 분말 및 고분자 수지를 포함하는 시트로 이루어질 수 있다. 수신 코일을 매립하는 구체적인 방법은 후술한다.

[56] 한편, 접착층(510)은 절연층을 포함하는 양면 구조일 수 있다.

[57] 도 6은 본 발명의 한 실시예에 따른 접착층의 단면도이다.

[58] 도 6을 참조하면, 접착층(510)은 제1 접착층(512), 제1 접착층(512) 상에 형성된 절연층(514) 및 절연층(514) 상에 형성된 제2 접착층(516)을 포함한다.

[59] 여기서, 절연층(514)은, 예를 들면 PET(polyethylene terephthalate) 소재를 포함할 수 있다. 이에 따라, 수신 코일(520)을 연자성층(500)의 내부에 형성하거나 매립하기 위한 과정에서 제1 접착층(512) 또는 제2 접착층(516)이 파괴되더라도, 연자성층(500) 내의 금속과 수신 코일 사이의 전기적인 단락을 예방할 수 있다.

[60] 도 7은 본 발명의 한 실시예에 따라 연자성층에 수신 코일을 매립하는 방법을 나타내는 순서도이다. 여기서, 연자성층은 연자성 금속 분말 및 고분자 수지를 포함하는 시트로 이루어지는 것을 가정한다.

[61] 도 7을 참고하면, 연자성 금속 분말과 고분자 수지를 포함하는 시트를 제조한다(S700). 이를 위하여, 용매, 연자성 금속 분말 및 고분자 수지를 포함하는 잉크를 필름 캐스팅하여 박형의 시트를 만들 수 있다. 여기서, 연자성 금속 분말은, 예를 들면 Fe-실리콘계의 합금을 포함할 수 있다. 그리고, 고분자 수지는, 예를 들면 러버(rubber)계, 에폭시계 및 실리콘계 중 적어도 하나의 고분자 수지를 포함할 수 있다.

[62] 다음으로, 복수의 시트를 적층한 후(S710), 복수의 시트의 상면에 접착층을 형성하고(S720), 접착층 상에 수신 코일을 배치한 후(S730), 복수의 시트, 접착층 및 수신 코일을 동시에 고온에서 압착한다(S740). 여기서, 압착 공정은 80~250?에서 1시간 내지 4시간 동안 100 내지 300kgf/cm^{2}의 압력 하에서 행해질 수 있다. 바람직하게는, 150~200?에서 2시간 내지 3시간 동안 150내지 250kgf/cm^{2}의 압력 하에서 행해질 수 있다.

[63] 이와 같이, 복수의 시트와 수신 코일을 동시에 압착하면, 시트 내에 포함된 고분자 수지의 유동성으로 인하여 시트와 수신 코일의 경계면에 홈부가 형성되며, 수신 코일 사이로 고분자 수지가 스며들어 공기층이 형성되지 않게 된다. 이에 따라, 수신 코일과 연자성층 사이의 공기층으로 인한 자기장 안내 감소 문제를 막을 수 있다.

[64] 반면, 복수의 시트와 수신 코일을 동시에 압착하지 않고, 복수의 시트를 먼저 고온 압착한 후 수신 코일을 상면에 배치하여 다시 압착하면, 도 8과 같이 기계적 압력 차이로 인하여 연자성층의 후면(502)에 요철 구조가 형성될 수 있다. 이는 자기장 안내 감소를 유도할 수 있다.

[65] 또한, 시트와 수신 코일의 경계면에 형성된 홈부는 고온에서 압착하는 과정에서 열적으로 경화되므로, 안정적인 구현이 가능하다.

[66] 또한, 시트에 포함된 고분자 수지는 고온 압착을 통하여 내열성이 높은 절연 물질이 되므로, 연자성 금속 분말 사이에서 필요한 절연 기능을 수행하며, 외부의 가혹한 환경에서도 연자성 금속 분말의 부식을 막을 수 있다.

[67] 또한, 전술한 바와 같이, 접착층을 절연층을 내부에 포함하는 양면 접착 구조로 형성하면, 복수의 시트와 수신 코일의 고온 압착 시 접착층의 일부가 벗겨지더라도 전기적인 단락을 방지할 수 있다.

[68] 이하, 수신 코일의 배치 및 매립 조건에 따른 전송 효율을 실험한 결과를 설명한다.

[69] 도 9는 비교예 및 실시예에 따른 연자성층과 수신 코일의 단면도이고, 도 10은 비교예 및 실시예의 전송 효율 측정 결과를 나타내는 그래프이다.

[70] 도 9(a)의 비교예를 참조하면, 4mm 두께의 자성시트(900) 상에 0.03mm 두께의 접착시트(910)가 배치되고, 접착시트(910) 상에 0.13mm 두께의 수신 코일(920)이 배치되며, 수신 코일(920) 상에 0.03mm 두께의 PI 필름(930)이 배치된다.

[71] 도 9(b)의 실시예 1을 참조하면, 4mm 두께의 자성시트(900), 0.03mm 두께의 접착시트(910), 0.13mm 두께의 수신 코일(920) 및 0.03mm 두께의 PI 필름(930)이 순차적으로 적층되며, 수신코일(920)은 자성시트(900) 내에 매립된다. 도 9(b)의 실시예 1과 같이 수신 코일(920)을 자성시트(900) 내에 매립하기 위하여, 알루미늄 호일(Aluminum Duofoil 1.2mmT) 1장, 하부커버(FR-25DM) 1장, 도 9(a)의 비교예의 구조, 상부커버(FR-250M) 1장, 알루미늄 호일 1.2mmT 1장, PVC 520mm*360mm 0.22mmT(고온용) 2장, 크래프트(kraft) 530mm*420mm 2장, 알루미늄 호일(Aluminum Duofoil 1.2mmT) 1장을 순차적으로 적층한 후, 도 11의 조건에 따라 열처리 및 가압하였다.

[72] 도 9(c)의 실시예 2를 참조하면, 4.3mm 두께의 자성시트(900), 0.03mm 두께의 접착시트(910), 0.13mm 두께의 수신 코일(920) 및 0.03mm 두께의 PI 필름(930)이 순차적으로 적층되며, 수신코일(920)은 자성시트(900) 내에 매립된다.

[73] 도 9(d)의 실시예 3을 참조하면, 4mm 두께의 자성시트(900), 0.03mm 두께의 접착시트(910), 0.16mm 두께의 수신 코일(920) 및 0.03mm 두께의 PI 필름(930)이

순차적으로 적층되며, 수신코일(920)은 자성시트(900) 내에 매립된다.

[74] 도 9(b)의 두께는 0.56mm으로, 0.59mm의 두께를 가지는 도 9(a)에 비하여 얇다. 그리고, 도 9(c) 및 도 9(d)의 단면은 0.59mm으로, 도 9(a)와 동일한 두께로 제작되었다.

[75] 비교예와 실시예 1의 전송 효율을 비교하는 도 10(a)를 참조하면, 실시예 1에 따르면 고효율(Max%) 구현 구간이 비교예에 비하여 넓게 나타난다. 이로부터, 실시예 1의 전송효율이 비교예에 비하여 높음을 알 수 있다.

[76] 비교예와 실시예 2의 전송 효율을 비교하는 도 10(b)를 참조하면, 실시예 2에 따른 전송효율은 비교예와 유사하다. 다만, 실시예 2에서는 자성시트의 두께가 넓으므로, 자기차폐효과가 증가하게 된다.

[77] 비교예와 실시예 3의 전송 효율을 비교하는 도 10(c)를 참조하면, 실시예 3에서는 비교예에 비하여 전송 효율이 우수함을 알 수 있다. 특히, 실시예 3에서는 구동 전력이 높아짐에 따라 전송 효율의 드롭(drop) 현상이 작아짐을 알 수 있다.

[78] 상기에서는 본 발명의 바람직한 실시예를 참조하여 설명하였지만, 해당 기술 분야의 숙련된 당업자는 하기의 특허 청구의 범위에 기재된 본 발명의 사상 및 영역으로부터 벗어나지 않는 범위 내에서 본 발명을 다양하게 수정 및 변경시킬 수 있음을 이해할 수 있을 것이다.

청구범위

[청구항 1] 무선으로 전력을 충전하는 무선 전력 수신 장치의 수신 안테나에 있어서,
기판,
상기 기판 상에 적층되는 연자성층,
상기 연자성층의 평면과 평행하게 감겨지고, 상기 연자성층의 내부에 형성된 수신 코일, 그리고
상기 연자성층과 상기 수신 코일 사이에 형성된 절연층을 포함하는 수신 안테나.

[청구항 2] 제1항에 있어서,
상기 연자성층과 상기 절연층 사이에 형성되는 제1 접착층, 그리고
상기 절연층과 상기 수신 코일 사이에 형성되는 제2 접착층을 더 포함하는 수신 안테나.

[청구항 3] 제1항에 있어서,
상기 절연층은 PET(polyethylene terephthalate) 소재를 포함하는 수신 안테나.

[청구항 4] 제1항에 있어서,
상기 연자성층은 연자성 금속 분말 및 고분자 수지를 포함하는 복수의 시트(sheet)가 적층된 수신 안테나.

[청구항 5] 제1항에 있어서,
상기 연자성층은 홈부를 포함하는 수신 안테나.

[청구항 6] 제5항에 있어서,
상기 홈부 내에 상기 수신 코일이 수용되는 수신 안테나.

[청구항 7] 제1항에 있어서,
상기 수신 코일 상에 적층된 지지수단을 더 포함하는 수신 안테나.

[청구항 8] 제1항에 있어서,
상기 수신 코일은 상기 연자성층의 한 면에 매립되는 수신 안테나.

[청구항 9] 수신 안테나의 제조 방법에 있어서,
연자성 금속 분말과 고분자 수지를 포함하는 복수의 시트를 적층하는 단계,
상기 복수의 시트의 상면에 절연층을 형성하는 단계,
상기 절연층 상에 수신 코일을 배치하는 단계, 그리고
상기 복수의 시트, 상기 절연층 및 상기 수신 코일을 압착하여 상기 수신 코일을 상기 복수의 시트 내부에 형성하는 단계
를 포함하는 제조 방법.

[청구항 10] 제9항에 있어서,
상기 연자성 금속 분말은 Fe-실리콘계의 합금을 포함하며, 상기

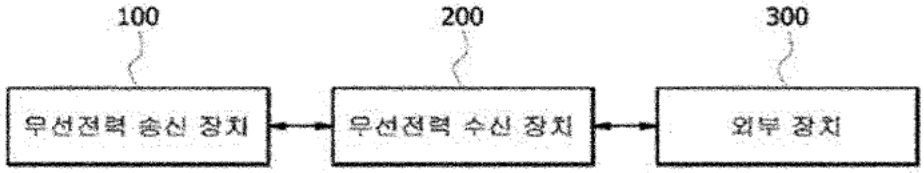
고분자 수지는 러버(rubber)계 고분자 수지, 에폭시계 고분자 수지 및 실리콘계 고분자 수지 중 적어도 하나를 포함하는 제조 방법.

[청구항 11] 무선으로 전력을 충전하는 무선 전력 수신 장치의 수신 안테나에 있어서,
기판,
상기 기판 상에 적층되는 연자성층,
상기 연자성층의 평면과 평행하게 감겨지고, 상기 연자성층의 내부에 형성된 수신 코일, 그리고
상기 연자성층과 상기 수신 코일 사이에 형성된 접착층을 포함하는 수신 안테나.

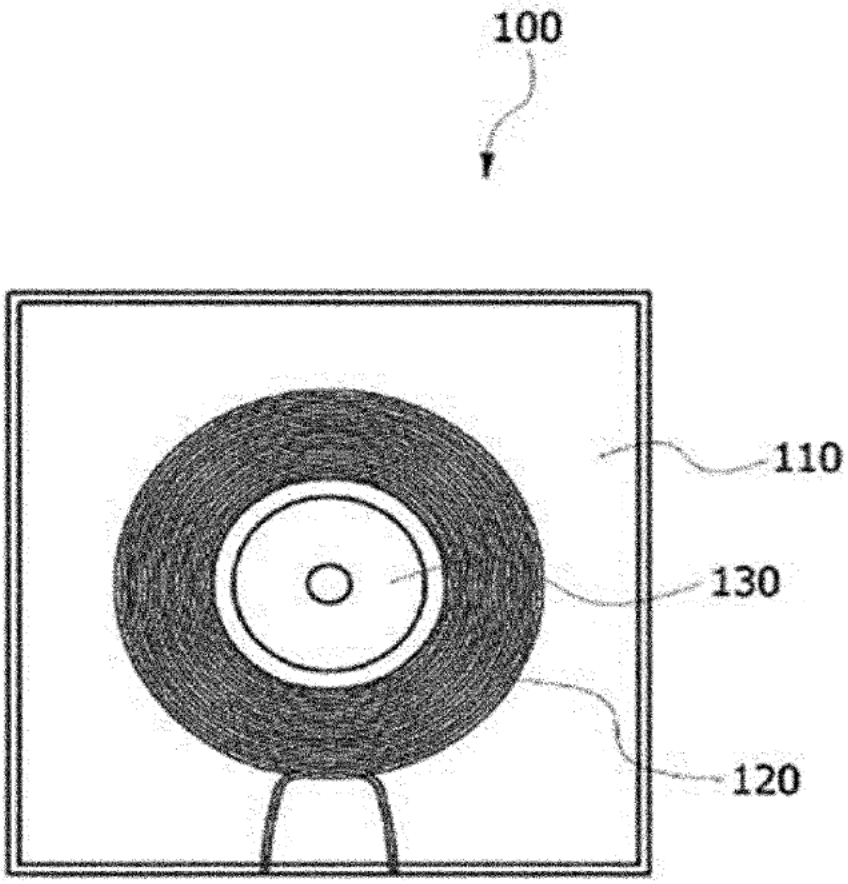
[청구항 12] 제11항에 있어서,
상기 접착층은 상기 연자성층 상에 형성되는 제1 접착층, 상기 제1 접착층 상에 형성되는 절연층, 그리고 상기 절연층 상에 형성되는 제2 접착층을 포함하는 수신 안테나.

[청구항 13] 무선으로 전력을 충전하는 무선 전력 수신 장치에 있어서,
기판,
상기 기판 상에 적층되는 연자성층,
상기 연자성층의 평면과 평행하게 감겨지고, 상기 연자성층의 내부에 형성되는 수신 코일,
상기 연자성층과 상기 수신 코일 사이에 형성된 절연층,
상기 수신 코일과 연결되며, 상기 전자기 에너지를 전기 에너지로 변환하는 회로부, 그리고
상기 전기 에너지를 저장하는 저장부
를 포함하는 무선 전력 수신 장치.

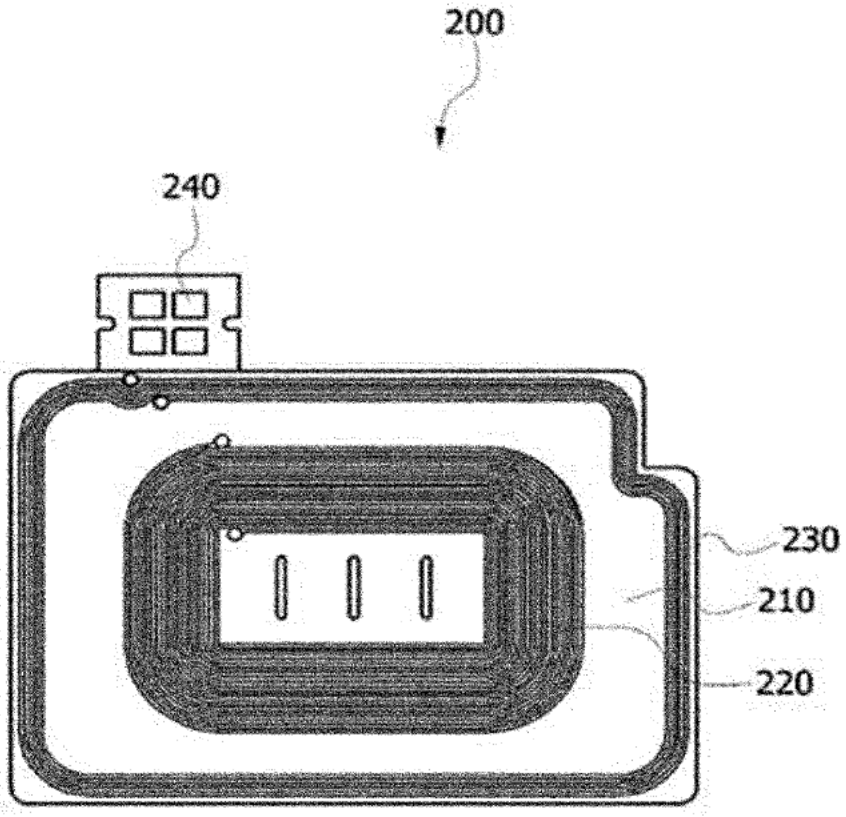
[Fig. 1]



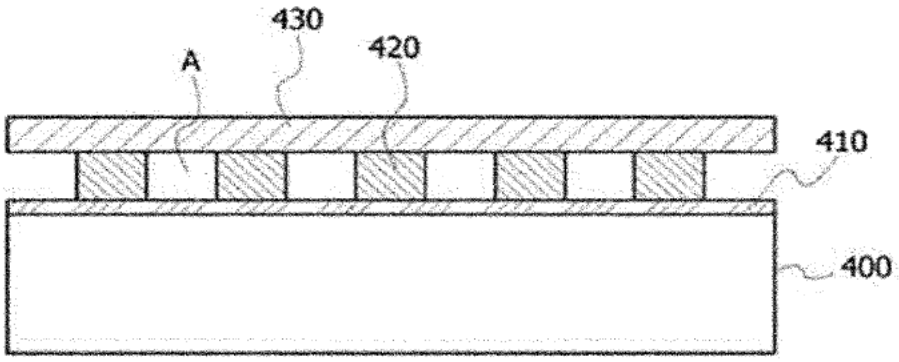
[Fig. 2]



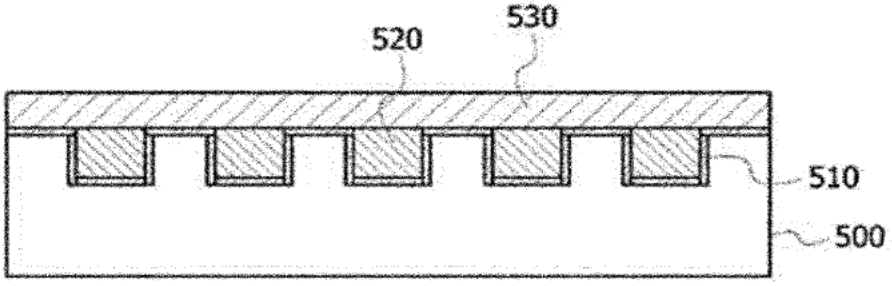
[Fig. 3]



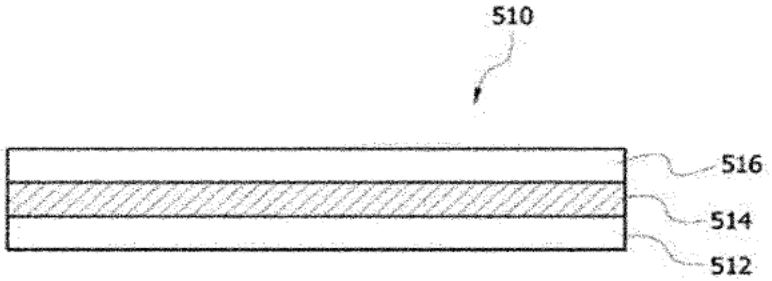
[Fig. 4]



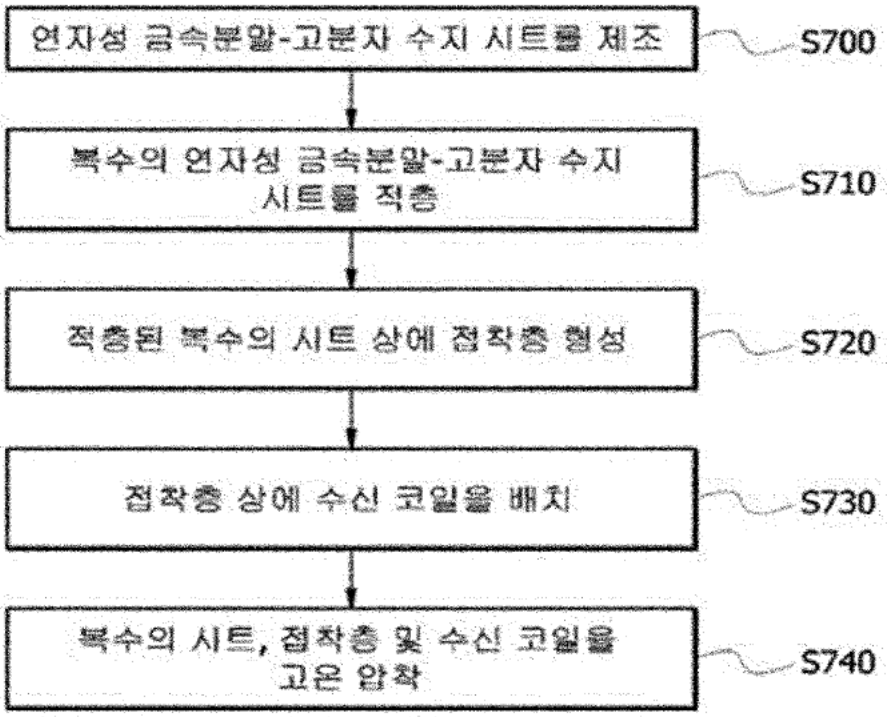
[Fig. 5]



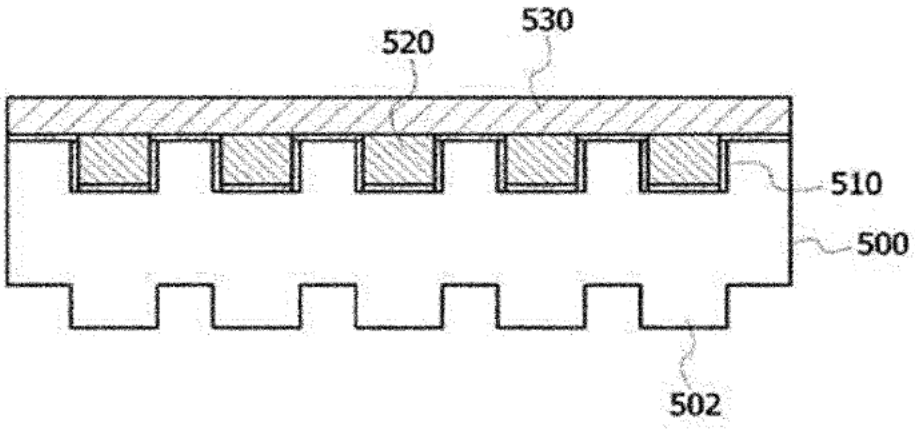
[Fig. 6]



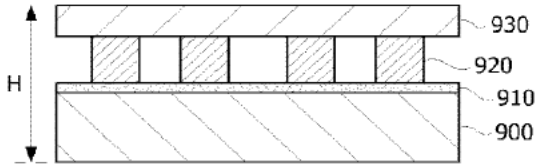
[Fig. 7]



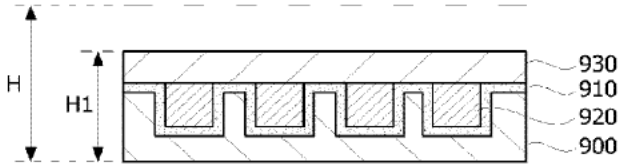
[Fig. 8]



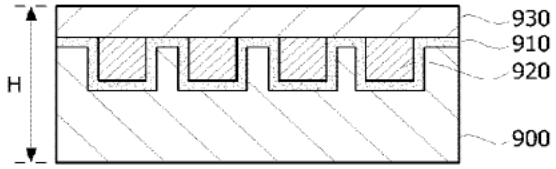
[Fig. 9]



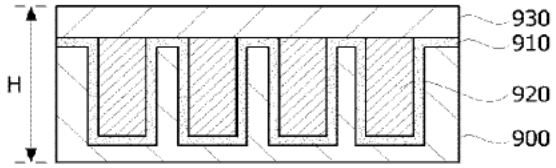
(a) 비교예



(b) 실시예 1

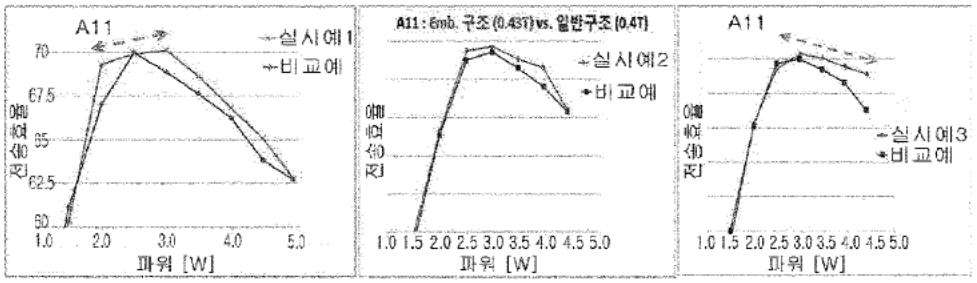


(c) 실시예 2



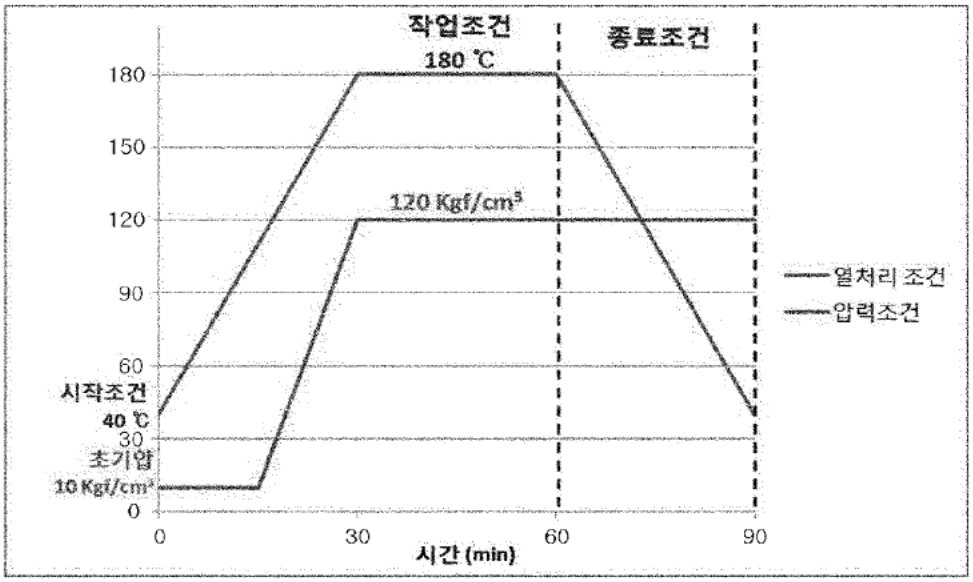
(d) 실시예 3

[Fig. 10]



(a) (b) (c)

[Fig. 11]


작업조건
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초기압
10 Kgf/cm²
0
30
60
90
시간 (min)
열처리 조건
압력조건

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2014/005258

A. CLASSIFICATION OF SUBJECT MATTER

H01Q 1/38(2006.01)i, H01Q 1/24(2006.01)i, H02J 17/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01Q 1/38; H01Q 7/00; H01F 1/147; H01F 38/14; H01F 41/14; H01F 37/00; H01F 17/00; H01F 17/04; H01Q 7/08; H01Q 1/24; H02J 17/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models: IPC as above
Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: antenna, soft magnetic layer, insulation layer, inside, filling-up, coil, groove, bonding layers

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2012-0057636 A (ACCESS BUSINESS GROUP INTERNATIONAL LLC) 05 June 2012 See paragraphs [0006], [0015]-[0047], claim 21 and figures 1-7.	1-13
Y	KR 10-2010-0111409 A (AMOTECH CO., LTD.) 15 October 2010 See abstract, paragraphs [0010], [0072]-[0084], claim 16 and figures 3-5.	1-13
Y	KR 10-2011-0124695 A (SAMSUNG ELECTRO-MECHANICS CO., LTD.) 17 November 2011 See abstract, paragraphs [0073], [0113] and figure 5.	5-6
A	JP 2008-288370 A (NEC TOKIN CORP.) 27 November 2008 See abstract, claims 1-4 and figures 1-7.	1-13
A	JP 2007-503715 A (KONINKLIJKE PHILIPS ELECTRONICS N. V.) 22 February 2007 See abstract, claims 1-5 and figures 1-6.	1-13

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 SEPTEMBER 2014 (18.09.2014)	**18 SEPTEMBER 2014 (18.09.2014)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
Government Complex-Daejeon, 189 Seonsa-ro, Daejeon 302-701, Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2014/005258

Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-2012-0057636 A	05/06/2012	CN 102598168 A	18/07/2012
		US 2011-0050382 A1	03/03/2011
		US 8692639 B2	08/04/2014
		WO 2011-031473 A2	17/03/2011
		WO 2011-031473 A3	23/06/2011
KR 10-2010-0111409 A	15/10/2010	KR 10-1197684 B1	05/11/2012
KR 10-2011-0124695 A	17/11/2011	CN 102244993 A	16/11/2011
		EP 2387106 A1	16/11/2011
		EP 2387106 B1	23/01/2013
		JP 2011-239368 A	24/11/2011
		JP 5305113 B2	02/10/2013
		KR 10-1179362 B1	03/09/2012
		US 2011-0278186 A1	17/11/2011
JP 2008-288370 A	27/11/2008	NONE	
JP 2007-503715 A	22/02/2007	EP 1661148 A2	31/05/2006
		EP 1661149 A2	31/05/2006
		JP 2007-503716 A	22/02/2007
		KR 10-2006-0101755 A	26/09/2006
		KR 10-2007-0032259 A	21/03/2007
		US 2006-0290460 A1	28/12/2006
		US 2007-0001796 A1	04/01/2007
		US 7417523 B2	26/08/2008
		WO 2005-020253 A2	03/03/2005
		WO 2005-020253 A3	14/04/2005
		WO 2005-020254 A2	03/03/2005
		WO 2005-020254 A3	07/04/2005

국 제 조 사 보 고 서

국제출원번호
PCT/KR2014/005258

A. 발명이 속하는 기술분류(국제특허분류(IPC))

H01Q 1/38(2006.01)i, H01Q 1/24(2006.01)i, H02J 17/00(2006.01)i

B. 조사된 분야

조사된 최소문헌(국제특허분류를 기재)

H01Q 1/38; H01Q 7/00; H01F 1/147; H01F 38/14; H01F 41/14; H01F 37/00; H01F 17/00; H01F 17/04; H01Q 7/08; H01Q 1/24; H02J 17/00

조사된 기술분야에 속하는 최소문헌 이외의 문헌

한국등록실용신안공보 및 한국공개실용신안공보: 조사된 최소문헌란에 기재된 IPC
일본등록실용신안공보 및 일본공개실용신안공보: 조사된 최소문헌란에 기재된 IPC

국제조사에 이용된 전산 데이터베이스(데이터베이스의 명칭 및 검색어(해당하는 경우))

eKOMPASS(특허청 내부 검색시스템) & 키워드: 안테나, 연자성층, 절연층, 내부, 매립, 코일, 홈, 접착층

C. 관련 문헌

카테고리*	인용문헌명 및 관련 구절(해당하는 경우)의 기재	관련 청구항
Y	KR 10-2012-0057636 A (액세스 비지니스 그룹 인터내셔날 엘엘씨) 2012.06.05 요약, 문단부호 [0006], [0015]-[0047], 청구항 21 및 도면 1-7 참조.	1-13
Y	KR 10-2010-0111409 A (주식회사 아모텍) 2010.10.15 요약, 문단부호 [0010], [0072]-[0084], 청구항 16 및 도면 3-5 참조.	1-13
Y	KR 10-2011-0124695 A (삼성전기주식회사) 2011.11.17 요약, 문단부호 [0073], [0113] 및 도면 5 참조.	5-6
A	JP 2008-288370 A (NEC TOKIN CORP.) 2008.11.27 요약, 청구항 1-4 및 도면 1-7 참조.	1-13
A	JP 2007-503715 A (KONINKLIJKE PHILIPS ELECTRONICS N. V.) 2007.02.22 요약, 청구항 1-5 및 도면 1-6 참조.	1-13

☐ 추가 문헌이 C(계속)에 기재되어 있습니다.

☒ 대응특허에 관한 별지를 참조하십시오.

* 인용된 문헌의 특별 카테고리:

"A" 특별히 관련이 없는 것으로 보이는 일반적인 기술수준을 정의한 문헌

"E" 국제출원일보다 빠른 출원일 또는 우선일을 가지나 국제출원일 이후에 공개된 선출원 또는 특허 문헌

"L" 우선권 주장에 의문을 제기하는 문헌 또는 다른 인용문헌의 공개일 또는 다른 특별한 이유(이유를 명시)를 밝히기 위하여 인용된 문헌

"O" 구두 개시, 사용, 전시 또는 기타 수단을 언급하고 있는 문헌

"P" 우선일 이후에 공개되었으나 국제출원일 이전에 공개된 문헌

"T" 국제출원일 또는 우선일 후에 공개된 문헌으로, 출원과 상충하지 않으며 발명의 기초가 되는 원리나 이론을 이해하기 위해 인용된 문헌

"X" 특별한 관련이 있는 문헌. 해당 문헌 하나만으로 청구된 발명의 신규성 또는 진보성이 없는 것으로 본다.

"Y" 특별한 관련이 있는 문헌. 해당 문헌이 하나 이상의 다른 문헌과 조합하는 경우로 그 조합이 당업자에게 자명한 경우 청구된 발명은 진보성이 없는 것으로 본다.

"&" 동일한 대응특허문헌에 속하는 문헌

국제조사의 실제 완료일	국제조사보고서 발송일
2014년 09월 18일 (18.09.2014)	2014년 09월 18일 (18.09.2014)

ISA/KR의 명칭 및 우편주소
대한민국 특허청
(302-701) 대전광역시 서구 청사로 189, 4동 (둔산동, 정부대전청사)
팩스 번호 +82-42-472-7140

심사관
강성철
전화번호 +82-42-481-8405

국제조사보고서
대응특허에 관한 정보

국제출원번호
PCT/KR2014/005258

국제조사보고서에서 인용된 특허문헌	공개일	대응특허문헌	공개일
KR 10-2012-0057636 A	2012/06/05	CN 102598168 A	2012/07/18
		US 2011-0050382 A1	2011/03/03
		US 8692639 B2	2014/04/08
		WO 2011-031473 A2	2011/03/17
		WO 2011-031473 A3	2011/06/23
KR 10-2010-0111409 A	2010/10/15	KR 10-1197684 B1	2012/11/05
KR 10-2011-0124695 A	2011/11/17	CN 102244993 A	2011/11/16
		EP 2387106 A1	2011/11/16
		EP 2387106 B1	2013/01/23
		JP 2011-239368 A	2011/11/24
		JP 5305113 B2	2013/10/02
		KR 10-1179362 B1	2012/09/03
		US 2011-0278186 A1	2011/11/17
JP 2008-288370 A	2008/11/27	없음	
JP 2007-503715 A	2007/02/22	EP 1661148 A2	2006/05/31
		EP 1661149 A2	2006/05/31
		JP 2007-503716 A	2007/02/22
		KR 10-2006-0101755 A	2006/09/26
		KR 10-2007-0032259 A	2007/03/21
		US 2006-0290460 A1	2006/12/28
		US 2007-0001796 A1	2007/01/04
		US 7417523 B2	2008/08/26
		WO 2005-020253 A2	2005/03/03
		WO 2005-020253 A3	2005/04/14
		WO 2005-020254 A2	2005/03/03
		WO 2005-020254 A3	2005/04/07

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

U.S. APPLICATION NUMBER NO.	FIRST NAMED INVENTOR	ATTY. DOCKET NO.
14/901,426	Seok BAE	DANA-0049

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

INTERNATIONAL APPLICATION NO.	
PCT/KR2014/005258	
I.A. FILING DATE	PRIORITY DATE
06/16/2014	06/27/2013

CONFIRMATION NO. 5436
371 ACCEPTANCE LETTER

OC000000080854383

Date Mailed: 02/25/2016

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office, in its capacity as a Designated / Elected Office (37 CFR 1.495), has ACCEPTED the above identified international application for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above. A Filing Receipt will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE "FILING DATE or 371(c) DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1) and (c)(2) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN BELOW.** The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363)

12/28/2015
DATE OF RECEIPT OF 35 U.S.C.
371(c)(1) and (c)(2) REQUIREMENTS

The following items have been received:

- Copy of the International Application filed on 12/28/2015
- Copy of the International Search Report filed on 12/28/2015
- Preliminary Amendments filed on 12/28/2015
- Information Disclosure Statements filed on 12/28/2015
- Inventor's Oath or Declaration filed on 12/28/2015
- Request for Immediate Examination filed on 12/28/2015
- U.S. Basic National Fees filed on 12/28/2015
- Priority Documents filed on 12/28/2015
- Application Data Sheet (37 CFR 1.76) filed on 12/28/2015

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.495(c).

- Properly executed inventor's oath or declaration for the following inventor(s) has not been submitted: **Seok BAE**, **Donchul CHOI**, and **Soon Young Hyun**

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

JAMILAH Z HARRIS

Telephone: (703) 756-1124

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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/901,426	12/28/2015		1620	DANA-0049	20	3

CONFIRMATION NO. 5436

FILING RECEIPT

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

OC000000080854382

Date Mailed: 02/25/2016

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)

Seok BAE, Seoul, KOREA, REPUBLIC OF;
Donchul CHOI, Seoul, KOREA, REPUBLIC OF;
Soon Young Hyun, Seoul, KOREA, REPUBLIC OF;

Applicant(s)

LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/KR2014/005258 06/16/2014

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 10-2013-0074620 06/27/2013

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/23/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/901,426**

Projected Publication Date: 06/02/2016

Non-Publication Request: No

Early Publication Request: No
Title

RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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 countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/901,426

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	480
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))	20 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 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	1480

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($)	ADDITIONAL FEE($)		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.

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
14901426	

Applicant(s) Seok BAE

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
2		1		1		
3		1		1		
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5		1		1		
6		1		1		
7		1		1		
8		1		1		
9	1		1			
10		1		1		
11	1		---	---		
12		1	---	---		
13	1		1			
14				1		
15				1		
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Total Indep	4		3		0	
Total Depend	9	↵	17	↵	0	↵
Total Claims	13		20		0	

	*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend
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Docket No.: **DANA-0049** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:		Confirmation No.:	**5436**
Seok BAE; Donchul CHOI; and Soon Young HYUN		Group Art Unit:	**2859**
Serial No.:	**14/901,426**	Examiner:	**To Be Assigned**
Filed:	**December 28, 2015**	Customer No.:	**34610**

For: **RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME**

SUBMISSION OF DECLARATIONS AND POWER OF ATTORNEY

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

Sir:

Further to the Notice of Acceptance dated **February 25, 2016**, submitted herewith are the following documents for filing in the above-referenced application:

- ☒ **Substitute Statements in Lieu of Oath or Declaration and Declaration.**
- ☒ **Power of Attorney.**
- ☒ **Statement Under 37 C.F.R. §3.73(c).**
- ☒ **Late filing surcharge of $140.00 (large entity) (Previously submitted on December 28, 2015).**

It is requested that an Official Filing Receipt showing the data contained herewith now be issued.

Please charge any shortage in fees due in connection with the filing of this paper, 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

/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/seg

Please direct all correspondence to Customer Number 34610

Q:\Documents\2414-049\582796.docx

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	+82-31-436-1891
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.: 14/901,426 Filed/Issue Date: December 28, 2015

Titled: RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

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/	April 20, 2016
Signature	Date
Daniel Y.J. Kim	36,186
Printed or Typed Name	Title or Registration Number

Docket No.: DANA-0049

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) BAE, Seok
(2) CHOI, Don Chul
(3) HYUN, Soon Young
(4) _____
(5) _____
(6) _____

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

RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

(a) for which an application for United States Letters Patent was filed on 12/28/2015, and identified by United States Serial No. 14/901,426; or

(b) for which an application for United States Letters Patent was executed on _____,

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: **BAE, Seok**	2. MAR. 2016
2) _____ Name: **CHOI, Don Chul**	_____
3) _____ Name: **HYUN, Soon Young**	_____
4) _____ Name:	_____
5) _____ Name:	_____
6) _____	_____

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

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 PCT/KR2014/005258 filed on June 16, 2014.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: BAE, Seok Date (Optional): Dec. 24, 2015

Signature: [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.

Doc code: Oath
Document Description: Oath or declaration filed

PTO/AIA/02 (07-13)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 14/901,426 filed on December 28, 2015

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Donchul CHOI

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Seoul		KR

Mailing Address (except for a deceased or legally incapacitated inventor):

Seoul Square, 416, Hangang-daero, Jung-gu

City	State	Zip	Country
Seoul		04637	KR

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

PTO/SB/AIA/02 (07-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased.
- ☐ Inventor is under legal incapacity.
- ☒ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ☒ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

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.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Gyung Ree Kim

Date (Optional): April 19, 2016

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: LG INNOTEK CO., LTD.

Title of Person Executing This Substitute Statement:

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City	State	Country
Seoul		KR

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

Seoul Square, 416, Hangang-daero, Jung-gu

City	State	Zip	Country
Seoul		04637	KR

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

Doc code: Oath
Document Description: Oath or declaration filed

PTO/AIA/02 (07-13)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

This statement is directed to:

☐ The attached application.

OR

☒ United States application or PCT international application number 14/901,426 filed on December 28, 2015

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Soon Young HYUN

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
Seoul		KR

Mailing Address (except for a deceased or legally incapacitated inventor):

Seoul Square, 416, Hangang-daero, Jung-gu

City	State	Zip	Country
Seoul		04637	KR

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies.

☐ Legal Representative (for deceased or legally incapacitated inventor only).

☒ Assignee.

☐ Person to whom the inventor is under an obligation to assign.

☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or

☐ Joint Inventor.

PTO/SB/AIA/02 (07-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased.
- ☐ Inventor is under legal incapacity.
- ☒ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ☒ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

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.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Gyungpal Kim

Date (Optional): April 19, 2016

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: LG INNOTEK CO., LTD.

Title of Person Executing This Substitute Statement:

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City Seoul | State | Country KR

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

Seoul Square, 416, Hangang-daero, Jung-gu

City Seoul | State | Zip 04637 | Country KR

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

Electronic Acknowledgement Receipt

EFS ID:	25552413
Application Number:	14901426
International Application Number:	
Confirmation Number:	5436
Title of Invention:	RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME
First Named Inventor/Applicant Name:	Seok BAE
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Deborah Kimberlin
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	DANA-0049
Receipt Date:	20-APR-2016
Filing Date:	28-DEC-2015
Time Stamp:	20:49:50
Application Type:	U.S. National Stage under 35 USC 371

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	Request for Corrected Filing Receipt	SubmissionDeclarations.pdf	145598 77024727648e0d4d8d2ff5e5a7912bddacc93437	no	1

Warnings:	
Information:	

2	Power of Attorney	POA.pdf	702377 e1eef70c3f91dad8afb8e84ac57125d616f2633e	no	1
Warnings:					
Information:					
3	Assignee showing of ownership per 37 CFR 3.73	373Statement.pdf	589077 b33e6546f268172b25715d5e17e79d98aab770f2	no	3
Warnings:					
Information:					
4	Oath or Declaration filed	Declaration.pdf	684731 0b546999bdfdab1ff38a6806e57eef8b79d67cdd	no	1
Warnings:					
Information:					
5	Oath or Declaration filed	SubstituteStatementDonChulChoi.pdf	2265428 b67414675e6e6f3f05977b383ba65a6c379c53f5	no	2
Warnings:					
Information:					
6	Oath or Declaration filed	SubstituteStatementSoonYoungHYUN.pdf	2286700 08da21aed68b62d7f09ea50e9fea1413a30cc6e7	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	6673911		

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
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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/901,426	12/28/2015	2859	1620	DANA-0049	20	3

CONFIRMATION NO. 5436

CORRECTED FILING RECEIPT

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

OC000000082355723

Date Mailed: 04/27/2016

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)

Seok BAE, Seoul, KOREA, REPUBLIC OF;
Donchul CHOI, Seoul, KOREA, REPUBLIC OF;
Soon Young Hyun, Seoul, KOREA, REPUBLIC OF;

Applicant(s)

LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF;

Power of Attorney: The patent practitioners associated with Customer Number 34610

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/KR2014/005258 06/16/2014

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 10-2013-0074620 06/27/2013

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/23/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/901,426**

Projected Publication Date: 06/02/2016

Non-Publication Request: No

Early Publication Request: No

Title

RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

Preliminary Class

320

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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 countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/901,426	12/28/2015	Seok BAE	DANA-0049

CONFIRMATION NO. 5436

POA ACCEPTANCE LETTER

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

OC000000082605001

Date Mailed: 05/03/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/27/2016.

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**.

/qtran/

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UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/901,426	12/28/2015	Seok BAE	DANA-0049

CONFIRMATION NO. 5436

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

PUBLICATION NOTICE

OC000000083354560

Title:RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

Publication No.US-2016-0156103-A1
Publication Date:06/02/2016

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
DANA-0049	14/901,426
APPLICANT(S)	
Seok BAE; Donchul CHOI; and Soon Young HYUN	
FILING DATE	GROUP
December 28, 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
	2009/0121677	05/14/2009	INOUE et al.			
	2010/0007215	01/14/2010	SAKUMA, Sadakatsu			
	2010/0052992	03/04/2010	OKAMURA et al.			
	2011/0050382	03/03/2011	BAARMAN 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

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

	European Search Report dated July 12, 2016 issued in Application No. 14817626.6.

EXAMINER	DATE CONSIDERED

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.
\\ked2\Documents\2414\2414-049\617208.docx

Electronic Acknowledgement Receipt

EFS ID:	27095560
Application Number:	14901426
International Application Number:	
Confirmation Number:	5436
Title of Invention:	RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME
First Named Inventor/Applicant Name:	Seok BAE
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Deborah Kimberlin
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	DANA-0049
Receipt Date:	30-SEP-2016
Filing Date:	28-DEC-2015
Time Stamp:	18:36:57
Application Type:	U.S. National Stage under 35 USC 371

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	IDS.pdf	149455 2dce5f729372374e567ada7e65cebe5a117d9ed1	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	182769 c6008e0bdca31cfe8e7b5d8b6f88b9217c862a61	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Other Reference-Patent/App/Search documents	20160712EPSR.pdf	354208 ec39cca21933178224139df53e0447b3f11c1adc	no	7
Warnings:					
Information:					
			Total Files Size (in bytes):	686432	

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.: **DANA-0049** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Confirmation No.: **5436**
Seok BAE; Donchul CHOI; and Soon Young HYUN	Group Art Unit: **2859**
Serial No.: **14/901,426**	Examiner: **Drew A. DUNN**
Filed: **December 28, 2015**	Customer No.: **34610**

For: **RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME**

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).

☐ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application. 37 C.F.R. §1.97(c).

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1). No fee is required.

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2). No fee is required.

☐ c. Please charge our Credit Card in the amount of $180.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information.

☐ 3. This Information Disclosure Statement is being filed after the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application, but on or before payment of the Issue Fee. Please charge our Credit Card in the amount of $180.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information. 37 C.F.R. §1.97(d).

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1).

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2).

☒ 4. 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 paper, 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

Daniel Y.J. Kim
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
Telephone: (703) 766-3777
DYK/dak
Please direct all correspondence to Customer Number 34610
\\ked2\Documents\2414\2414-049\617206.docx

Docket No.: **DANA-0049** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Confirmation No.: **5436**
Seok BAE; Donchul CHOI; and Soon Young HYUN	Group Art Unit: **2859**
Serial No.: **14/901,426**	Examiner: **Drew A. DUNN**
Filed: **December 28, 2015**	Customer No.: **34610**

For: **RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME**

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).

☐ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application. 37 C.F.R. §1.97(c).

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1). No fee is required.

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2). No fee is required.

☐ c. Please charge our Credit Card in the amount of $180.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information.

☐ 3. This Information Disclosure Statement is being filed after the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application, but on or before payment of the Issue Fee. Please charge our Credit Card in the amount of $180.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information. 37 C.F.R. §1.97(d).

☐ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1).

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2).

☒ 4. 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 paper, 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

/Daniel Y.J. Kim/

Daniel Y.J. Kim
Registration No. 36,186

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
Telephone: (703) 766-3777
DYK/dak
Please direct all correspondence to Customer Number 34610
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Electronic Acknowledgement Receipt

EFS ID:	27095860
Application Number:	14901426
International Application Number:	
Confirmation Number:	5436
Title of Invention:	RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME
First Named Inventor/Applicant Name:	Seok BAE
Customer Number:	34610
Filer:	Daniel Y.J. Kim/Deborah Kimberlin
Filer Authorized By:	Daniel Y.J. Kim
Attorney Docket Number:	DANA-0049
Receipt Date:	30-SEP-2016
Filing Date:	28-DEC-2015
Time Stamp:	18:56:16
Application Type:	U.S. National Stage under 35 USC 371

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	IDS.pdf	149512 21493ed861802233ae27abf8f0706b0740b b71df	no	2

Warnings:

Information:	
Total Files Size (in bytes):	149512

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.

PLUS Search Results for S/N 14901426, Searched Tue Aug 22 14:36:33 EDT 2017

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

4631766 99	5374129 95	6209771 95
5358110 96	5405095 95	6221019 95
5382223 96	5415573 95	6244808 95
5399051 96	5417668 95	3617078 93
6081948 96	5437364 95	3642312 93
4276884 95	5443214 95	3915833 93
4278456 95	5452794 95	3804184 93
4286696 95	5477519 95	4024945 93
4300865 95	5505477 95	4043445 93
4317733 95	5536985 95	4062569 93
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4350375 95	5542753 95	4166507 93
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5292265 95	6168183 95	4268991 93
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5369079 95	6209771 95	4270719 93
5370486 95	6221019 95	4270426 93

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/901,426	12/28/2015	Seok BAE	DANA-0049	5436

34610 7590 09/22/2017
KED & ASSOCIATES, LLP
P.O. Box 8638
Reston, VA 20195

EXAMINER	
DIAO, M BAYE	

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
09/22/2017	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. 14/901,426	Applicant(s) BAE ET AL.	
	Examiner M'BAYE DIAO	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 *12/28/2015*.

☐ 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) *1-10 and 13-22* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *9,10 and 17-19* is/are allowed.

7)☒ Claim(s) *1,3-4,7,8,13-16,21 and 22* is/are rejected.

8)☒ Claim(s) *2,5,6 and 20* 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 *12/28/2015* 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 *12/28/2015;09/30/2016*.

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

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Response to Amendment

2. Acknowledgement is made of preliminary amendment filed on 12/28/2015 in which claims 1-4,9-10, and 13 are currently amended, claims 11-12 have been canceled while claims 14-22 have been newly added. By this amendment, claims 1-10,13-22 are now pending in the application for examination in a first action on the merits.

Priority

3. Receipt is acknowledged of certified copies of papers required by 37 CFR 1.55.

Information Disclosure Statement

4. The information disclosure statements (IDS) submitted on 12/28/2015 and 09/30/2016 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement are being considered by the examiner.

Claim Objections

5. Claim 3 is objected to because of the following informalities: Claim 3 recites, "The receiving antenna of claim 1, wherein the insulating layer includes is a film including a polyethylene terephthalate (PET) material". There is insufficient antecedent basis for this underlined limitations in the claims.

6. Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 3 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim Rejections - 35 USC § 102

9. 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.

10. 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.
>
> (a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

11. Claims 1,7-8, and 13 are rejected under 35 U.S.C. 102(a)(1)|(a)(2) as being anticipated by Waffenschmidt et al., (Waffenschmidt) US 2013/0069444.

12. Regarding claim 1, Waffenschmidt discloses and shows in Fig. 20: A receiving antenna of a wireless power receiving device wirelessly charging electric power, the receiving antenna comprising: a substrate**(212)**; a soft magnetic layer **(202)**stacked on the substrate**(212)**; a receiving coil **(203)** wound in parallel with a plane of the soft magnetic layer**(202)**, and formed inside of the soft magnetic layer; and an adhesive layer **(211)** formed between the soft magnetic layer**(202)** and the receiving coil**(203)([0087]-[0088])**.

13. Regarding claim 13, Waffenschmidt discloses**([0087]-[0088])** and shows in Fig. 20: A wireless power receiving device wirelessly charging electric power, comprising: a substrate**(212)**; a soft magnetic layer **(202)**stacked on the substrate; a receiving coil **(203)** wound in parallel with a plane of the soft magnetic layer**(202)**, and formed inside of the soft magnetic layer**(202)**; an adhesive layer **(211)** formed between the soft magnetic layer **(202)** and the receiving coil**(203)**; a circuit unit **(i.e. additional power converters and On top of the carrier electronic components may be located, e.g. to rectify the alternating voltage of the receiver)** connected to the receiving coil**(203)**, and configured to convert electromagnetic energy into electrical energy; and a storage unit configured to store the electrical energy**(see [0087],[0094])**.

14. Regarding claim 7, Waffenschmidt disclose, wherein the receiving antenna further comprising a support means **(213)**stacked on the receiving coil**(203)([0087]).**

15. Regarding claim 8, Waffenschmidt disclose, wherein the receiving coil **(203)**is embedded in one surface of the soft magnetic layer **(202)(see Fig. 20).**

Claim Rejections - 35 USC § 103

16. 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.

17. 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.

18. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

19. This application currently names joint inventors. In considering patentability of the claims the examiner presumes that the subject matter of the various claims was

commonly owned as of the effective filing date of the claimed invention(s) absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and effective filing dates of each claim that was not commonly owned as of the effective filing date of the later invention in order for the examiner to consider the applicability of 35 U.S.C. 102(b)(2)(C) for any potential 35 U.S.C. 102(a)(2) prior art against the later invention.

20. **Claims 3-4,14,15,16,21, and 22 are rejected under 35 U.S.C. 103 as being unpatentable over Waffenschmidt et al., (Waffenschmidt) US 2013/0069444. In view of Official Notice or Inoue US 2009/0121677(cited by Applicants).**.

21. Regarding claims 4,15,16,21, and 22, Waffenschmidt discloses wherein the soft magnetic layer **(202)** includes a plurality of stacked sheets **(210)** including and a polymer resin**(Ferrite polymer compound,[0088])**.

22. Waffenschmidt discloses all the claimed limitations except for the soft magnetic layer including a soft magnetic metal powder. It would have been obvious to one having ordinary skill in the art at the time of the effective filing date of the claimed invention to include in the soft magnetic layer of the device of Waffenschmidt to include a soft magnetic metal powder and a polymer resin, 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.

23. Inoue also teaches factual evidence of a power receiving portion including making the power receiving portion thinner corresponding to thickness reduction of an

apparatus by using a flat coil formed by printing a metal powder paste in a spiral shape on a substrate**([0005],[0006],[0039]).**

24. Therefore it would have been obvious to one having ordinary skill in the art at the time of the effective filing date of the claimed invention to include in the soft magnetic layer of the device of Waffenschmidt to include a soft magnetic metal powder and a polymer resin, as did Inoue, for the advantages of making the power receiving portion thinner, as per the teachings of Inoue**([0006]).**

25. **Regarding claim 3,** Waffenschmidt discloses all the claimed limitations except for wherein the insulating layer includes is a film including a polyethylene terephthalate (PET) material.. It would have been obvious to one having ordinary skill in the art at the time of the effective filing date of the claimed invention to have included in the insulating layer of Waffenschmidt, a film including a polyethylene terephthalate (PET) material, 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.

26. Accordingly claim 3 would have been obvious.

27. Accordingly claims 4,14,15,16,21, and 22 would have been obvious.

Allowable Subject Matter

28. Claims 2,5-6,,20,are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

29. Claims 9-10,17-19 are allowed over the prior art of record.

30. Regarding claim 9, the prior art of record either taken alone or in combination thereof fail to teach or reasonably suggest, in the claimed combination, a method of fabricating a receiving antenna comprising among other patentable steps, "…stacking a plurality of sheets including a soft magnetic metal powder and a polymer resin; forming an adhesive layer on an upper plane of the plurality of sheets; disposing a receiving coil on the adhesive layer; and compressing the plurality of sheets, the adhesive layer, and the receiving coil to form the receiving coil inside of the plurality of sheets".

31. Claim 10,17-19 depend either directly or indirectly from claim 9 and therefore are also allowed for the same reasons.

32. Regarding claim 5, the prior art of record does not teach or reasonably suggest, In the claimed combination, "wherein the soft magnetic layer includes a groove portion".

33. Regarding claims 2 and 20, patentability exists at least in part, "wherein the adhesive layer includes a first adhesive layer formed on the soft magnetic layer, an insulating layer formed on the first adhesive layer, and a second adhesive layer formed on the insulating layer".

34. Claim 6 depend directly from claim 5 and thus is also allowable for the same reason.

Citation of Prior Art

35. For a list of related prior art references not mentioned above but disclose related apparatus or method, see Form PTO-892.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M'BAYE DIAO whose telephone number is (571)272-6127. The examiner can normally be reached on 8:30-7:00; Friday off.

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

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DREW 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.

M'baye Diao
Primary Examiner
Art Unit 2859

/M'BAYE DIAO/
Primary Examiner, Art Unit 2859
September 17, 2017

Notice of References Cited	Application/Control No. 14/901,426	Applicant(s)/Patent Under Reexamination BAE ET AL.	
	Examiner M'BAYE DIAO	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-5,940,362 A	08-1999	Plonsky; Christopher B.	G08B13/2408	369/273
*	B	US-2005/0226136 A1	10-2005	Moribe, Mineo	G11B11/10591	369/275.4
*	C	US-2013/0169399 A1	07-2013	YOO; Young Seuck	H01F17/0013	336/180
*	D	US-9,362,776 B2	06-2016	Low; Zhen Ning	G04C10/00	1/1
*	E	US-9,504,194 B2	11-2016	Lee; Dong Hoon	H01F38/14	1/1
*	F	US-2013/0069444 A1	03-2013	Waffenschmidt; Eberhard	H01F38/14	307/104
	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)
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	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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	(soft near magnetic near layer) with (groove near section)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 15:15
L2	3	(soft near magnetic near layer) same (groove near section)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 15:22
L3	4	("20090121677" | "20100007215" | "20100052992" | "20110050382").PN.	US-PGPUB; USPAT	OR	ON	2017/09/17 15:26
S1	1	"20160156215"	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 08:24
S2	1	"20160156103"	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 08:25
S3	2	"9504194".pn.	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 09:14
S4	1	"9252611".pn.	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 09:56
S5	1	"20130249302"	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:03
S6	11	reciv$3 near (antenna choke coil)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:31
S7	2522191	substrate	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:31
S8	7113	soft near magnetic near layer	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:31
S9	40087	receiv$3 near coil	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:32
S10	234770	adhesive near layer	US-	OR	ON	2017/09/17

			PGPUB; USPAT; EPO			10:32
S11	40317	receiv$3 near (coil choke)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:32
S12	245187	receiv$3 near (antenna choke coil)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:33
S13	1	S12 with (S7 same S8 same S9 same S10)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:34
S14	1	S12 and (S7 same S8 same S9 same S10)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:34
S15	7	S12 and (S7 and S8 and S9 and S10)	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:34
S16	2	"20130169399"	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:41
S17	1	"9362776".pn.	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 10:59
S18	581	S10 S11 S12	US-PGPUB; USPAT; EPO	AND	ON	2017/09/17 11:21
S19	5781	S7 S8	US-PGPUB; USPAT; EPO	AND	ON	2017/09/17 11:21
S20	7	S18 and S19	US-PGPUB; USPAT; EPO	AND	ON	2017/09/17 11:21
S21	148	(US-4631766-$ or US-5358110-$ or US-5382223-$ or US-5399051-$ or US-6081948-$ or US-4276884-$ or US-4278456-$ or US-4286696-$ or US-4300865-$ or US-4317733-$ or US-4319616-$ or US-4350375-$ or US-4361090-$ or US-4381830-$ or US-4392012-$ or US-4396799-$ or US-4411460-$ or US-4440706-$ or US-4444795-$ or US-4480513-$ or US-4491018-$ or US-4501034-$ or US-4522603-$ or US-4536165-$ or US-4555806-$ or US-4587582-$).did. or (US-4590542-$ or US-4590340-$ or US-4610676-$ or US-4761032-$ or US-4791751-$ or US-4869014-$ or US-4911153-$ or US-4924121-$ or US-	USPAT	OR	ON	2017/09/17 11:23

		4933258-$ or US-4938396-$ or US-4974771-$ or US-5178107-$ or US-5202176-$ or US-5226674-$ or US-5230178-$ or US-5243799-$ or US-5244277-$ or US-5289979-$ or US-5292265-$ or US-5344086-$ or US-5360112-$ or US-5369079-$ or US-5370486-$ or US-5374129-$ or US-5405095-$ or US-5415573-$ or US-5417668-$).did. or (US-5437364-$ or US-5443214-$ or US-5452794-$ or US-5477519-$ or US-5505477-$ or US-5536985-$ or US-5535462-$ or US-5542753-$ or US-5562215-$ or US-5591207-$ or US-5604752-$ or US-5621764-$ or US-5660410-$ or US-5669493-$ or US-5690350-$ or US-5711581-$ or US-5717872-$ or US-5727029-$ or US-5728170-$ or US-5766174-$ or US-5769086-$ or US-5791690-$ or US-5806876-$ or US-5845512-$ or US-5845406-$ or US-5853188-$ or US-5872835-$).did. or (US-5894669-$ or US-5899160-$ or US-5906058-$ or US-5915720-$ or US-6002716-$ or US-6035040-$ or US-6044106-$ or US-6044111-$ or US-6099530-$ or US-6109583-$ or US-6115435-$ or US-6134188-$ or US-6138437-$ or US-6168183-$ or US-6192618-$ or US-6193515-$ or US-6209771-$ or US-6221019-$ or US-6244808-$ or US-3617078-$ or US-3642312-$ or US-3915833-$ or US-3804184-$ or US-4024945-$ or US-4043445-$ or US-4062569-$ or US-4160230-$).did. or (US-4166507-$ or US-4179829-$ or US-4068581-$ or US-4106868-$ or US-4109556-$ or US-4129059-$ or US-4242853-$ or US-4243122-$ or US-4243851-$ or US-4245158-$ or US-4244459-$ or US-4244360-$ or US-4244123-$ or US-4245360-$ or US-4245960-$ or US-4245456-$ or US-4246738-$ or US-4248228-$ or US-4249432-$ or US-4251066-$ or US-4252324-$ or US-4252135-$ or US-4254206-$ or US-4254908-$ or US-4256109-$ or US-4256952-$ or US-4259160-$).did. or (US-4261054-$ or US-4261366-$ or US-4262909-$ or US-4264549-$ or US-4265167-$ or US-4267794-$ or US-4268991-$ or US-4270070-$ or US-4270720-$ or US-4270719-$ or US-4270426-$ or US-4275535-$ or US-4278236-$ or US-4278029-$).did.				
S22	0	S18 and S21	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:23
S23	13392	(320/108;307/104;455/41.1,572,573).ccls.	US-PGPUB; USPAT;	OR	ON	2017/09/17 11:24

			EPO			
S24	40	S18 and S23	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:24
S25	11955	(H04B5/0037 H02J7/025 H02J5/005).cpc.	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:28
S26	105	S18 and S25	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:28
S27	1	(S24 S26) and ((adhesive near layer) near formed near between near5 (soft near magnetic near layer))	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:30
S28	2	(S24 S26) and ((adhesive near layer) with formed same between near5 (soft near magnetic near layer))	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:31
S29	6	(S24 S26) and S8 and S10 and S12	US-PGPUB; USPAT; EPO	OR	ON	2017/09/17 11:34

EAST Search History (Interference)

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9/ 17/ 2017 5:12:17 PM
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.D/

SHEET 1 OF 1

LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
DANA-0049	14/901,426
APPLICANT(S)	
Seok BAE; Donchul CHOI; and Soon Young HYUN	
FILING DATE	GROUP
December 28, 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
/M.D/	2009/0121677	05/14/2009	INOUE et al.			
	2010/0007215	01/14/2010	SAKUMA, Sadakatsu			
	2010/0052992	03/04/2010	OKAMURA et al.			
	2011/0050382	03/03/2011	BAARMAN 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

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

European Search Report dated July 12, 2016 issued in Application No. 14817626.6.

EXAMINER	DATE CONSIDERED
/M BAYE DIAO/	09/17/2017

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. /M.D/

LIST OF ART CITED BY APPLICANT

(PTO-1449)

ATTORNEY. DOCKET NO.	APPLICATION SERIAL NO.
DANA-0049	National Stage of PCT/KR2014/005258
APPLICANT(S)	
Seok BAE; Donchul CHOI; and Soon Young HYUN	
FILING DATE	GROUP
December 28, 2015	To Be Assigned

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

U.S. PATENT APPLICATIONS

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

FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	Translation Yes	Translation No
/M.D/	JP 2007-503715 A	02/22/2007	Japan (English Abstract and Full Japanese Text)			X	
	JP 2008-288370 A	11/27/2008	Japan (English Abstract and Full Japanese Text)			X	
	KR 10-2010-0111409 A	10/15/2010	Korea (English Abstract and Full Korean Text)			X	
	WO 2011/031473 A2	03/17/2011	WIPO (Full English Text) (related to KR 10-2012-0057636 A below)			X	
	KR 10-2011-124695 A	11/17/2011	Korea (English Abstract and Full Korean Text)			X	
	KR 10-2012-0057636 A	06/05/2012	Korea (English Abstract and Full Korean Text) (WO 2011/031473 A2 above)			X	

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

	International Search Report dated September 18, 2014 issued in Application No. PCT/KR2014/005258.

EXAMINER	DATE CONSIDERED
/M BAYE DIAO/	09/17/2017

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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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14901426	BAE ET AL.
	Examiner	Art Unit
	M'BAYE DIAO	2859

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

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

CLAIM		DATE								
Final	Original	09/17/2017								
	1	✓								
	2	O								
	3	✓								
	4	✓								
	5	O								
	6	O								
	7	✓								
	8	✓								
	9	=								
	10	=								
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	12	-								
	13	✓								
	14	✓								
	15	✓								
	16	✓								
	17	=								
	18	=								
	19	=								
	20	O								
	21	✓								
	22	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14901426	BAE ET AL.
	Examiner	Art Unit
	M'BAYE DIAO	2859

CPC- SEARCHED		
Symbol	Date	Examiner
H01Q 7/06	09/17/2017	MD
H02J50/20,27; H02J7/025	09/17/2017	MD

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
320	108	09/17/2017	MD
307	104	09/17/2017	MD

* 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(Search Notes Attached).	09/17/2017	MD
Inventor Name and Assignee search (EAST).	09/16/2017	MD
PLUS Search Conducted.	08/22/2017	MD

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

	/M'BAYE DIAO/ Primary Examiner.Art Unit 2859

UNITED STATES PATENT AND TRADEMARK OFFICE

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BIB DATA SHEET

CONFIRMATION NO. 5436

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/901,426	12/28/2015	320	2859	DANA-0049

APPLICANTS

LG INNOTEK CO., LTD., Seoul, KOREA, REPUBLIC OF;

INVENTORS

Seok BAE, Seoul, KOREA, REPUBLIC OF;
Donchul CHOI, Seoul, KOREA, REPUBLIC OF;
Soon Young Hyun, Seoul, KOREA, REPUBLIC OF;

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

This application is a 371 of PCT/KR2014/005258 06/16/2014

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

REPUBLIC OF KOREA 10-2013-0074620 06/27/2013

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

02/23/2016

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	/M'BAYE DIAO/ Examiner's Signature	☐ Initials	KOREA, REPUBLIC OF	7	20	3

ADDRESS

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

TITLE

RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME

FILING FEE RECEIVED		
1620	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

Docket No.: **DANA-0049** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: **5436**
Seok BAE; Donchul CHOI; and Soon Young HYUN	Group Art Unit: **2859**
Serial No.: **14/901,426**	Examiner: **M. Baye DIAO**
Filed: **December 28, 2015**	Customer No.: **34610**

For: **RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME**

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 September 22, 2017, 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 ~~receiving antenna of a~~ wireless power receiving ~~device~~ ~~wirelessly charging electric power, the receiving~~ antenna comprising:

a substrate;

a soft magnetic layer ~~stacked~~ comprising a first magnetic sheet disposed on the substrate and a second magnetic sheet disposed on the first magnetic sheet;

a receiving coil ~~wound in parallel with a plane of the soft magnetic layer, and formed inside of the soft~~ disposed on the second magnetic ~~layer~~ sheet; and

an adhesive layer formed between the ~~soft~~ second magnetic ~~layer~~ sheet and the receiving coil,

wherein the adhesive layer includes a first adhesive layer in contact with the second magnetic sheet, a second adhesive layer in contact with the receiving coil, and an insulating layer disposed between the first adhesive layer and the second adhesive layer, and

wherein a height of a highest position of the second magnetic sheet from the substrate is higher than a height of a lowest position of the receiving coil from the substrate.

2 – 8. (Canceled)

9. (Currently Amended) A method of fabricating a wireless power receiving antenna, the method comprising:

preparing a substrate;

disposing a first soft magnetic sheet including a Fe-Si based alloy on the substrate;

stacking a plurality of the soft magnetic sheets ~~including a soft magnetic metal powder and a polymer resin~~ by stacking a second soft magnetic sheet including the Fe-Si based alloy on the first soft magnetic sheet;

~~forming~~ disposing an adhesive layer on ~~an upper plane of the plurality of sheets~~ the second soft magnetic sheet;

disposing a receiving coil on the adhesive layer; and

compressing the plurality of the soft magnetic sheets, the adhesive layer, and the receiving coil ~~to form the receiving coil inside of the plurality of sheets~~,

wherein the adhesive layer includes a first adhesive layer in contact with the second soft magnetic sheet, a second adhesive layer in contact with the receiving coil, and an insulating layer disposed between the first adhesive layer and the second adhesive layer, and

wherein compressing the plurality of the soft magnetic sheets, the adhesive layer, and the receiving coil includes forming a height of a highest position of the second

magnetic sheet from the substrate so to be higher than a height of a lowest position of the receiving coil from the substrate.

10 – 12. (Cancelled)

13. (Currently Amended) A wireless power receiving ~~device~~ apparatus ~~wirelessly charging electric power,~~ comprising a receiving circuit and a wireless power receiving antenna, the wireless power receiving antenna comprising:

a substrate;

a soft magnetic layer ~~stacked on the substrate~~comprising a first magnetic sheet disposed on the substrate and a second magnetic sheet disposed on the first magnetic sheet;

a receiving coil ~~wound in parallel with a plane of the soft magnetic layer, and formed inside of the soft magnetic layer;~~disposed on the second magnetic sheet, and

an adhesive layer formed between the second ~~soft~~ magnetic ~~layer~~ sheet and the receiving coil;

~~a circuit unit connected to the receiving coil, and configured to convert electromagnetic energy into electrical energy; and~~

~~a storage unit configured to store the electrical energy~~

wherein the adhesive layer includes a first adhesive layer in contact with the second magnetic sheet, a second adhesive layer in contact with the receiving coil, and an insulating layer disposed between the first adhesive layer and the second adhesive layer, and

wherein a height of a highest position of the second magnetic sheet from the substrate is higher than a height of a lowest position of the receiving coil from the substrate.

14 - 22. (Canceled)

23. (New) The wireless power receiving antenna of claim 1, wherein the soft magnetic layer includes an Fe-Si based alloy.

24. (New) The wireless power receiving antenna of claim 23, further comprising a support means stacked on the receiving coil.

25. (New) The wireless power receiving antenna of claim 24, further comprising an NFC coil disposed so as to surround a side portion of the receiving coil.

26. (New) The wireless power receiving antenna of claim 25, wherein the insulating layer includes a polyethylene terephthalate (PET).

27. (New) The wireless power receiving antenna of claim 25, wherein the insulating layer includes a polyimide (PI).

28. (New) The wireless power receiving antenna of claim 25, wherein a portion of the receiving coil is embedded in a portion of the second magnetic sheet.

29. (New) The wireless power receiving antenna of claim 25, wherein a portion of a side of the soft magnetic layer on which the NFC coil is disposed is removed.

30. (New) The wireless power receiving antenna of claim 1, wherein at least one of the first magnetic sheet or the second magnetic sheet includes an Fe-Si based soft magnetic metal powder and a polymer resin.

31. (New) The method of fabricating a wireless power receiving antenna of claim 9, further comprising stacking a support means on the receiving coil.

32. (New) The method of fabricating a wireless power receiving antenna of claim 9, further disposing an NFC coil to surround a side portion of the receiving coil.

33. (New) The method of fabricating a wireless power receiving antenna of claim 32, wherein a portion of a side of the plurality of the soft magnetic sheets on which the NFC coil is disposed is removed.

34. (New) The method of fabricating a wireless power receiving antenna of claim 9, wherein compressing the plurality of the soft magnetic sheets, the adhesive layer, and the receiving coil includes simultaneously compressing the plurality of the soft magnetic sheets, the adhesive layer, and the receiving coil by heating.

35. (New) The method of fabricating a wireless power receiving antenna of claim 34, wherein the insulating layer includes a polyethylene terephthalate (PET).

36. (New) The method of fabricating a wireless power receiving antenna of claim 34, wherein a portion of the receiving coil is formed to be embedded in a portion of the second magnetic sheet.

37. (New) The method of fabricating a wireless power receiving antenna of claim 9, wherein at least one of the first soft magnetic sheet and the second soft magnetic sheet includes an Fe-Si based soft magnetic metal powder and a polymer resin.

38. (New) The wireless power receiving apparatus of claim 38, further comprising a NFC coil disposed to surround a side portion of the receiving coil.

REMARKS/ARGUMENTS

Claims 1, 9, 13 and 23-38 are pending in this application. By this Reply, claims 1, 9 and 13 are amended, claims 2-8, 10-12 and 14-22 are canceled, and claims 23-38 are added. Certain amendments are made for purposes of clarity and unrelated to issues of patentability. No new matter is added. Support for the claims can be found throughout the specification, including the original claims and the drawings.

At the outset, the Examiner is thanked for the indication that claims 9-10 and 17-19 are allowed and that claims 2, 5-6 and 20 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

By this Amendment, independent claim 1 is amended to incorporate the allowable features of claim 2. Independent claim 13 is amended to substantially incorporate the allowable features of claim 20. Moreover, independent claim 9 is amended to incorporate similar features.

Specifically, independent claims 1, 9 and 13 are amended to recite "wherein the adhesive layer includes a first adhesive layer in contact with the second magnetic sheet, a second adhesive layer in contact with the receiving coil, and an insulating layer disposed between the first adhesive layer and the second adhesive layer," in combination with other features, respectively. Independent claim 1 is further amended to recite "wherein a height of a highest position of the second magnetic sheet from the substrate is higher than a height of a lowest position of the receiving coil from the substrate." Independent claims 9 and 13

recite similar features in varying scope. The applied prior art fails to teach or suggest these features. Hence, independent claims 1, 9 and 13 should be in condition for allowance, along with dependent claims 23-38 which respectively depend therefrom.

Claim 3 stands objected to for informalities. Moreover, claim 3 stands rejected under 35 U.S.C. §112, second paragraph. Claim 3 is canceled, and hence, this objection and rejection are moot.

Claims 1, 7-8 and 13 stand rejected under 35 U.S.C. §102(a)(1)/(a)(2) as being anticipated by U.S. Patent Publication No. 2013/0069444 to Waffenschmidt et al. (hereinafter "Waffenschmidt"). Claims 3-4, 14-16 and 21-22 stands rejected under 35 U.S.C. §103 as being unpatentable over Waffenschmidt in view of U.S. Patent Publication No. 2009/0121677 to Inoue (hereinafter "Inoue"). The rejections are moot in view of the amendments to independent claims 1, 9 and 13 as previously discussed.

By this Amendment, dependent claims 23-38 are added. It is respectfully submitted that claims 23-38 are allowable by virtue of their dependency on independent claims 1, 9 and 13, respectively, as well as for their added features.

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, **Paul H. Kang**, 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

Paul H. Kang
Registration No. 66,545

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
703 766-3777 (main)
703 766-3755 (direct) PHK/seg
Please direct all correspondence to Customer Number 34610
Q:\Documents\2414-049\700842

Docket No.: **DANA-0049** PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Confirmation No.: **5436**
Seok BAE; Donchul CHOI; and Soon Young HYUN	Group Art Unit: **2859**
Serial No.: **14/901,426**	Examiner: **M. Baye DIAO**
Filed: **December 28, 2015**	Customer No.: **34610**

For: **RECEIVING ANTENNA AND WIRELESS POWER RECEIVING DEVICE INCLUDING THE SAME**

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).

☒ 2. This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application. 37 C.F.R. §1.97(c).

☒ a. I hereby state that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(1). No fee is required.

☐ b. I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any

individual designated in 37 C.F.R. §1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. §1.97(e)(2). No fee is required.

☐ c. Please charge our Credit Card in the amount of $180.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information.

☐ 3. This Information Disclosure Statement is being filed after the mailing date of a Final Rejection OR Notice of Allowance OR an action that otherwise closes prosecution in the application, but on or before payment of the Issue Fee. Please charge our Credit Card in the amount of $180.00 in payment of the fee under 37 C.F.R. §1.17(p) per the attached PTO 2038 form. Please credit or debit Deposit Account No. 16-0607 as needed to ensure consideration of the disclosed information. 37 C.F.R. §1.97(d).

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☒ 4. The references were cited in a corresponding Chinese Office Action. Please note that the references previously submitted in an Information Disclosure Statement filed on September 30, 2016, are not submitted herewith.

☒ 5. 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 paper, 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

Paul H. Kang
Registration No. 66,545

Correspondence Address:
P.O. Box 8638
Reston, VA 20195
Telephone: (703) 766-3777
PHK/seg
Please direct all correspondence to Customer Number 34610
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LIST OF ART CITED BY APPLICANT

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U.S. PATENT DOCUMENTS

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U.S. PATENT APPLICATIONS

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

FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	*PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	Translation Yes	Translation No
	TW 2007-23596	06/16/2007	Taiwan (English Abstract and Taiwanese Full Text, related to TWI335688)			X	
	EP 2 096 711	09/02/2009	Europe (related to TWI335688)			X	
	CN 102598168	07/18/2012	China (English Abstract and Chinese Full Text of published CN 102598168B, related to previously cited U.S. Patent Publication No. 2011/0050382)			X	
	CN 103094992	05/08/2013	China (English Abstract and Chinese Full Text)			X	

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

	Chinese Office Action dated November 29, 2017 issued in Application No. 201480037192.1 (English translation attached).

EXAMINER	DATE CONSIDERED

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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Espacenet

Bibliographic data: TW200723596 (A) — 2007-06-16

Sheet body for improving communication, antenna device provided with such sheet body and electronic information transmitting apparatus

Inventor(s): GO HARUHIDE [JP]; YOSHIDA TAKAHIKO [JP]; MATSUSHITA MASATO [JP]; KIYOHARA YOSHIHARU [JP]; SATO SHINICHI [JP]; YOSHIHARA RYOTA [JP]; MORITA KAZUHISA [JP]; KOGURE HIROAKI [JP] ± (GO, HARUHIDE, ; YOSHIDA, TAKAHIKO, ; MATSUSHITA, MASATO, ; KIYOHARA, YOSHIHARU, ; SATO, SHINICHI, ; YOSHIHARA, RYOTA, ; MORITA, KAZUHISA, ; KOGURE, HIROAKI)

Applicant(s): NITTA CORP [JP] ± (NITTA CORPORATION)

Classification: **- international:*G06K19/077; H01Q1/44; H05K9/00***
- cooperative: H01Q1/526; H01Q15/0026; H01Q17/00; H01Q19/108

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Priority number(s): JP20050307325 20051021

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Abstract of TW200723596 (A)

A conductive pattern (22) formed on a pattern layer (15) operates as antenna. When an electromagnetic wave of a prescribed frequency arrives, resonance phenomenon is exhibited, and the electromagnetic wave of a specific frequency is introduced into a sheet body (10). Since the sheet body (10) having the pattern layer (15) can adjust the phase of a reflection wave from a reflection area, even the sheet body is small and thin, and an area having a high electric field intensity can be set in the vicinity of the antenna element by interference of the reflection wave from the sheet body and the coming electromagnetic wave. An electromagnetic field is generated in the periphery of the conductive pattern (22) by arranging the sheet body (10) between the antenna element (51) and the communication disturbing member (57), and electromagnetic energy is supplied from the conductive pattern to the antenna element (51). Thus, receiving power of the antenna element (51) is increased and wireless communication can be suitably performed.

發明專利說明書 200723596

（本說明書格式、順序及粗體字，請勿任意更動，※記號部分請勿填寫）

※ 申請案號：95139078

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一、發明名稱：（中文/英文）

通信改善用片體與包含其之天線裝置及電子資訊傳達裝置

二、申 請 人：（共 1 人）

姓名或名稱：（中文/英文）

日商新田股份有限公司

NITTA CORPORATION

代表人：（中文/英文）

新田 長彥

NITTA, TAKEHIKO

住居所或營業所地址：（中文/英文）

日本國大阪府大阪市浪速區櫻川4丁目4番26號

4-26, SAKURAGAWA 4-CHOME, NANIWA-KU, OSAKA-SHI,OSAKA 556-0022, JAPAN

國 籍：（中文/英文）

日本 JAPAN

三、發明人：（共 8 人）

姓　名：（中文/英文）

1. 吳 東英
   GO, HARUHIDE
2. 吉田 隆彥
   YOSHIDA, TAKAHIKO
3. 松下 正人
   MATSUSHITA, MASATO
4. 清原 好晴
   KIYOHARA, YOSHIHARU
5. 佐藤 真一
   SATO, SHINICHI
6. 吉原 良太
   YOSHIHARA, RYOTA
7. 森田 和久
   MORITA, KAZUHISA
8. 小暮 裕明
   KOGURE, HIROAKI

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7. 日本　JAPAN
8. 日本　JAPAN

四、聲明事項：

☐ 主張專利法第二十二條第二項☐第一款或☐第二款規定之事實，其事實發生日期為：　年　月　日。

☑ 申請前已向下列國家（地區）申請專利：

【格式請依：受理國家（地區）、申請日、申請案號　順序註記】

☑ 有主張專利法第二十七條第一項國際優先權：

1. 日本；2005年10月21日；特願2005-307325

2.

☐ 無主張專利法第二十七條第一項國際優先權：

1.

2.

☐ 主張專利法第二十九條第一項國內優先權：

【格式請依：申請日、申請案號　順序註記】

☐ 主張專利法第三十條生物材料：

☐ 須寄存生物材料者：

國內生物材料　【格式請依：寄存機構、日期、號碼　順序註記】

國外生物材料　【格式請依：寄存國家、機構、日期、號碼　順序註記】

☐ 不須寄存生物材料者：

所屬技術領域中具有通常知識者易於獲得時，不須寄存。

九、發明說明：

【發明所屬之技術領域】

本發明係關於一種在妨礙通信構件之近旁，使用天線元件而進行無線通信用之通信改善用片體與包含其之天線裝置及電子資訊傳達裝置。

【先前技術】

圖51係簡化先前技術之標籤(Tag)1而顯示之剖面圖。是13.56 MHz頻帶為代表之電磁感應方式之無線通信的情況。RFID(無線頻率識別(Radio Frequency IDentification))系統係用於固定之自動識別之系統，且基本上包含：讀取器與轉發器。該RFID系統之轉發器使用標籤1。標籤1包含：檢測磁力線之磁場型天線之線圈天線2，及使用其線圈天線2進行無線通信之積體電路(IC)3。標籤1係構成接收來自讀取器之要求信號時，傳送記憶於IC3內之資訊，換言之，可藉由讀取器而讀取保持於標籤1之資訊。標籤1如貼合於商品而設置，利用於商品管理，以防止商品遭竊及掌握庫存狀況等。

該標籤1貼合於金屬製之商品而使用等，於天線2之近旁存在妨礙通信構件4(本例為導電性材料)時，藉由天線2收發之電磁波之信號而形成之磁場之磁力線，通過妨礙通信構件4之表面近旁。此時，在妨礙通信構件4上產生渦電流，電磁波能轉換成熱能而被吸收。如此，能量被吸收時，電磁波之信號大幅衰減，導致標籤1無法進行無線通信。此外，藉由感應之渦電流產生與標籤之通信用磁場相

反方向之磁場(反磁場)，亦產生消磁現象。標籤1亦由於該現象而無法進行無線通信。再者，由於妨礙通信構件4之影響，亦有天線2之共振頻率偏移之現象。因此，標籤1在妨礙通信構件4之近旁無法使用。

圖52係簡化其他先前技術之標籤1A而顯示之剖面圖。圖52所示之標籤1A與圖51之標籤1類似，在對應之部分註記相同符號，而僅說明不同之構造。圖52之標籤1A為求解決圖51之標籤1的問題，其構造包含磁性吸收板7，其係配置於貼合物品之構件4及天線2之間而設置。具有複數相對磁導率之板的磁性吸收板7係由鐵矽鋁磁合金、鐵氧體及羰基鐵等高磁導率材料，亦即由複數相對磁導率高之材料構成。

複數相對磁導率包含實數部與虛數部，實數部高時，複數相對磁導率提高。換言之，複數相對磁導率高之材料，其複數相對磁導率中之實數部高。磁場中存在複數相對磁導率中實數部高之材料時，磁力線可集中而通過其構件內。使用檢測磁力線之磁場型之天線2的標籤1A，藉由設置磁性吸收板7，防止磁場洩漏於妨礙通信構件4，即使在妨礙通信構件4近旁使用，仍可抑制磁場能量之衰減而進行無線通信。此種標籤1A如專利文獻1中所示。

此外，另外之先前技術係配置於包含金屬等之壁面附近，在可傳送指定電波之非接觸式無線資料載體上，以接合劑等貼合片體，而吸收該片體朝向壁面之電波及藉由壁面而反射之電波，於非接觸式無線資料載體動作時，在有

效之電波區域中，可以全部之空間收發。該例係將藉由2.4 GHz頻帶之電波方式之無線通信的RFID系統作為對象。此外，藉由接合劑等貼合：非接觸無線資料載體；具有指定厚度，且具有不吸收電波性質之間隔物；及電波反射體；使非接觸無線資料載體之位置，與自電波反射體離開λ/4(λ表示波長)程度之位置，與自該位置離開nλ/2(符號n係自然數)之位置不一致地，設定間隔物8之厚度，於非接觸無線資料載體動作時，在有效之電波區域，可以全部之空間收發。使用非接觸無線資料載體之資料載體系統，如專利文獻2所示。

[專利文獻1]日本特開2000-114132號公報

[專利文獻2]日本特開2002-230507號公報

【發明內容】

[發明所欲解決之問題]

本發明所稱之妨礙通信構件，係藉由存在於天線近旁，比在自由空間時，可使天線之通信特性惡化之構件。妨礙通信構件如相當於：金屬等之導電性材料，玻璃、紙張、液體等之電介質材料，及帶磁性之磁性體材料。在天線元件之近旁存在導電性材料時，天線元件之輸入阻抗顯著降低，造成無線通信困難。此外，瓦楞板、樹脂、玻璃及液體等電介質材料，藉由其具有之介電常數，使天線之共振頻率降低而妨礙無線通信。再者，磁性材料亦藉由磁導率，照樣使天線之共振頻率降低，而妨礙無線通信。

如圖52所示之標籤1A，使用線圈天線等磁場型之天線2

情況下，藉由防止磁場洩漏，雖可在妨礙通信構件4之近旁進行無線通信，但是，磁場型天線通常存在無法確保充分之通信距離的問題。此外，此種防止磁場洩漏用之構造，於使用檢測電力線之電場型之天線情況下，視同無效，而不檢討採用。

此外，專利文獻2係在非接觸無線資料載體上，經由片體或間隔物而堆疊電波反射體，而使資料載體之位置與自電波反射體離開λ/4程度之位置及自該位置離開nλ/2(n係自然數)之位置不一致。該專利文獻2，係在各個自反射面離開λ/4程度之位置及自該位置離開λ/2之位置，出現入射波與反射波抵銷而無法收發之點。但是，本發明人發現，如圖12所示，電波經電波反射面反射時，其相位偏移180°，結果自電波反射面離開λ/4程度之位置，藉由干擾而電場強度最強。同時，該位置之磁場強度為零。亦即，雖然磁場型天線無法接收，但是一般使用之電場型天線則顯示最佳之接收。若離開其位置，則有在妨礙通信構件近旁，無法確保充分通信距離之問題。

再者，共振頻率之偏移問題，視存在於近旁之材料(材質)而異，由於其偏移量不定，因而要求個別之通信改善對策(修正共振頻率)。

本發明之目的，在提供一種並非衰減電磁能之電波吸收體，而係在妨礙通信構件近旁可保存通信能，可正常進行無線通信之通信改善用片體與包含其之天線裝置及電子資訊傳達裝置。

[解決問題之手段]

本發明之通信改善用片體之特徵為：包含圖案層，其係在妨礙通信構件之近旁使用天線元件進行無線通信時，設於天線元件與妨礙通信構件之間，並且形成導電性圖案。

按照本發明，圖案層之導電性圖案用作天線，於指定頻率之電磁波到來時發現共振現象。在圖案層之近旁設置偶極天線等之天線元件時，導電性圖案層與天線元件引起電磁耦合，貯存於圖案層之電磁能，自導電性圖案轉移至天線元件。自導電性圖案供給共振頻率之電磁能至天線元件，與不設置圖案層時比較，可增加天線元件之接收電力。因此，即使在妨礙通信構件之近旁仍可正常進行無線通信，並可確保充分之通信距離。如此，藉由包含導電性圖案，片體獨自具有天線功能，可獲得天線元件之通信改善效果。本發明之通信改善用片體，本身不受妨礙通信構件之影響，且設計成其本身不致對天線元件造成不良影響，再者，成為於天線元件中補足用於通信之電磁能之構造體。

此外，本發明之特徵為包含貯藏體層，其係包含非導電性之電介質層及/或磁性體層，並且收集用於無線通信之電磁波能量。

按照本發明，在妨礙通信構件之近旁配置天線元件時，由於在天線元件與妨礙通信構件之間配置收集用於無線通信之電磁波能量之貯藏體層，因此，防止導通，可增加電抗(L)成分及電容(C)成分，此外，藉由複數相對介電常數

之實數部ε'及/或複數相對磁導率之實數部μ"，可彎曲進入片體之電磁波之傳播路徑，再者，藉由波長縮短效應，可使導電性圖案及片體厚度體積小及厚度薄。貯藏體層藉由不具導電性之磁性材料層或介電材料層之至少1個而形成。

此外，在妨礙通信構件之近旁配置天線元件時，由於在天線元件與妨礙通信構件之間配置非導電性之貯藏體層，因此可抑制因妨礙通信構件造成天線元件之輸入阻抗降低。輸入阻抗小時，與使用天線元件進行通信之通信機構之阻抗背離，在天線元件與通信機構之間無法收發信號。由於片體可在妨礙通信構件之近旁配置天線元件時，抑制天線元件之輸入阻抗降低，因此，即使在妨礙通信構件之近旁，仍可正常進行無線通信。

此外，本發明之特徵為：進一步包含反射區域形成層，其係在與圖案層之間夾著貯藏體層，自圖案層隔以間隔而設於與天線元件相反側，將用於無線通信之電磁波之波長設為λ時，在自圖案層起電性長度為((2n-1)/4)λ(n為正整數)之位置附近，形成反射用於無線通信之電磁波之反射區域。

按照本發明，藉由共振而將特定頻率之電磁波取入片體內部，在片體內部調整取入之電磁波的相位，用於無線通信之電磁波之波長為λ時，可使形成於自反射區域起離開電性長度為((2n-1)/4)λ(n為正整數)之位置之電場強度變強之區域產生於圖案層之位置。藉由反射區域形成層而形成

之反射區域所反射之電磁波，由於其相位變位180°，因此，到來之電磁波與被反射區域所反射之電磁波干擾時，自反射區域起電性長度為電磁波之波長之((2n-1)/4)倍中，電場強度提高。藉由在反射之電磁波與到來之電磁波強力結合而干擾之位置設置天線元件，亦即，藉由在天線元件上，以電性絕緣狀態而近旁地配置圖案層來使用，可防止可藉由天線元件接收之電場強度降低，即使在妨礙通信構件之近旁，仍可正常地進行無線通信。此外，反射區域可為反射區域形成層本身，或是亦可為虛擬連結導電性圖案之中央附近與反射區域形成層之電場為零之位置(虛擬之電磁波反射面)。反射區域為虛擬連結導電性圖案之中央附近與反射區域形成層之電場為零之位置(虛擬之電磁波反射面)時，利用在該位置電磁波反射與電磁波繞進導電性圖案，可爭取自導電性圖案至反射區域之電性長度。因而可使片體厚度比((2n-1)/4)λ(n為正整數)小，而可實現薄型化。

此外，藉由設置反射區域形成層，可防止受到片體設置位置之影響，亦即，可防止因構成妨礙通信構件之材料種類及附著於妨礙通信構件表面之水等液體存在，導致導電性圖案之共振頻率變化。藉此，各個不同之天線元件無須再度調整通信之最佳條件，而可使天線元件之通信條件穩定化。

此外，本發明之特徵為：圖案層係形成彼此電性絕緣之複數導電性圖案。

按照本發明，藉由圖案層，可接收對應於各導電性圖案尺寸之電磁波，而發現共振現象。藉由導電性圖案尺寸之決定方法，可藉由用於無線通信之電磁波增加天線元件獲得之電力。此時，與通信頻率之電磁波共振之圖案可為單數亦可為複數。圖案層亦可為單層或數層。亦可立體地形成。

此外，本發明之特徵為：圖案層係形成尺寸及形狀中之至少任一方不同之複數種導電性圖案。

按照本發明，尺寸及形狀中之至少任一方不同之複數種導電性圖案，其各個共振頻率不同，因此，可以圖案層接收數種頻率之電磁波。此外，可藉由用於無線通信之電磁波，而確實增加天線元件獲得之電力。

此外，本發明之特徵為：圖案層係形成涵蓋片體之寬廣範圍而連續延伸之導電性圖案。

按照本發明，由於形成涵蓋寬廣範圍而連續構成之導電性圖案之圖案層，可涵蓋寬廣帶域之頻率提高增益，因此，包含其之片體可接收寬廣帶域頻率之電磁波。此外，藉由用於無線通信之電磁波，可確實增加天線元件獲得之電力。

此外，本發明之特徵為：導電性圖案具有至少1個角部係曲線狀之大致多角形之外輪廓形狀。

接收電磁波之導電性圖案，具有基本上係多角形之大致多角形之外輪廓形狀，且至少1個角部形成曲線狀。藉由在角部賦予R，亦即藉由形成曲線狀，可抑制而減少依電

磁波之偏振方向，增益達到峰值之頻率的偏差，而形成良好之偏振特性。因此，可實現增益之峰值提高，且依電磁波之偏振方向，增益達到峰值之頻率偏差小之優異的通信改善用片體。

圖案層之構造亦可全部導電性圖案具有曲線狀之角部，亦可並非全部之導電性圖案具有曲線狀角部之構造，只要是一部分之導電性圖案具有曲線狀之角部的構造即可。一部分導電性圖案具有曲線狀之角部情況下，其他之導電性圖案並非就有無曲線狀之角部而限定者。再者，具有曲線狀角部之導電性圖案亦可為僅一部分角部係曲線狀，亦可為全部之角部為曲線狀。此外，導電性圖案亦可為大致多角形之面狀形狀，亦可為延伸成大致多角形狀之封閉迴路之線狀形狀。如此，藉由用於無線通信之電磁波，可確實增加天線元件獲得之電力。

此外，本發明之特徵為：圖案層係形成複數導電性圖案，並組合角部之曲率半徑不同之導電性圖案而形成。

按照本發明，藉由形成角部之曲率半徑不同之導電性圖案，對於僅形成角部之曲率半徑相同之導電性圖案時，不降低增益之峰值，而可變更接收之電磁波之頻率帶域(以下，有時稱為「接收帶域」)。接收帶域之變更包含：擴大接收帶域及接收頻率之變更。如藉由在鄰接之導電性圖案之角部曲率半徑上賦予若干差異，不降低增益之峰值，而可擴大接收帶域，此外，如藉由在鄰接之導電性圖案之角部曲率半徑上賦予稍大之差異，不降低增益之峰值，而

可將接收之電磁波之頻率(以下，有時稱為「接收頻率」)向低的方向擴大。

此外，本發明之特徵為：圖案層係形成複數導電性圖案，鄰接之2個導電性圖案之間隔依位置而不同。

按照本發明，比將鄰接之2個導電性圖案之間隔保持一定時，可擴大增益。

此外，本發明之特徵為：用於無線通信之電磁波頻率包含於300 MHz以上300 GHz以下之範圍。

按照本發明，可使用頻率為300 MHz以上，300 GHz以下之電磁波正常地進行無線通信。在300 MHz以上，300 GHz以下之範圍中，包含UHF頻帶(300 MHz~3 GHz)、SHF頻帶(3 GHz~30 GHz)及EHF頻帶(30 GHz~300 GHz)。

此外，本發明之特徵為：總厚度為50 mm以下。

按照本發明，可減少厚度而達到可使用頻率為300 MHz以上300 GHz以下範圍中包含之頻率之電磁波而正常進行無線通信用之片體厚度，而達到薄型化。

此外，本發明之特徵為：用於無線通信之電磁波頻率包含於860 MHz頻帶以上1,000 MHz頻帶以下之任一頻帶(以下，稱為高MHz頻帶)，且總厚度為15 mm以下。

按照本發明，可減少厚度而達到可使用頻率包含於高MHz頻帶之頻率之電磁波而正常進行無線通信用之片體厚度，而達到薄型化。

此外，本發明之特徵為：用於無線通信之電磁波頻率包含於2.4 GHz頻帶，總厚度為8 mm以下。

按照本發明，可減少厚度而達到可使用頻率包含於2.4GHz頻帶之頻率之電磁波而正常進行無線通信用之片體厚度，而達到薄型化。

此外，本發明之特徵為：貯藏體層係包含對有機聚合物100重量份，作為磁性材料，以1重量份以上1500重量份以下之添加量包含選自鐵氧體、鐵合金及鐵粒子之群中之1個或複數材料之材料。

按照本發明，可在貯藏體層中賦予複數相對磁導率(μ'、μ")，可適切實現達成前述效果之片體。

此外，本發明之特徵為：係賦予難燃性。

按照本發明，片體具有難燃性。如使用包含標籤、讀取器、行動電話之天線元件進行無線通信之電子資訊傳達裝置，有時要求難燃性。片體亦可適用於要求此種難燃性之用途上。

此外，本發明之特徵為：至少一方之表面部具有黏合性或接合性。

按照本發明，由於至少一方表面部具有黏合性或接合性，因此，如前述妨礙通信構件等可黏合於其他物品上。藉此，可輕易使用片體。

此外，本發明之天線裝置之特徵為包含：天線元件，其係具有配合用於無線通信之頻率之共振頻率；及

前述通信改善用片體。

按照本發明，片體係設於天線元件與妨礙通信構件之間。藉此，可使用天線裝置，設於妨礙通信構件之近旁，

使用天線元件正常進行無線通信，而傳達電子資訊。如此，可實現可在妨礙通信構件近旁正常使用之天線裝置。

此外，本發明之電子資訊傳達裝置之特徵為：包含前述天線裝置。

按照本發明，可實現即使設於妨礙通信構件之近旁，仍可使用包含天線元件之天線裝置正常進行無線通性之電子資訊傳達裝置。

[發明之效果]

本發明藉由將通信改善用片體設置於天線元件與妨礙通信構件之間，在天線元件上，以電性絕緣狀態而在近旁配置圖案層來使用，引起導電性圖案與天線元件之電磁耦合，電磁能自導電性圖案轉移至天線元件，而將共振頻率之電磁能自導電性圖案供給至天線元件。因此，即使在妨礙通信構件之近旁，仍可正常進行無線通信，並可確保充分之通信距離。

此外，本發明將天線元件配置於妨礙通信構件之近旁時，由於在天線元件與妨礙通信構件之間配置收集用於無線通信之電磁波能量之貯藏體層，因此防止導通，可增加電抗(L)成分及電容(C)成分，此外可藉由複數相對介電常數之實數部ε'及/或複數相對磁導率之實數部μ'，彎曲進入片體之電磁波之傳播路徑，再者可藉由波長縮短效應而達到小型化。

此外，本發明藉由反射區域形成層形成反射區域，雖是體積小且厚度薄之片體，但是調整來自反射區域之反射波

之相位，藉由來自反射區域之反射波與到來之電磁波之干擾，可在片體表面及/或天線元件近旁設定電場強度高之區域。此外，將天線元件配置於妨礙通信構件之近旁時，由於可抑制因妨礙通信構件造成天線元件之輸入阻抗降低，因此即使在妨礙通信構件之近旁，仍可正常進行無線通信。

藉由設置反射區域形成層，可防止因各個妨礙通信構件之材料(材質)造成天線元件之通信條件改變，即使在任何環境下，均可使天線元件之通信條件穩定化。

此外，本發明藉由圖案層，接收對應於各導電性圖案尺寸之電磁波，可發現共振現象。依導電性圖案之尺寸之決定方法，可藉由用於無線通信之電磁波而增加天線元件獲得之電力。

此外，本發明由於尺寸及形狀中之至少任何一方不同之數種導電性圖案之各個共振頻路不同，因此可以圖案層接收數種頻率之電磁波。此外，可藉由用於無線通信之電磁波，而確實增加天線元件獲得之電力。

此外，本發明由於形成涵蓋寬廣範圍而連續構成之導電性圖案之圖案層，可涵蓋寬廣帶域之頻率而提高增益，因此，包含其之片體可接收寬廣帶域之頻率或數種頻率帶之電磁波。此外，可藉由用於無線通信之電磁波而確實增加天線元件獲得之電力。

此外，本發明由於接收電磁波之導電性圖案具有基本上為多角形之大致多角形之外輪廓形狀，且至少1個角部形

成曲線狀，因此，可實現增益之峰值高，且依電磁波之偏振方向，增益達到峰值之頻率的偏差小，而優異之通信改善用片體。

此外，本發明藉由形成角部之曲率半徑不同之導電性圖案，對於僅形成角部之曲率半徑相同之導電性圖案時，不降低增益之峰值，而可變更接收之電磁波之頻率帶域(以下，有時稱為「接收帶域」)。

此外，本發明比鄰接之2個導電性圖案之間隔保持一定時，可擴大增益。

此外，本發明可使用頻率為300 MHz以上，300 GHz以下之電磁波正常進行無線通信。

此外，本發明可減少厚度而達到可使用頻率為300 MHz以上，300 GHz以下範圍中包含之頻率之電磁波而正常進行無線通信用之片體厚度，而達到薄型化。

此外，本發明可減少厚度而達到可使用頻率包含於高MHz頻帶之頻率之電磁波而正常進行無線通信用之片體厚度，而達到薄型化。

此外，本發明可減少厚度而達到可使用頻率包含於2.4 GHz頻帶之頻率之電磁波而正常進行無線通信用之片體厚度，而達到薄型化。

此外，本發明由於貯藏體層係由對有機聚合物100重量部，其磁性材料係以1重量部以上，1500重量部以下之配合量，包含自鐵氧體、鐵合金及鐵粒子之群中選出之1個或複數材料之材料而構成，因此可適切實現達成前述效果

之片體。

此外，本發明之片體具有難燃性，而可適用於要求難燃性之用途上。

此外，本發明由於至少一方表面部具有黏合性或接合性，因此，可黏合於其他物品上。藉此，可輕易使用片體。

此外，本發明可實現設置片體，可設於妨礙通信構件之近旁，而適合用於無線通信之天線裝置。

此外，本發明可實現即使設於妨礙通信構件之近旁，仍可正常進行無線通信之電子資訊傳達裝置。

【實施方式】

圖1係本發明一種實施形態之通信改善用片體(以下稱片體)10之剖面圖。片體10係在妨礙通信構件之近旁，使用天線元件而正常進行無線通信用之片，且設於天線元件與妨礙通信構件之間。

該片體10係片狀，且包含：圖案層15、第一貯藏體層14、反射區域形成層12及貼合層11。片體10進一步包含第二貯藏體層13。各層11~15在圖1中係自上方側之厚度方向(疊層方向)一方側之電磁波入射側，依序堆疊：圖案層15、第一貯藏體層14、第二貯藏體層13、反射區域形成層12及貼合層11，並藉由該疊層構造而構成片體10。在圖案層15之電磁波入射側(圖1之上方)，亦可進一步形成並非反射電磁波之層之表面層16。以下，為了容易瞭解，有時將各貯藏體層14, 13稱為貯藏體層。

本實施形態中，片體10之必要構成要素係：圖案層15、貯藏體層及反射區域形成層12。但是，反射區域形成層12連接於具有其功能之電磁波反射材料(如金屬)而使用時，亦可不包含於片體10中。圖案層15形成起作用作為天線功能之導電性圖案22。貯藏體層係包含非導電性之電介質層及/或磁性體層之層，且由包含：複數相對介電常數之實數部ε'及/或複數相對磁導率之實數部μ'，而儘量抑制各個損失成分之複數相對介電常數之虛數部ε"及/或複數相對磁導率之虛數部μ"為較低之材料而構成。貯藏體層位於圖案層15之近旁，可藉由其複數相對介電常數之實數部ε'及/或複數相對磁導率之實數部μ'，彎曲進入片體10之電磁波之傳播路徑，並可藉由波長縮短效應，而使導電性圖案22及片體10之厚度小型化及薄型化。片體10之複數相對介電常數之實數部ε'之範圍，於通信頻率帶中係1~200，複數相對磁導率之實數部μ'之範圍於通信頻率帶中為1~100。並宜在接近導電性圖案22之處設置高ε'及/或高μ'之材料，如此容易獲得波長縮短效應。該貯藏體層可為單層，亦可為多層，亦可為含有空氣層之構造。如貯藏體層(電介質層)可使用發泡體、樹脂、紙、接合劑、黏合劑等，片體10如可為以：圖案層15、接合劑層(高介電常數)、發泡體層(低損失)及反射區域形成層12之方式堆疊之構造。此因，愈在圖案層15之近旁，愈容易獲得來自貯藏體層之波長縮短效應，而使用配合介電材料等之接合材料，確保導電性圖案22與反射區域形成層12之距離時，使用低損失之介電材

料，達到輕量化及低價格化，並進行通信改善之構造。該接合材料層及發泡體層形成本發明中所稱之貯藏體層。當然，並不限定於該構造，亦可組合各種材料。

圖1所示之構造，貯藏體層係包含第一及第二貯藏體層14, 13之構造。貯藏材料包含：包含介電性材料之介電性材(以下，有時稱為「介電材」)及包含磁性材料之磁性材。第一及第二貯藏體層14, 13由包含複數相對磁導率(μ', μ")之磁性材及包含複數相對介電常數(ε', ε")之介電材之至少任何一方之材料而構成，亦可均為磁性材或均為介電材，亦可任何一方為介電性材，且任何之另一方係磁性材。此外，僅使用亦可為介電材或磁性材之第一貯藏體層14，而不設置第二貯藏體層13之構造亦包含於本發明。本實施形態之第一貯藏體層14係磁性材，第二貯藏體層13係介電材。

反射區域形成層12係在與第二貯藏體層13之電磁波入射側之相反側的表面上，涵蓋全面形成導電性膜而構成，藉由堆疊於片體10之後述之標籤本體54而反射用於無線通信之電磁波。貼合層11具有黏合性或接合性，係由將片體10貼合於物品用之貼合材構成之層。貼合材包含黏合劑及接合劑之至少一種，藉由黏合性或接合性而具有結合力。貼合層11並非必要，亦可沒有。為形成一體者時，其構造不拘。

為求經由天線元件正常地進行無線通信，將本片體10作為對象之電磁波係依用途而決定者，如為包含於高MHz頻

帶之頻率的電磁波，更具體而言，在日本國內係包含於950 MHz以上，956 MHz以下範圍之頻率的電磁波。作為前述對象之電磁波之頻率係例示，即使是將例示之頻率以外頻率之電磁波作為對象之構造，亦包含於本發明。

此外，本片體10有時用於藉由2.4 GHz頻帶之頻率的電磁波正常進行無線通信。2.4 GHz頻帶係2400 MHz以上，而未達2500 MHz之頻率範圍。RFID系統使用之電磁波，包含於2400 MHz以上，2483.5 MHz以下之範圍。

作為前述對象之電磁波之頻率並非特別限定者，包含300 MHz以上，300 GHz以下之範圍，可選擇任意之單數或複數之頻率。在該300 MHz以上，300 GHz以下之範圍中包含：UHF頻帶(300 MHz~3 GHz)、SHF頻帶(3 GHz~30 GHz)及EHF頻帶(30 GHz~300 GHz)。

各層11~15之厚度尺寸及片體10全部之厚度尺寸並非特別限定者，舉例而言，本實施形態係形成圖案層15之厚度尺寸為100Å(1×10^{-8}m)以上，500 μm以下，第一貯藏體層14之厚度尺寸為1 μm以上，5 mm以下，第二貯藏體層13之厚度尺寸為1 μm以上，45 mm以下，反射區域形成層12之厚度尺寸為100Å(1×10^{-8}m)以上，500 μm以下，貼合層11為1 μm以上，1 mm以下，片體10全體之厚度尺寸為3 μm以上，50 mm以下，每單位面積之質量為0.1 kg/m^2以上，40 kg/m^2以下之片狀。片體10之全體厚度尺寸如前述地小，且各層13~16由前述之材料構成，而具有撓曲性。因此，片體10可隨意變形。

用於高MHz頻帶之無線通信情況下，片體10之全體厚度為0.1 mm以上，15 mm以下，用於2.4 GHz頻帶之無線通信情況下，片體10之全體厚度形成0.1 mm以上，8 mm以下。藉由形成此種構造，可減少厚度而達到可使用頻率為包含於高MHz頻帶或2.4 GHz頻帶之頻率的電磁波正常進行無線通信之片體10的厚度，而可達到薄型化。

本實施形態之第一貯藏體層14藉由選擇包含複數相對磁導率μ及複數相對介電常數ε之材料特性值，收集用於無線通信之電磁波。複數相對磁導率之實數部μ'愈大，磁力線愈集中通過，而可彎曲電磁波之傳播路徑。複數相對磁導率之虛數部μ"及磁導率損失項tanδμ(=μ"/μ')愈小，磁場能量之損失愈小。因此，複數相對磁導率之實數部μ'宜較大，複數相對磁導率之虛數部μ"及磁導率損失項tanδμ宜較小。藉由磁性體之波長縮短效應，而縮小導電性圖案之尺寸及圖案層與反射區域形成層之距離。此外，藉由電介質之波長縮短效應及沿著圖案之電磁波之路徑，而將相當於λ/4(2.4 GHz時約為3 cm)之距離縮短為約1 mm~約8 mm(2.4 GHz頻帶時)。此時，亦與在空間中之λ/4實質相同，而可包含於本發明中所稱之λ/4。此外，複數相對介電常數之實數部ε'愈大，電力線愈集中而通過，而可彎曲電磁波之傳播路徑，複數相對介電常數之虛數部ε"愈小，電場能量之損失愈小。因此，複數相對介電常數之實數部ε'宜較大，此外，複數相對介電常數之虛數部ε"宜較小。貯藏體層並非謀求能量損失，而係謀求集中收集能量，而以不損

失之形態通過。該貯藏體層中損失宜較小之性質，係本發明之片體10與電磁波吸收體不同之處。

此外，本發明中，複數相對磁導率之實數部μ'及虛數部μ"以及複數相對介電常數之實數部ε'及虛數部ε"之數值，係對應於用於無線通信之電磁波頻率之數值。用於無線通信之電磁波頻率如前述，亦可為包含UHF頻帶、SHF頻帶及EHF頻帶之300 MHz以上，300 GHz以下之範圍，如亦可為高MHz頻帶或2.4 GHz頻帶。

圖2係放大第一貯藏體層14之內部構造而顯示之剖面圖。圖2中，為了容易瞭解，係省略磁性粉末18及磁性微粒子19之陰影線而顯示。第一貯藏體層14為了獲得如前述之材料特性值，在結合材17上混合：包含具有磁性材料之粉末(以下，稱為「磁性粉末」)18與包含具有磁性材料之微粒子(以下，稱為「磁性微粒子」)19而形成。第一貯藏體層14之磁性材料含有磁性粉末18及磁性微粒子19。圖2係例示，而並不限定於此。本實施形態之結合材17包含聚合物，如包含非鹵素系聚合物，或混合非鹵素系聚合物與其他聚合物等之材料之非鹵素系混合材料。

結合材17亦可使用鹵素系聚合物。關於結合材17，如聚合物(樹脂、TPE、橡膠)凝膠、低聚物等，不論是有機系或無機系，此外，不取決於聚合度等可使用所有材質之材料。非鹵素系之材料係從環境觀點適合使用者。為求形成片，宜採用聚合材料，如宜使用以下列舉者，不過未列舉之種類的材料、刮片材料及合金化之材料等，凡是可形成

片之材料全部均可使用。

結合劑20之材料可使用各種有機聚合物材料，如包含：橡膠、熱可塑性彈性體及各種塑膠之高分子材料等。前述橡膠除天然橡膠之外，如有：異戊二烯橡膠、丁二烯橡膠、苯乙烯-丁二烯橡膠、乙二醇-丙烯橡膠、乙二醇-乙酸乙烯基系橡膠、丁基橡膠、氯丁二烯橡膠、硝基橡膠、丙烯基橡膠、乙二醇丙烯基系橡膠、環氧氯丙烷橡膠、氟橡膠、聚氨酯橡膠、矽橡膠、氯化聚乙烯橡膠及加氫硝基橡膠(HNBR)等合成橡膠單獨、此等之衍生物、或將此等以各種變性處理而改質者等。

此等橡膠除了單獨使用外，亦可混合數種而使用。橡膠中，除加硫劑之外，可適切配合加硫促進劑、防老化劑、軟化劑、可塑劑、填充劑及著色劑等先前用作橡膠配合劑者。除此等之外，亦可使用任意之添加劑。如為了控制介電常數及導電率，進行材料設計而添加指定量之電介質(碳黑、黑鉛、氧化鈦等)。再者，亦可適切選擇而添加加工輔助劑(滑劑、分散劑)。

熱可塑性彈性體如為：氯化聚乙烯等氯系、乙烯系共聚合物、丙烯基系、乙烯丙烯基共聚合物系、聚氨酯系、酯系、矽系、苯乙烯系、醯胺基系等各種熱可塑性彈性體及此等之衍生物。

再者，各種塑膠如為：聚乙烯、具丙烯、AS樹脂、ABS樹脂、聚苯乙烯、聚氯乙烯、聚偏氯乙烯等氯系樹脂、聚乙酸乙烯、乙二醇-乙酸乙烯共聚合物、氟樹脂、矽樹

脂、丙烯基系樹脂、尼龍、聚碳酸酯、聚對苯二甲酸乙二醇酯、醇酸樹脂、不飽和聚酯、聚碸、聚二苯硫化物樹脂、液晶聚合物、聚醯胺亞胺樹脂、聚氨酯樹脂、苯酚樹脂、尿素樹脂、環氧樹脂、聚醯亞胺樹脂等熱可塑性樹脂或熱硬化性樹脂及此等之衍生物。此等之結合劑可使用低分子量之低聚物型及液狀型者。如為藉由熱、壓力、紫外線、硬化劑等成型後，而形成片狀者，可選擇任意之材料。除此等之外，亦可使用陶瓷、紙、黏土等有機物質、無機物質之一切材料。

磁性粉末18係扁平之軟磁性金屬粉末，彼此不接觸而分散，且配向成對第一貯藏體層14之厚度方向垂直地延伸。磁性粉末18係大致圓板狀，平均厚度尺寸係2 μm，垂直於厚度方向之方向的平均外徑係55 μm。磁性微粒子19係厚度尺寸比金屬粉末小之微粒子，至少外表面部全體具有非導電性，而構成導電性降低。磁性微粒子19之平均外徑係1 μm。

形成第一貯藏體層14之結合材17，如使用添加氫之NBR橡膠之HNBR。此外，磁性粉末18如包含鐵、矽及鋁合金(鐵-矽-鋁)之鐵矽鋁磁性合金。此外，磁性微粒子包含抑制全體之導電性而具有耐腐蝕性之如氧化鐵(磁鐵礦)。前述之尺寸及材料不過是例示，並不限定於此。

第一貯藏體層14只要係具有適切之複數相對磁導率及複數相對介電常數者，其材料構成並無特別限定。如本實施例所示，亦可使軟磁性粉末18及/或磁性微粒子19分散於

結合材17中，亦可直接使用磁性體(金屬氧化物、陶瓷、粒狀體(granular)薄膜、鐵氧體電鍍等)作為第一貯藏體層14。軟磁性粉末18及/或磁性微粒子19之軟磁性粉末如為：鐵矽鋁磁性合金(鐵-矽-鋁合金)、坡莫合金(鐵-鎳合金)、矽鋼(鐵-銅-矽合金)、鐵-矽合金、鐵-矽-硼(-銅-鈮)合金、鐵-鎳-鉻-矽合金、鐵-鉻-矽合金、鐵-鋁-鎳-鉻合金、鐵-鎳-鉻合金、鐵-鉻-鋁-矽合金等。此外，亦可使用鐵氧體或純鐵粒子。鐵氧體如為：錳-鋅鐵氧體、鎳-鋅鐵氧體、錳-鎂鐵氧體、錳鐵氧體、銅-鋅鐵氧體、銅-鎂-鋅鐵氧體等軟鐵氧體，或是永久磁石材料之硬鐵氧體。純鐵粒子如為羰基鐵等。並宜使用磁導率高之扁平軟磁性粉末。除了以單體使用此等磁性材料外，亦可混合數種。軟磁性粉末亦可使用扁平軟磁性粉末與非扁平軟磁性粉末(針狀、纖維狀、球狀、塊狀等)之組合，不過，組合之至少一種宜為扁平狀。軟磁性粉末之粒徑為0.1 μm以上，1000 μm以下並宜為10 μm以上，300 μm以下者。此外，扁平軟磁性粉末之縱橫尺寸比為2以上，500以下，並宜為10以上，100以下者。軟磁性粉末，為求使其表面提高耐腐蝕性，亦可包含氧化覆膜。磁性粉末之表面宜實施表面處理。表面處理劑可使用耦合劑及界面活性劑等之一般處理法。此外，可使用提高磁性粉末與結合材之浸潤性之全部手段(樹脂覆膜、分散劑等)。

第一貯藏體層14之磁性材係包含軟磁性金屬、軟磁性氧化金屬、磁性金屬及磁性氧化金屬中之至少任何一種之材

料，並由含有其之材料而構成。第一貯藏體層14亦可為使包含軟磁性金屬、軟磁性氧化金屬、磁性金屬及磁性氧化金屬中之至少任何一種之粉末及微粒子之至少一方，如前述地分散於結合材17之構造，亦可藉由軟磁性金屬、軟磁性氧化金屬、磁性金屬及磁性氧化金屬中之至少任何一種而形成於包含薄膜之膜中。第一貯藏體層14中如亦可直接使用具有磁性之陶瓷(鐵氧體等)。

使磁性材料分散於結合材17之構造的第一貯藏體層14，係由對於作為結合材17之有機聚合物100重量部，以1重量部以上，1500重量部以下之配合量含有磁性材料之自鐵氧體、鐵合金及鐵粒子之群中選出之1種或數種材料之材料而形成。磁性材料對有機聚合物100重量部之配合量，宜為10重量部以上，1000重量部以下。磁性材料對有機聚合物100重量部之配合量未達1重量部時，無法獲得充分之磁導率，超過1500重量部時，加工性差，而無法製造片體10，或是製造困難。

第一貯藏體層14之構造相同時，複數相對磁導率之實數部μ'及虛數部μ"，依對象之電磁波頻率而異，並具有隨著對象之電磁波頻率提高，而變小之傾向。本實施形態中，作為對象之電磁波包含高MHz頻帶及2.4 GHz頻帶之電磁波。複數相對磁導率之實數部μ'及虛數部μ"具有隨著對象之電磁波頻率提高，而變小之傾向。因此，為了形成包含高MHz頻帶及2.4 GHz頻帶之電磁波而集中通過之構造，如與集中1以上10 MHz頻帶以下程度之低頻率電磁波而通

過為目的的構造比較，整體而言，複數相對磁導率之實數部μ'及虛數部μ"，特別是實數部μ'變小。

為了增大第一貯藏體層14中之複數相對磁導率之實數部μ'，需要增加第一貯藏體層14中由具有磁性之材料構成部分之量。此外，為了減少複數相對磁導率之虛數部μ"，只須減少磁力線之路徑20上由非磁性材料構成之部分即可。單純地考慮時，增加第一貯藏體層14中之磁性粉末18之配合量時，可增加由具有磁性之材料構成部分之量，並可減少磁力線之路徑上之由非磁性材料構成部分，不過，磁性粉末18之配合量過多，如各導電性磁性粉末18接觸時，造成第一貯藏體層14具有導電性，而在第一貯藏體層14內產生電流，結果產生導電性圖案與反射區域形成層之導通，而損害作為接收電磁波之天線之性能。因此，不可單純地增加磁性粉末18之配合量。

本實施形態藉由混合磁性粉末18與磁性微粒子19，防止磁性粉末18彼此接觸，且可使各磁性粉末18間介有磁性微粒子19，可增加由具有磁性之材料構成部分之量，並且減少磁力線之路徑25上由非磁性材料構成之部分。因此，對高MHz頻帶及2.4 GHz頻帶之電磁波，可獲得如前述之複數相對磁導率μ。

此外，本發明其他實施形態之第一貯藏體層14，為了提高磁性材料之填充率，係將成為平均粒子徑比約4：1之大小之兩種磁性粒子，混合於與前述相同之結合材17中，而混合磁性微粒子及軟磁性金屬纖維。再者，為了確保電絕

緣性，而混合電絕緣性微粒子。前述兩種磁性粒子包含與前述磁性粉末18相同之材料，大的一方之平均粒子徑約為20 μm，小的一方之平均粒子徑約為5 μm。此外，磁性微粒子及軟磁性金屬纖維包含鐵系材料，磁性微粒子之平均粒徑及軟磁性金屬纖維之平均纖維徑約為1 μm。電絕緣性微粒子包含氧化矽(SiO_2)，平均粒子徑約為10 nm。再者，為了儘量消除第一貯藏體層14內之空隙，第一貯藏體層14之實測比重值，取儘量接近於來自配合之理論比重值來設計、製造。即使變成圖2所示之構造，而係如前述之構造，同樣地，複數相對磁導率之虛數部μ"成為峰值之共鳴頻率向高頻率側偏移，再者，藉由提高為5 GHz及10 GHz，不致造成在300 MHz以上，特別是高MHz頻帶及2.4 GHz頻帶之複數相對磁導率之實數部μ'變大，且複數相對磁導率之虛數部μ"過大，而可實現第一貯藏體層14。

第二貯藏體層13亦可使用與第一貯藏體層14相同之材料，依其用途，只要是氯乙烯樹脂、三聚氰胺、聚酯樹脂、聚氨酯樹脂、木材、石膏、水泥、陶瓷、不織布、發泡樹脂、發泡體、隔熱材、包含耐燃紙之紙及玻璃布等不具導電性之介電材料，均可使用。當然，亦可適切配合介電材及磁性材。第二貯藏體層13之複數相對介電常數之實數部ε'在1以上50以下之範圍內作選擇。形成該構造時，可任意控制第二貯藏體層13及片體10之介電常數，而有助於導電性圖案22之小型化及片體10之薄型化。

片體10，其至少一方之表面部具有黏合性或接合性。本

實施形態如前述，具有貼合層11，藉此，於厚度方向之另一方側的表面部具有黏合性或接合性。片體10藉由貼合層11之黏合性或接合性的結合力，可貼合於物品上。因此，片體10如藉由貼合於妨礙通信構件57上，而可輕易地設於天線元件51與妨礙通信構件57之間。片體10之厚度方向的一方側配置於天線元件51，厚度方向另一方側配置於妨礙通信構件57側而設置。實現貼合層11之貼合材如使用日東電工社製No.5000 NS。

反射區域形成層12可為：金、白金、銀、鎳、鉻、鋁、銅、鋅、鉛、鎢、鐵等金屬，亦可為在樹脂中混入上述金屬之粉末、導電性碳黑之樹脂混合物、熟知之導電性墨或導電性樹脂之膜等。亦可為上述金屬等加工成板、片、膜、不織布、布等者。亦可為ITO及ZnO等之導電性氧化物。此外，亦可為組合金屬箔與玻璃布之形態。或是，亦可具有在合成樹脂性膜上形成有膜厚如為600Å之金屬層之構造。此外，亦可為將導電墨(導電率為5,000 S/m以上)塗布於基板上之構造。亦可為反射特定頻率之電磁波之篩網、圖案狀之構造。

使用上述反射區域形成層12之構成材料，可形成圖案層15之導電性圖案22。各導電性圖案22如包含銀、鋁等金屬，且導電率為5,000 S/m以上。板狀基底21如包含聚對苯二甲酸乙二醇酯，蒸鍍前述金屬而形成導電性圖案22。在此等導電性圖案22之近旁設置貯藏體層14, 13。

各導電性圖案22之尺寸依對象之電磁波頻率予以最佳

化，而決定為前述之尺寸。因此，前述尺寸係一種範例，且係依據對象之電磁波頻率而適切決定。此外，各導電性圖案22之間隔亦是依據對象之電磁波頻率，以接收效率提高之方式決定。此外，貯藏體層之特性，具體而言，為依據材質等之複數相對介電常數或複數相對磁導率及厚度等，依據對象之電磁波頻率，以接收效率提高之方式而決定。如此，決定導電性圖案22之尺寸及間隔尺寸，並構成貯藏體層，而可有效接收電磁波。

此外，本發明另外實施形態之片體10，如將難燃劑或難燃輔助劑添加於圖案層15、貯藏體層之至少任何一個，而賦予難燃性、準不燃性或不燃性。在圖案層15及貯藏體層中如添加有難燃劑或難燃輔助劑。藉此，在片體10中賦予難燃性。此外，亦可在片體10之至少外周之一部分，以具有難燃性或不燃性之材料覆蓋。如行動電話等之電子機器，其內裝之聚合物材料亦要求難燃性。

此種獲得難燃性用之難燃劑並無特別限定，如可適切使用磷化合物、硼化合物、溴系難燃劑、鋅系難燃劑、氮系難燃劑、氫氧化物系難燃劑及金屬化合物系難燃劑等。磷化合物如為磷酸酯、磷酸鈦等。硼化合物如為硼酸鋅等。溴系難燃劑如為：六溴苯、六溴環十二烷、十溴苄基苯基醚、十溴苄基苯基氧化物、四溴雙酚、溴化銨等。鋅系難燃劑如為碳酸鋅、氧化鋅或硼酸鋅等。氮系難燃劑如為三氮雜苯化合物、受阻胺化合物或三聚氰胺三聚氰酸脂、三聚氰胺胍化合物之三聚氰胺系化合物等。氫氧化物系難燃

劑如為氫氧化鎂、氫氧化鋁等。金屬化合物系難燃劑如為三氧化銻、氧化鉬、氧化錳、氧化鉻、氧化鐵等。

本實施形態於重量比中，藉由以結合材為100，溴系難燃劑為20，三氧化銻為10，磷酸酯為14之比分別添加，於UL94難燃試驗中可獲得相當於V0之難燃性。片體10可適合作為構成此種物品之素材，或是安裝於物品。如可適合安裝於飛機、船舶及車輛內之裝置等，而在希望防止燃燒及其產生之氣體的空間等中使用之物品。

此外，片體10具有電絕緣性。具體而言，藉由各層14, 13由前述之材料構成，片體10之表面電阻率(JIS K6911)為10^2 Ω/□以上。貯藏體層之表面電阻率宜較大。因此，可實現之最大值成為表面電阻率之上限值。如此具有高表面電阻率及電絕緣性。

此外，片體10具有耐熱性。具體而言，在橡膠或樹脂材料中添加交聯劑時之片體10之耐熱溫度為150℃，片體10至少達到超過150℃之溫度，其特性不產生變化。關於耐熱性，藉由以陶瓷或耐熱性樹脂(如在聚苯硫化物樹脂中添加SiO_2填料者)覆蓋標籤54、片體10、天線元件及IC晶片之至少一部分，即使在150℃以上，仍可保持耐熱性。以陶瓷覆蓋時，可為完全燒結，亦可為部分燒結或未燒結。

此外，本發明之其他實施形態，亦可形成不在圖1所示之實施形態之片體10中設置反射區域形成層12之構造。即使是不設置反射區域形成層12之構造，藉由設置於具有由

導電性材料構成部分之物體之面上而構成，仍可獲得相同之效果。此外，使用反射區域形成層12之構造，而防止受到各片體10之設置位置之影響，亦即，依構成妨礙通信構件之材料等，導致導電性圖案22之共振頻率變化，及片體10之接收特性變化。藉此，可防止天線元件51之通信條件變化，而可使天線元件51之通信條件穩定化。如即使將片體10設於建築物內裝材中，仍可防止受到其內裝材之複數相對介電常數等之影響，而導致可接收之頻率變化。

本發明使用之導電性圖案包含：以不連續之形態排列具有導電性之圖案之情況；及自具有導電性之層挖空成孔隙(空孔)狀之形態而形成之情況。而圖案之形狀中並無限制。可採用單一或數種使用，或組合使用圓形、方形、線狀、多角形、帶狀、不定形狀等可發揮天線功能之全部形狀。

圖3係顯示構成本發明一種實施形態之片體10之圖案層15之前視圖。圖4及圖5係圖3所示之實施形態中之圖案層15之一部分放大之前視圖。圖案層15在板狀基底21之電磁波入射側表面上形成導電性圖案22。板狀基底21如由合成樹脂之電介質而構成，該板狀基底21亦是介電材。導電性圖案22包含：放射形圖案30與矩形圖案31。板狀基底21與各導電性圖案22電性絕緣。圖3、圖4及圖5中，為了容易瞭解，而在導電性圖案22中附加斜線之陰影線來顯示。

放射形圖案30形成放射形狀，複數放射形圖案形狀30a相互隔以間隔(以下稱「放射形圖案間隔」)c2x, c2y而設

置。進一步具體說明，如本實施形態之放射形圖案形狀30a係形成沿著相互垂直之x方向及y方向之放射狀之十字狀，並在x方向隔以放射形圖案間隔c2x，在y方向上隔以放射形圖案間隔c2y，而規矩地配置成行列狀。

放射形圖案形狀30a係將圖5中以虛擬線表示之十字形40為基礎，而將交叉部分36之4個角部41形成曲線狀，具體而言係形成圓弧狀之形狀。成為基礎之十字形(以下稱為基礎十字形)40，係細長延伸於x方向之長方形之形狀部分34與細長延伸於y方向之長方形之形狀部分35，重疊此等各形狀部分34, 35之圖心，而在交叉部分36直角地交叉之形狀。各形狀部分34, 35在交叉部分36，於垂直之軸線周圍偏差90度，而具有相同形狀。其係將直角等腰三角形，且與直角之角部相對之斜邊朝向直角之角部而凹下之圓弧狀之4個大致三角形42，以直角之角部收納於基礎十字形40之各交叉部分36之角部41之方式而設置於該基礎十字形40中之形狀。

對象之電磁波頻率為2.4 GHz頻帶時，列舉放射形圖案形狀30a之一種尺寸，各形狀部分34, 35之寬度a1x, a1y相等，如為1.0 mm，各形狀部分34, 35之長度a2x, a2y相等，如為25.0 mm。形成弧狀之角部之圓弧狀之尺寸，亦即除去大致三角形42斜邊之邊長，具體而言係x方向之邊長a3x及y方向之邊長a3y相等，如為11.5 mm，斜邊之曲率半徑R1為11.5 mm。放射形圖案間隔之x方向間隔c2x與y方向之間隔c2y相等，如為4.0 mm。

矩形圖案形狀31a係在被放射形圖案形狀30a包圍之區域，自放射形圖案形狀30a隔以間隔(以下稱為「放射-方形間隔」)c1而配置，並以全面佔滿被放射形圖案形狀30a包圍之區域之方式設置。進一步詳細而言，係形成對應於被放射形圖案部包圍之區域之形狀。進一步具體說明，如本實施形態之放射形圖案部30係前述之十字形，被放射形圖案形狀30a包圍之區域係以長方形為基礎之大致長方形，而形成對應於其之形狀，亦即係形成放射-方形間隔c1在全周相同之形狀。各形狀部分34, 35如前述為相同形狀時，被放射形圖案形狀30a包圍之區域成為以正方形為基礎之大致正方形，矩形圖案形狀31a成為以正方形25為基礎之大致正方形。矩形圖案形狀31a係以成為基礎之正方形(以下稱為基礎正方形)25之邊部延伸於x方向及y方向之任何一方之方式配置。

矩形圖案形狀31a係大致矩形狀，且係以基礎正方形25為基礎，將4個角部26形成曲線狀，具體而言係形成圓弧狀之形狀。具體而言，係自基礎正方形25，以直角之角部收納於正方形之各角部26之方式的位置關係而除去直角等腰三角形，且與直角角部相對之斜邊朝向直角之角部而凹下之圓弧狀之4個大致三角形27之形狀。

對象之電磁波頻率為2.4 GHz頻帶時，列舉矩形圖案形狀31a之一種尺寸，基礎正方形25之x方向之尺寸b1x與y方向之尺寸b1y相等，如為25.0 mm。形成弧狀之角部之圓弧狀之尺寸，亦即除去大致三角形27斜邊之邊長，具體而言

係z方向之邊長b2x及y方向之邊長b2y相等，如為10.0 mm，角部之曲率半徑R2為10.0 mm。放射-方形間隔之x方向之間隔c1x與y方向之間隔c1y相等，如為4.0 mm。

如此，放射形圖案形狀30a及矩形圖案形狀31a係將大致多角形為基礎，具有至少1個角部係曲線狀之大致多角形之外輪廓形狀之導電性圖案。該圖案於接收電磁波時之共振電流，在形成曲線狀之角部順利地流動。

此外，放射形圖案形狀30a及矩形圖案形狀31a並非沿著前述形狀之外周緣而延伸之封閉迴路的線狀(帶狀)，而係內周部亦全面佔滿之面狀的圖案。因此可在與反射區域形成層12之間形成電容器。

此種片體10可藉由圖案層15而有效接收導電性圖案22之共振頻率之電磁波。片體10之共振頻率首先由導電性圖案22之長度及周圍長來律定。此因係以與特定頻率之電磁波共振之形式接收電磁波，因此依據其特定頻率之電磁波之波長的1/2或1/4之長度等，來決定共振長度。不過，最後之共振頻率，除了圖案尺寸之外，再加上各導電性圖案22之結合特性及第一及第二貯藏體層14, 13之複數相對介電常數之實數部ε'或複數相對磁導率之實數部μ'之波長縮短效應，來設置表面層16時，係受到其表面層16之複數相對介電常數之實數部ε'之波長縮短效應，及自第一及第二貯藏體層14, 13決定之輸入阻抗之影響而決定。該共振頻率與用於後述之天線元件51之無線通信時之頻率大致相等。

再者，以配合後述之標籤本體54之大小來使用片體10

時，放射形圖案形狀30a及矩形圖案形狀31a之至少任何一方，可能僅其一部分包含於導電性圖案22。此時，共振頻率係因應圖案形狀之縮短，亦即係因應包含於導電性圖案22之放射形圖案形狀30a之一部分形狀及大致矩形圖案形狀31a之一部分形狀，而向高頻側偏移。

圖6係顯示以模擬計算藉由導電性圖案22切斷之影響而變化之共振頻率之結果圖。圖7係顯示用於模擬之片體10之導電性圖案22之圖案形狀之前視圖。圖7中，橫軸表示頻率，縱軸表示反射損失。反射損失係從入射於片體10之電磁波被片體10反射之觀點而觀察時之損失，且係對應於片體10中電磁波接收量之值。反射損失以負值表示，反射損失之絕對值成為電磁波之接收量。亦即，成為作為天線之特性評估的指標。反射損失之值愈小，表示片體10接收電磁波之效率愈高。本發明之反射損失量之計算，係以電腦模擬來進行。模擬時使用TLM法，並使用Flomerics社製「Micro-Stripes」。進行其計算時，第一貯藏體層14之如2.4 GHz頻帶之材料常數分別為：複數相對介電常數之實部ε'=12.3，複數相對介電常數之虛部ε"=1.3，複數相對磁導率之實部μ'=1.3，複數相對磁導率之虛部μ"=0.5，厚度為0.5 mm。第二貯藏體層13之如2.4 GHz頻帶之材料常數為：ε'=4.6，ε"=0.1，厚度為2.0 mm。模擬時係計算在金屬板上堆疊片體10狀態下之頻率及反射損失之關係。

成為用於模擬之圖案層15之基本之導電性圖案22係a1x=a1y=1.0 mm，a2x=a2y=17.5 mm，a3x=a3y=7.5 mm，

c1x=c1y=1.5 mm，c2x=c2y=7.0 mm，b1x=b1y=20.5 mm，c1x=c1y=1.5 mm，R1=7.5，R2=7.0 mm。此外，垂直於片體10之疊層方向之長度方向(x方向)之尺寸1及寬度方向(y方向)之尺寸L2分別為L1=80 mm，L2=20 mm。

將藉由切割用於模擬之片體10之導電性圖案22之一部分而形成之兩種圖案形狀，分別設為第一圖案形狀22A及第二圖案形狀22B，並將形成有第一圖案形狀22A之片體10設為第一片體10A，將形成有第二圖案形狀22B之片體10設為第二片體10B。

圖7係第一片體10A之前視圖。第一圖案形狀22A包含導電性圖案22中，被通過放射形圖案形狀30a之圖心而平行於x方向之2個邊，與通過放射形圖案形狀30a之圖心而平行於y方向之2個邊所形成之長方形包圍之部分之大致矩形圖案形狀31a與放射形圖案形狀30a之一部分。第一圖案形狀22A包含沿著x方向排列成1行，各個圖心設於y方向中央之4個大致矩形圖案形狀31a，與排列於大致矩形圖案形狀31a周圍之放射形圖案形狀30a之一部分。

圖6中之實線38表示第一片體10A之頻率-反射損失特性。片體10之導電性圖案22係配合2.4 GHz頻帶而設計成為反射損失之峰值之頻率(共振頻率)者，抽樣切割後之第一片體10A，其共振頻率比2.4 GHz頻帶，向高頻側偏移。此時之共振頻率係在安裝天線元件51之前階段之片體10單體時者。

圖6中，第一片體10A之共振頻率與2.4 GHz頻帶不一

致，但是反射損失變大之共振峰值38A之前襟部分有2.4 GHz頻帶，亦即，由於2.4 GHz頻帶中之反射損失大，因此判明有收集2.4 GHz頻帶之頻率之電磁波的能力(收集而供給之能力)。這表示片體10在對象之2.4 GHz頻帶中，雖共振頻率並未完全地符合，但是藉由電抗匹配等來調整共振頻率時，可將片體10作為抑制金屬面等之影響之收發天線，而發揮將電磁波供給至天線元件51之作用上之增強天線之功能。

藉由在片體10上設置天線元件51，雖然共振頻率有可能進一步偏移，但是，藉由天線元件51與片體10間之距離調整、介電常數或磁導率調整、及調整導電性圖案22之切斷方法及天線元件51之尺寸，仍可對應。在天線元件51與片體10之間，可使用接合材或黏合材而介有如適當厚度之發泡體、樹脂、紙等。

片體10藉由形成前述之疊層構造，可提高電磁波之接收效率，因此作為天線功能可獲得大的增益，並可謀求薄型化及輕量化。

此外，導電性圖案22中，放射形圖案形狀30a如前述係以使延伸成放射狀之部分相互對接之方式配置，矩形圖案形狀31a形成對應於被放射形圖案形狀30a包圍之區域之形狀。該配置之接收原理不同(放射形圖案成為雙極天線，矩形圖案成為修補(patch)天線)，藉由組合放射形圖案30與矩形圖案31接收效率最佳(提高)。因此，可實現接收效率高之片體10。此外，放射形圖案形狀30a係沿著x方向及

y方向而放射之配置，並且係以成為矩形圖案形狀31a之基礎之正方形之邊部延伸於x方向及y方向之方式配置，可提高在x方向及y方向存在電場方向而偏振之電磁波之接收效率。

片體10上，接收電磁波之導電性圖案22具有基本上為多角形之大致多角形之外輪廓性狀，可比導電性圖案22之外輪廓形狀為圓形時，提高增益之峰值。因而，基本上為多角形，而至少1個角部形成曲線狀。藉此，可抑制並減少藉由電磁波之偏振方向，增益達到峰值之頻率之偏差。因此，可獲得增益之峰值高，且藉由電磁波之偏振方向而增益達到峰值之頻率偏差小之優異之接收特性。

片體10藉由圖案層15之導電性圖案22，按照天線之共振原理而接收特定頻率之電磁波。換言之，本發明之片體10即使導電性圖案22作為接收天線，仍具有有效地動作之功能。此時，特定頻率係依導電性圖案22之形狀及尺寸等諸元而決定之頻率。以導電性圖案22接收電磁波時，共振電流流入導電性圖案22之端部，而在導電性圖案22之周緣部周圍產生電磁場。片體10藉由共振而使特定頻率之電磁波集中於片體內部。

再者，藉由在圖案層15與導電性層之間介有貯藏體層之疊層狀態下使用片體10，可在圖案層15之導電性圖案22與導電性層之間構成電容器或電感器。導電性層於本實施形態係反射區域形成層12，在不設置反射區域形成層12之其他形態中，則是由導電性材料構成之物體的表面層。縮短

導電性圖案22與導電性層之距離時，可增大電容器之電容。此外，導電性圖案22相互間亦可形成電容器。電容器可儲存特定頻率之電磁能。此外，藉由利用電容器等，可藉由賦予電抗調整功能而達成薄型化。藉此，可在片體10中儲存對應於特定頻率之電磁能。在外觀上是儲存電磁能，不過，片體10實際上係使捕捉之電磁能不斷地通過。片體10以作為高性能之小型天線功能之導電性圖案22高效率地再放射特定頻率之電磁波，與入射波干擾，而形成電場強度強之區域，使後述之天線元件51發揮藉由電磁結合而傳送此等能量之角色。

圖8係分解包含片體10之標籤50而顯示之立體圖。標籤50係藉由無線通信而傳達資訊之一種電子資訊傳達裝置，如用作利用於固體自動識別之RFID(無線頻率識別)系統之轉發器。標籤50包含：天線元件51，電性連接於天線元件51，而使用天線元件51進行通信之通信機構之積體電路(以下稱「IC」)52及片體10。標籤50係構成藉由天線元件51接收來自讀取器之要求信號時，藉由天線元件51傳送表示記憶於IC52內之資訊之信號。因此，讀取器可讀取保持於標籤50之資訊。標籤50如貼合於商品而設置，用於商品管理，而防止商品遭竊及掌握庫存狀況等。包含天線元件51與片體10而構成天線裝置。標籤50係藉由天線元件51收發電磁波信號之電子資訊傳達裝置，且係利用接收之電磁波信號之能量回覆電磁波信號之無電池標籤。標籤50亦可為無電池標籤，亦可為內藏電池之電池標籤。

天線機構之天線元件51至少係電場型之天線元件，且係雙極天線或迴路天線或是單極天線，本實施形態係藉由雙極天線來實現。本發明之其他實施形態中，天線元件51亦可藉由其他天線而實現。藉由組合雙極天線與片體10，可實現天線元件51之小型化。藉由片體10之複數相對磁導率之實數部μ'及複數相對介電常數之實數部ε'之高度互相結合，除波長縮短效應之外，還可達成天線元件51之小型化。雙極天線係線狀，可以有曲線及曲折，全長為λ/2即可。如950 MHz時約為15.8 cm之長度，其中加上片體10之波長縮短效應，可形成約3~10 cm之線狀元件，即使加上曲折，其尺寸仍可保持在2~3 cm之程度。再者，亦可予以小型化，而使貼合對象之範圍廣。單極天線係在雙極天線之一側的元件與接地板之間供電，因此，可使元件全長進一步小型化成λ/4。形成迴路天線時，於全周接近1個波長時，可近似於將2個半波長雙極天線並列之構造，而可視為電場型之天線元件。為完全磁場型時，若係電場型與磁場型切換者或電場型與磁場型之功能並存者時，亦包含於本發明之天線元件。此外，本發明之天線元件中亦包含安裝電抗構造部者。

天線元件51藉由形成於由聚對苯二甲酸乙二醇酯(PET)構成之基底53之厚度方向一方側之表面部之圖案導體而實現。IC52配置於天線元件51之如中央部，而與天線元件51電性連接。IC52至少包含：記憶部與控制部。記憶部中可記憶資訊，控制部可使記憶部記憶資訊，或是自記憶部讀

取資訊。該IC52回應藉由天線元件51而接收之電磁波信號表示之指令，將資訊記憶於記憶部中，或是讀取記憶於記憶部中之資訊，並將表示該資訊之信號供給至天線元件51。基底53係長方形板狀，天線元件51延伸於長度方向而設於基底53之中央部。天線元件51及IC52之層之厚度尺寸為1 nm以上，500 μm以下，基底53之層之厚度尺寸為0.1 μm以上，2 mm以下。亦可為在片體10上直接印刷、加工天線元件51，而不使用基底之構造。

藉由天線元件51、IC52及基底53而構成標籤本體54。標籤本體54搭載於具有撓曲性之接合膠帶等加以包裝。藉由標籤本體54與片體10而構成標籤50。圖8中分解標籤本體54與片體10來顯示，不過，標籤本體54係使形成天線元件51之表面部，與片體10之一個表面(本實施形態為圖案層15之一個表面)相對而堆疊。天線元件51之表面藉由厚度為25 μm之由聚對苯二甲酸乙二醇酯構成之絕緣膜覆蓋，藉此，天線元件51與導電性圖案22絕緣。亦有在標籤本體54(亦有不含基底53之構造)與片體10之間，使用黏合劑及接合劑貼合，或是標籤本體54或片體10之任何一方或兩者具有黏合性及接合性而貼合之情況，不過圖8並未顯示。片體10形成長方形板狀，與標籤本體54堆疊而構成之標籤50成為長方形板狀。

片體10與標籤本體54之結合構造並無特別限定，亦可使用包含黏合劑及接合劑之結合劑而結合。在形成於片體10表面附近之電場強之區域，片體10與天線元件51在不導通

之狀態下堆疊，亦即，係經由具有電絕緣性之非導通層(亦可為電介質層或磁性體層)而堆疊。該片體10與天線元件51之距離可從天線元件51之通信特性來決定最佳位置。圖8中省略結合片體10與標籤本體54用之構造來顯示。標籤50自厚度方向之一方側向另一方側，依序堆疊有：基底53之層、天線元件51及IC52之層、標籤本體接合層、圖案層15、第一貯藏體層14、第二貯藏體層13、反射區域形成層12及貼合層11。

天線元件51可朝向與天線元件51延伸之方向交叉之方向傳送電磁波信號，並可接收自與天線元件51延伸之方向交叉之方向到來之電磁波信號。本實施形態可將天線元件51為基準，而向與片體10相反側之收發方向A傳送電磁波信號，並接收自收發方向A到來之電磁波信號。

標籤50如自讀寫器之資訊管理裝置，藉由天線元件51而接收表示預定須記憶之資訊(以下稱「主資訊」)，及指示記憶其主資訊之資訊(以下稱「指示記憶資訊」)之電磁波信號時，係自天線元件51對IC52供給表示主資訊及指示記憶資訊之電信號。IC52之控制部依據指示記憶資訊，而將主資訊記憶於記憶部中。

此外，藉由天線元件51接收表示指示自資訊管理裝置傳送記憶於記憶部之資訊(以下稱「記憶資訊」)之資訊(以下稱「指示傳送資訊」)之電磁波信號時，係自天線元件51供給表示指示傳送資訊之電信號至IC52。IC52之控制部依據指示傳送資訊，而讀取記憶於記憶部中之資訊(記憶資