UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.
Petitioner

v.

SCRAMOGE TECHNOLOGY LTD.
Patent Owner

U.S. Patent No. 10,461,426

PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,461,426

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I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") requests *inter partes* review ("IPR") of Claims 1-12, 17-29, 34-45, 50-52 ("challenged claims") of U.S. Patent No. 10,461,426 ("the '426 Patent," Ex-1001). According to PTO records, the '426 Patent is assigned to Scramoge Technology Ltd. ("PO"). For the reasons set forth below, the challenged claims should be found unpatentable and canceled.

II. MANDATORY NOTICES

A. Real Party-in-Interest

Petitioner identifies the following as the real parties-in-interest: Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

B. Related Matters

The '426 Patent is at issue in the following district court proceeding:

- *Scramoge Technology Ltd. v. Samsung Electronics Co. Ltd. et al.*, Case No. 2:22-cv-00015-JRG-RSP (E.D. Tex.)

C. Counsel and Service Information

Lead Counsel: Naveen Modi (Reg. No. 46,224). Backup Counsel: Joseph E. Palys (Reg. No. 46,508), Phillip Citroën (Reg. No. 66,541), and David Valente (Reg. No. 76,287). Service Information: Paul Hastings LLP, 2050 M Street, N.W., Washington, DC 20036. Tel: (202) 551-1700. Fax: (202) 551-1705. E-mail: PH-Samsung-Scramoge-IPR@paulhastings.com. Petitioner consents to electronic service.

III. PAYMENT OF FEES

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 50-2613.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '426 Patent is available for IPR, and that Petitioner is not barred or estopped from requesting IPR on the grounds identified below.

V. PRECISE RELIEF REQUESTED

Claims 1-12, 17-29, 34-45, and 50-52 of the '426 Patent should be cancelled as unpatentable based on the following grounds:

Ground 1: Claims 1-5, 9-12, and 50 are anticipated by Korean Patent Application Publication No. KR10-2015-0010063 ("Kim") (Ex-1005);

Ground 2: Claims 6, 17-22, 25-29, 34-39, 42-45, 51, and 52 are rendered obvious by Kim in view of U.S. Patent No. 9,276,642 ("Shostak") (Ex-1006);

Ground 3: Claims 7 and 8 are rendered obvious by Kim in view of Korean Patent No. 10-1185681 ("Kim '681") (Ex-1007);

Ground 4: Claims 12, 29, and 45 are rendered obvious by Kim in view of PCT Patent Publication No. 2013/141658 A1 ("An") (Ex-1008);

Ground 5: Claims 23, 24, 40 and 41 are rendered obvious by Kim in view of Shostak and Kim '681;

Ground 6: Claims 1-12, 17-29, 34-45, and 50-52 are rendered obvious by Shostak in view of Kim; and

Ground 7: Claims 12, 29, and 45 are rendered obvious by Shostak in view of Kim and An.

The '426 Patent issued on October, 29, 2019, from U.S. Patent App. No. 16/011,282 (Ex-1004), filed on June 18, 2018, and claims priority to Korean Patent Application No. 10-2015-0096051, filed on July 6, 2015.[1]

Kim published on January 28, 2015 (Ex-1005), Kim '681 issued on September 24, 2012 (Ex-1007), An published on September 26, 2013 (Ex-1008). Therefore, these references are prior art under AIA 35 U.S.C. § 102(a)(1). Shostak issued on March 1, 2016, from U.S. Patent App. No. 14/444,369, filed July 28, 2014 (Ex-1006) and is thus prior art at least under AIA 35 U.S.C. § 102(a)(2).

Other than Shostak's Pre-Grant Publication No. 2015/0381239 and An's U.S. counterpart (U.S. Patent Pub. No. 2015/0077296), which were cited by the examiner, none of these references were considered during prosecution. (Ex-1004, 540-45, 578-80, 708; Section X.B.)

[1] Petitioner does not concede that the '426 Patent is entitled to its claimed priority date.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art as of the claimed priority date of the '426 patent ("POSITA") would have had a bachelor's degree in electrical engineering, computer engineering, applied physics, or a related field, and at least one year of experience in the research, design, development, and/or testing of wireless charging systems, or the equivalent. (Ex-1002, ¶20.)[2] More education can supplement practical experience and vice versa. (*Id.*)

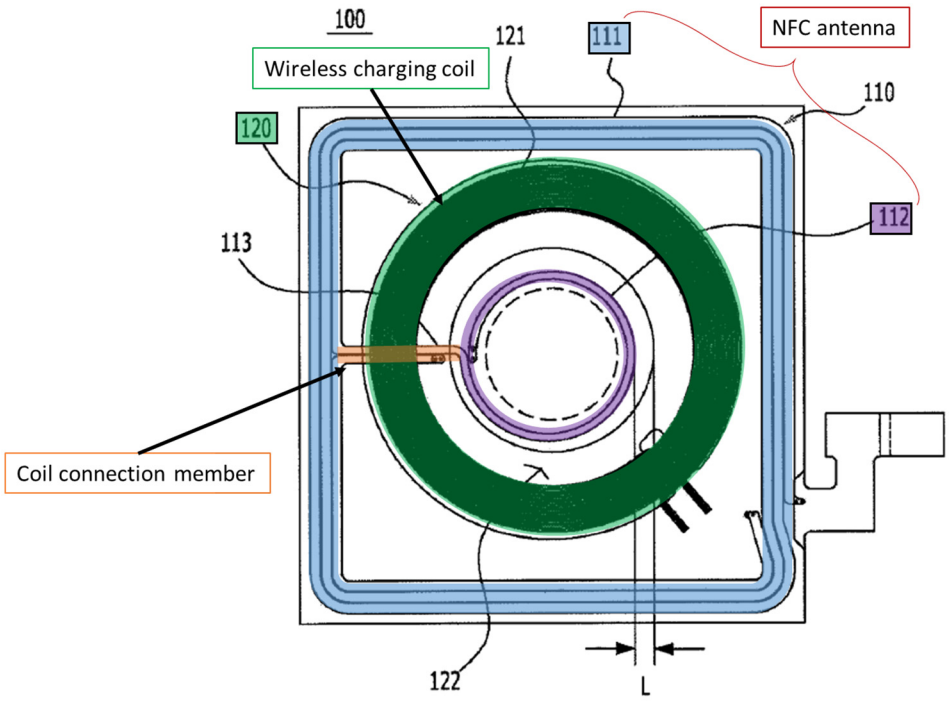
VII. OVERVIEW OF THE '426 PATENT

The '426 Patent relates to "a wireless antenna capable of simultaneously supporting wireless charging and near field communication (NFC)." (Ex-1001, Title, 1:22-25; Ex-1002, ¶¶27-28.) The '426 Patent intends to address limitations of conventional antennas that have both a wireless charging antenna and an NFC antenna. (Ex-1001, 1:39-64.) In such antennas, "charging efficiency may be reduced or NFC recognition efficiency may be deteriorated due to interference between the two loop antennas." (Ex-1001, 1:51-56.) Thus, the '426 Patent provides "a wireless antenna designed such that a loop antenna that supports an NFC

[2] Petitioner submits the testimony of Dr. R. Jacob Baker (Ex-1002, ¶¶1-244), an expert in the field of the '426 Patent. (*Id.*, ¶¶5-15; Ex-1003.)

function is added inside a loop antenna that supports wireless charging, and a wireless terminal to which the same is applied." (*Id*., 1:60-64.)

With respect to figure 1 below, the '426 Patent concerns "a wireless antenna including a near field communication (NFC) antenna [110] including a first coil member [111] and a second coil member [112] each including at least one first loop pattern, and a charging antenna [120] including an induction coil member including at least one second loop pattern formed between the first coil member [111] and the second coil member [112]." (*Id.*, 2:4-12, 3:44-62, 4:40-58.) "The NFC antenna may further include a coil connection member [113] connected to one side of an inner surface of the first coil member and to one side of an outer surface of the second coil member." (*Id.*, 2:13-16, 4:59-5:4.)



(*Id.*, FIG. 1 (annotated).)

VIII. CLAIM CONSTRUCTION

For IPR proceedings, the Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 83 Fed. Reg. 51,340-59 (Oct. 11, 2018). The Board, however, only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper No. 11 at 16 (Aug. 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Petitioner believes that no express constructions of the claims are necessary to assess whether the prior art reads on the challenged claims.

IX. DETAILED EXPLANATION OF UNPATENTABILITY

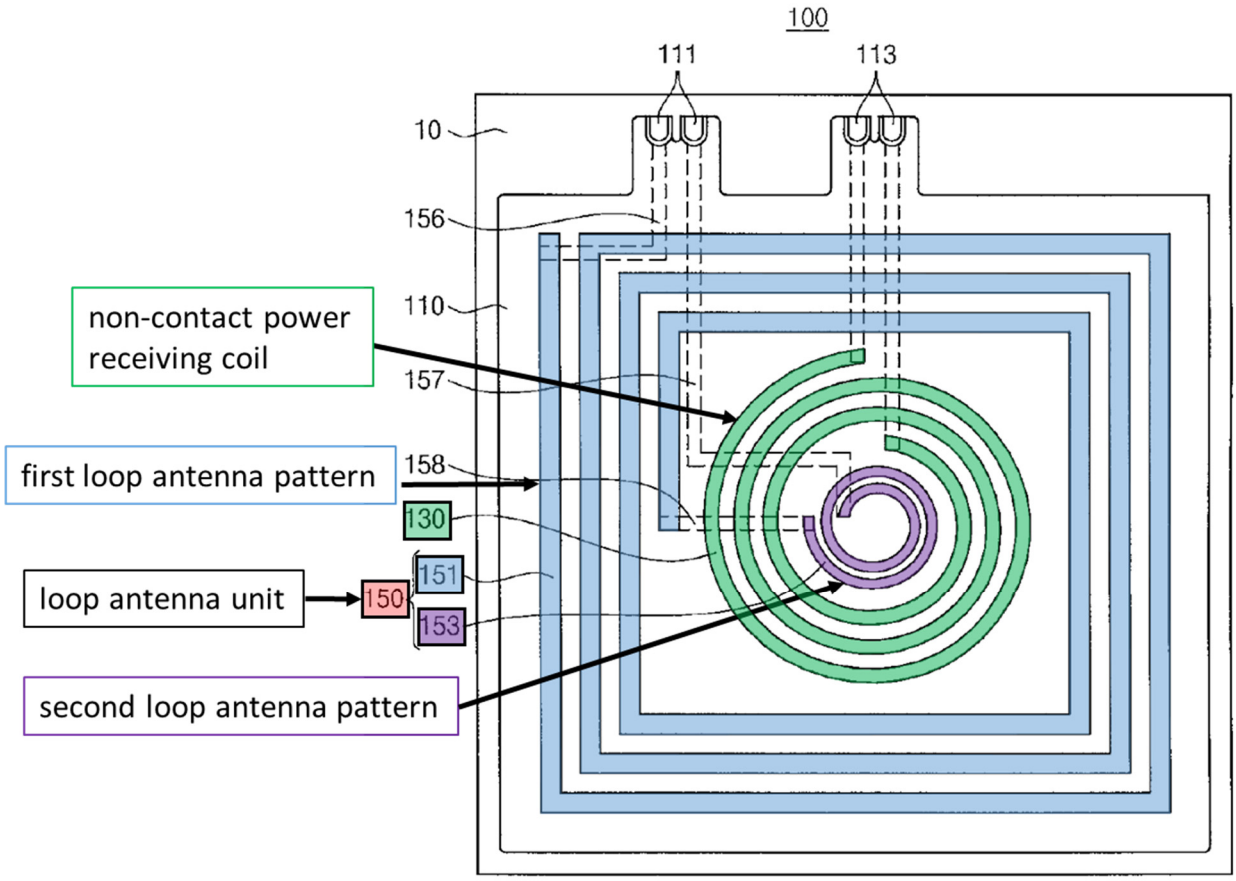
A. Ground 1 – Claims 1-5, 9-12, and 50 are Anticipated by Kim

1. Claim 1

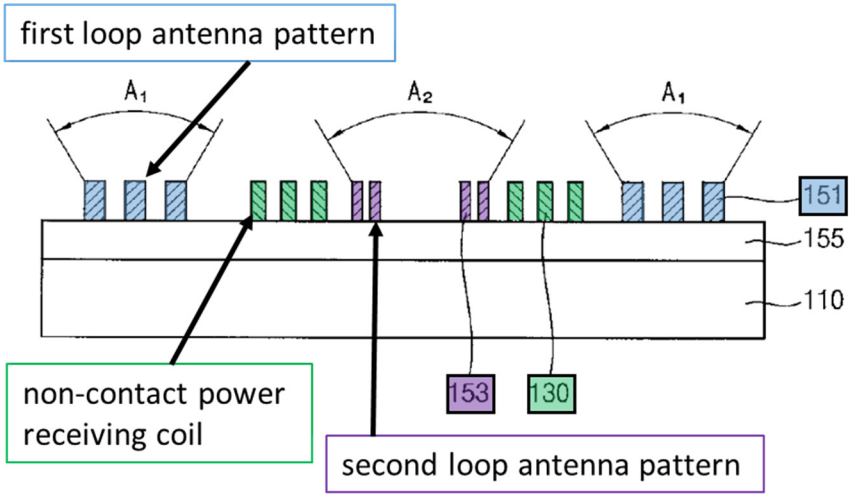
a) 1[pre]: A wireless antenna comprising:

To the extent the preamble of claim 1 is limiting, Kim discloses the features therein. (Ex-1002, ¶¶48-49.) For instance, Kim discloses "an **antenna structure** for near field communication capable of **non-contact charging** and **near field communication** by generating an induced electromotive force." (Ex-1005, ¶[0001] (emphasis added); *see also id.*, Title, Abstract, ¶¶[0012]-[0013], [0025]-[0026], [0031], FIGs. 1, 2; Ex-1019, ¶[0006] and Ex-1020, ¶[0006] (explaining NFC); Ex-1027, ¶¶[0003], [0005]-[0007], [0048]-[0049], [0052]-[0054] (explaining wireless charging); Ex. 1002, ¶¶22, 30.))

Kim's antenna structure 100 ("wireless antenna") includes a loop antenna unit 150 with a first loop antenna pattern 151 and a second loop antenna pattern 153 that are electrically connected. (*Id.*, ¶¶[0012]-[0013], [0025]-[0026], [0031].) The antenna structure 100 also includes a non-contact power receiving coil unit 130 disposed between the first loop antenna pattern 151 and the second loop antenna pattern 153. (*Id.*)



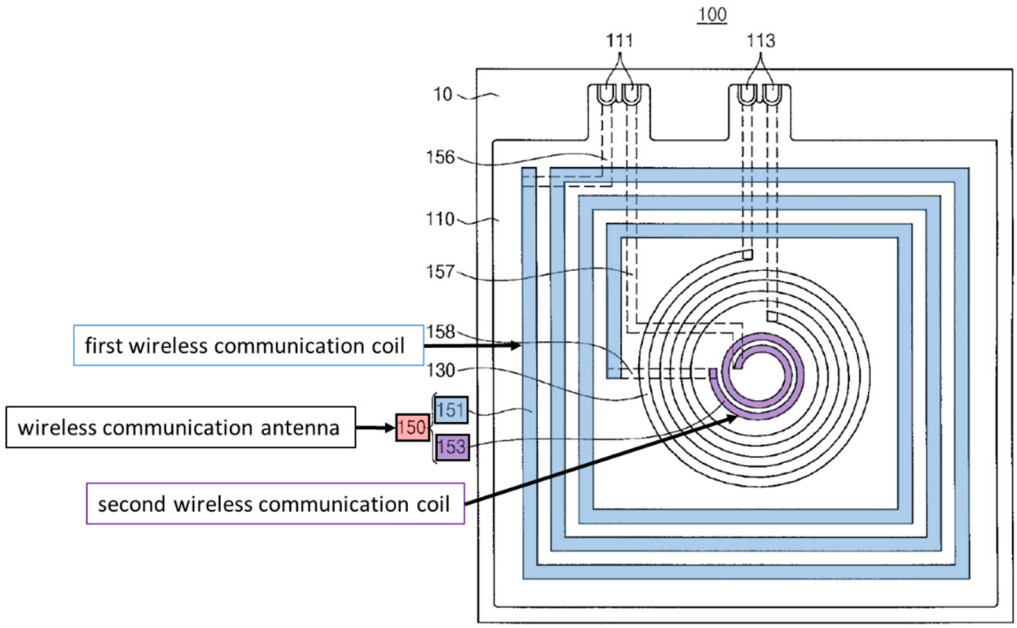
(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶49.)



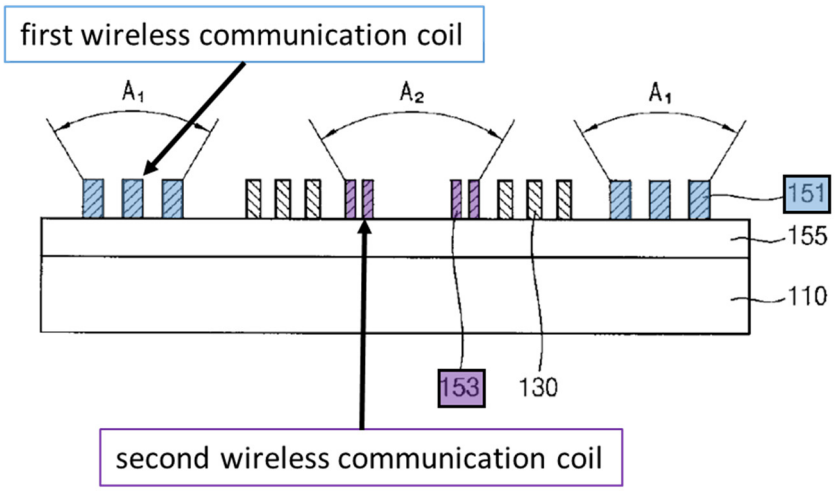
(Ex-1005, FIG. 2 (annotated); Ex-1002, ¶49.)

b) 1[a]: a wireless communication antenna comprising a first wireless communication coil and a second wireless communication coil; and

Kim discloses these features. (Ex-1002, ¶¶50-52.) For instance, Kim discloses that the antenna structure 100 ("wireless antenna") includes a loop antenna unit 150 ("wireless communication antenna") that has a first loop antenna pattern 151 ("first wireless communication coil") and a second loop antenna pattern 153 ("second wireless communication coil") electrically connected to the first loop antenna pattern 151. (Ex-1005, ¶[0031], FIGs. 1, 2.) The first and second loop antenna patterns (151, 153) are each depicted as coils. (*Id*., FIG. 1; Ex-1002, ¶50.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶50.)

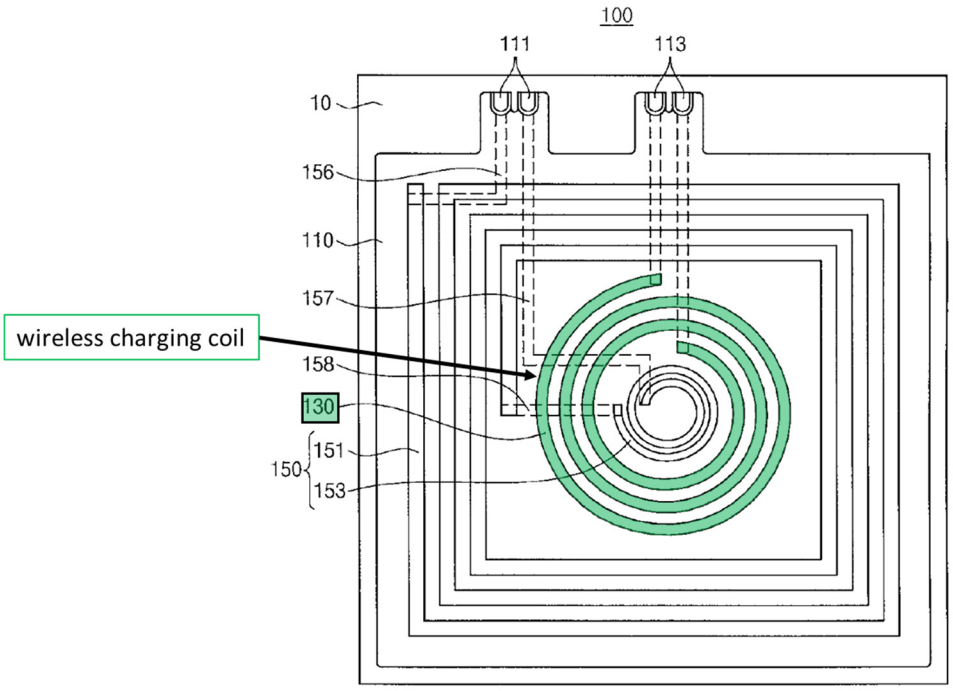


(Ex-1005, FIG. 2 (cross-section of FIG. 1) (annotated); Ex-1002, ¶50.)

Kim discloses that "[t]he loop antenna unit (150) enables near field **communication**," and "is electrically connected to the terminals for near field **communication** (111)." (Ex-1005, ¶[0031] (emphasis added).) Kim further discloses that "the first loop antenna pattern (151) enables near field **communication** with an RFID tag located in the A1 region adjacent to that location corresponding to the edge of the base (110)," and that "the second loop antenna pattern (153) can enable near field **communication** with an RFID tag adjacent to the location in the A2 region corresponding to the center portion of the base (110)." (*Id.*, ¶[0031] (emphasis added), FIG. 2.) Thus, Kim's first and second loop antenna patterns 151, 153 correspond to the claimed first and second wireless communication coils at least because they are in a coil-shaped pattern and because they enable near field communications. (Ex-1002, ¶51.)

c) 1[b]: a wireless charging antenna comprising a wireless charging coil,

Kim discloses this feature. (Ex-1002, ¶¶53-55.) For instance, Kim discloses a non-contact power receiving coil unit 130 ("wireless charging antenna comprising a wireless charging coil") for wirelessly receiving power that is "a loop **antenna** in the form of a **spiral coil**." (Ex-1005, ¶¶[0004]-[0005] (emphasis added), [0028]-[0029], FIGs. 1, 2; Ex-1002, ¶¶53-54.)

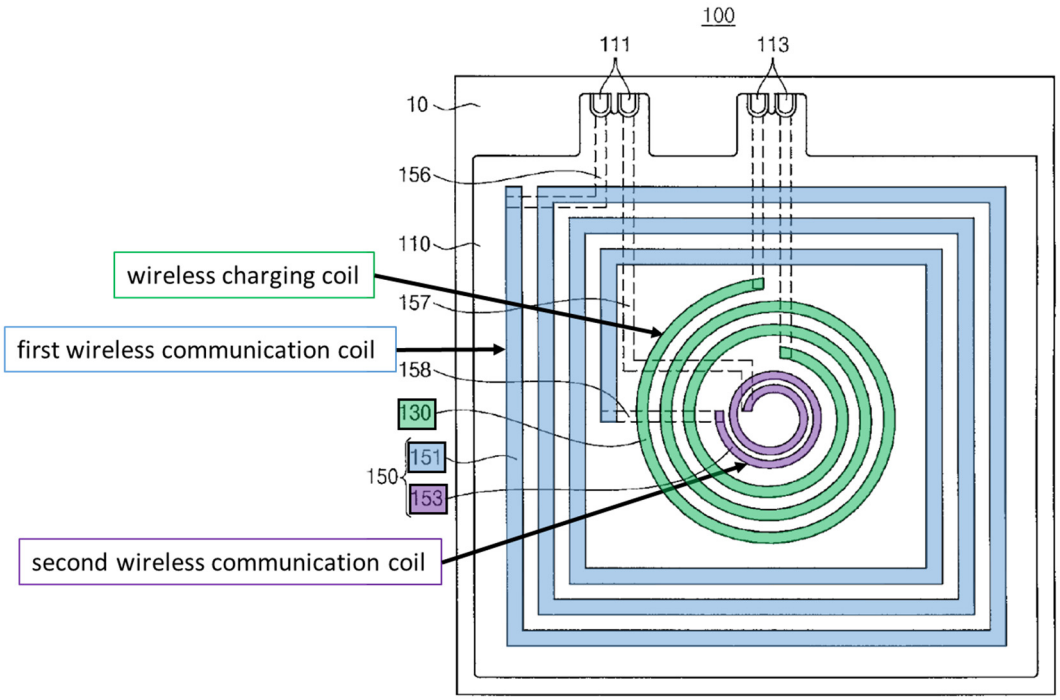


(*Id.*, FIG. 1 (annotated); Ex-1002, ¶53.)

d) 1[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, and the second wireless communication coil is disposed inside the wireless charging coil,

Kim discloses this feature. (Ex-1002, ¶¶56-58.) For instance, as discussed above in Sections IX.A.1(a)-(b), Kim discloses a first loop antenna pattern 151

("first wireless communication coil") that surrounds a non-contact power receiving coil unit 130 ("wireless charging coil"), and a second loop antenna pattern 153 ("second wireless communication coil") disposed inside the non-contact power receiving coil unit 130. (Ex-1005, ¶[0031]; FIGs. 1, 2; Ex-1002, ¶¶56-57.)

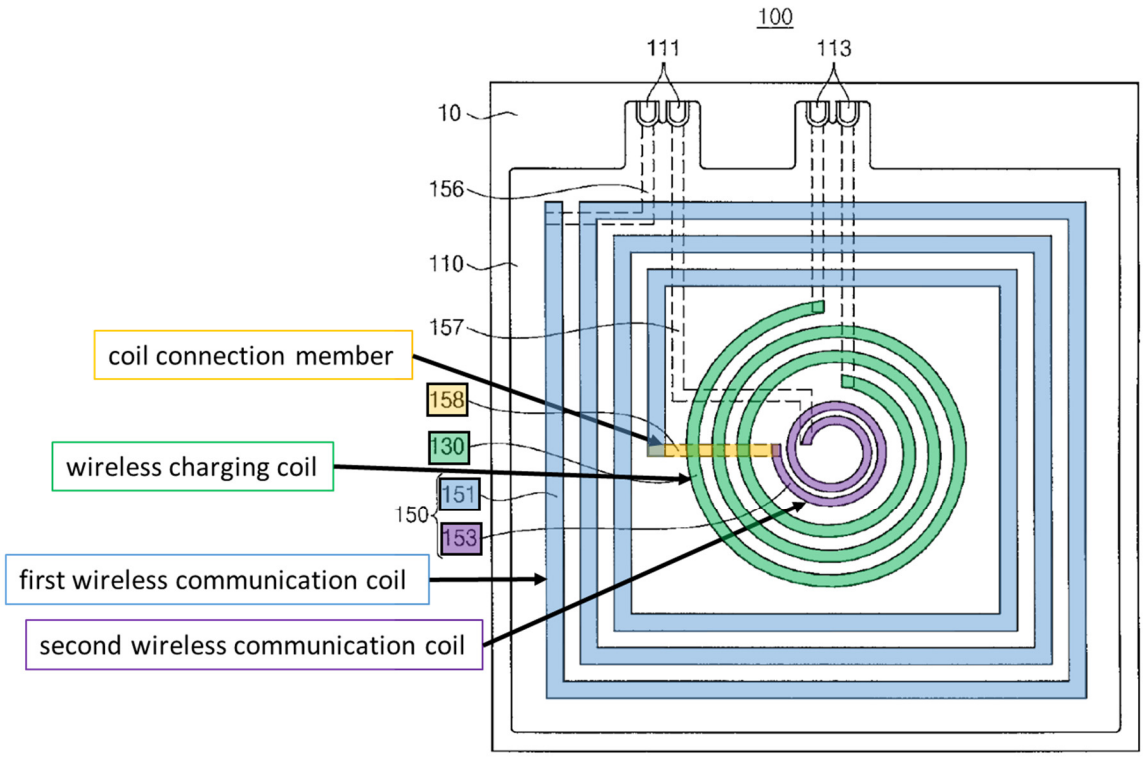


(*Id.*, FIG. 1 (annotated); Ex-1002, ¶57.)

e) 1[d]: wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil so as to interconnect the first wireless communication coil and the second wireless communication coil,

Kim discloses this feature. (Ex-1002, ¶¶59-60.) For instance, Kim discloses that the loop antenna unit 150 comprises second connection line 158 ("coil connection member") that "interconnects the first and second loop antenna patterns

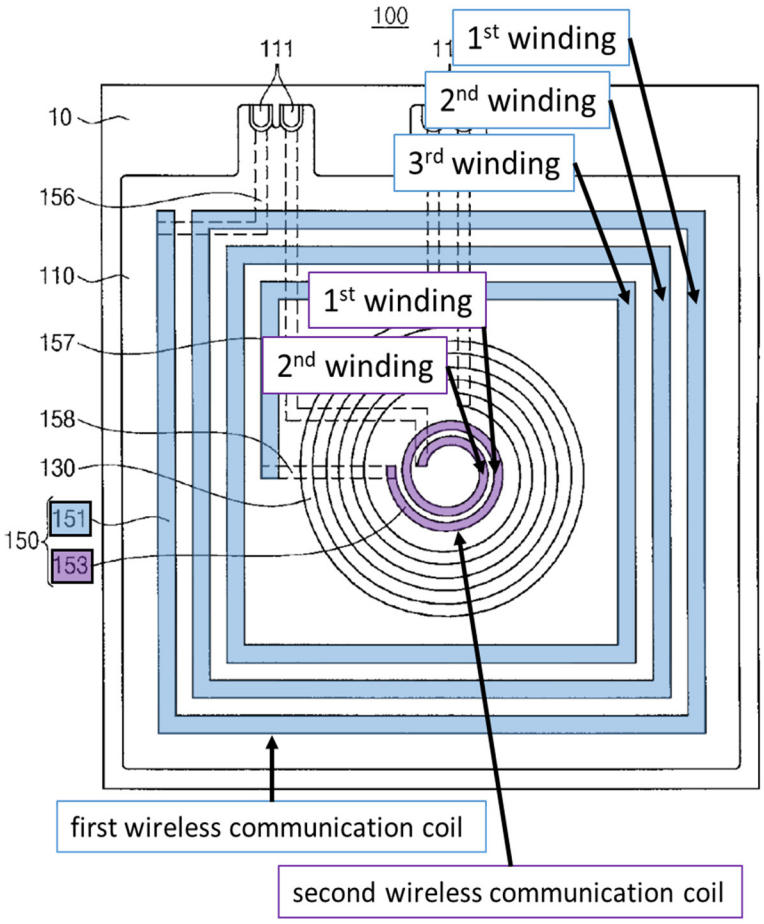
(151, 153)" by traversing the wireless charging coil 130. (Ex-1005, ¶¶[0031]-[0032], [0035], FIG. 1); Section IX.A.1(b).)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶60.)

f) 1[e]: wherein a number of windings of the second wireless communication coil is less than a number of windings of the first wireless communication coil, and

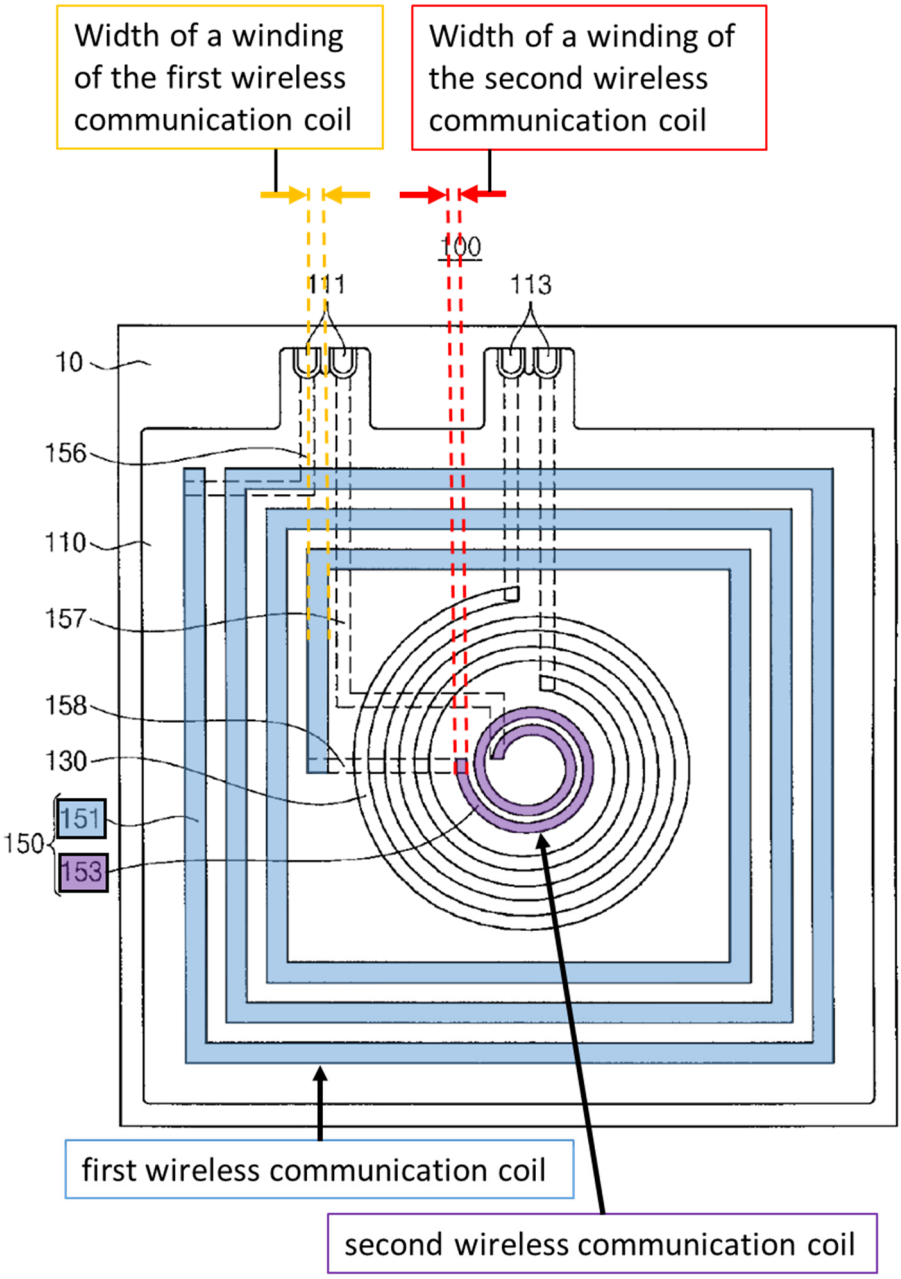
Kim discloses this feature. (Ex-1002, ¶61.) For instance, Kim discloses a second loop antenna pattern 153 ("second wireless communication coil") with two windings and a first loop antenna pattern 151 ("first wireless communication coil") with three windings. (Ex-1005, FIGs. 1, 2.)



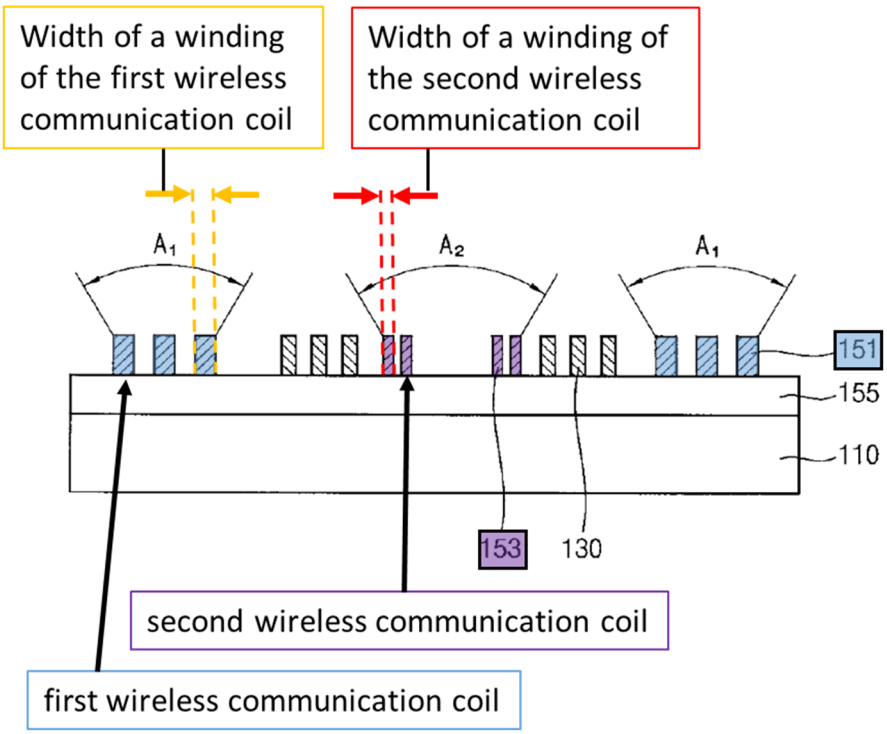
(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶61.)

g) 1[f]: wherein a width of a winding of the second wireless communication coil is less than a width of a winding of the first communication coil.

Kim discloses this feature. (Ex-1002, ¶¶62-64.) For instance, Kim discloses that a width of a winding of second loop antenna pattern 153 (the "second wireless communication coil") is less than a width of a winding of the first loop antenna pattern 151 (the "first communication coil"). (Ex-1005, FIGs. 1, 2; Ex-1002, ¶62.)



(Ex-1005, FIG. 1 (annotated).)

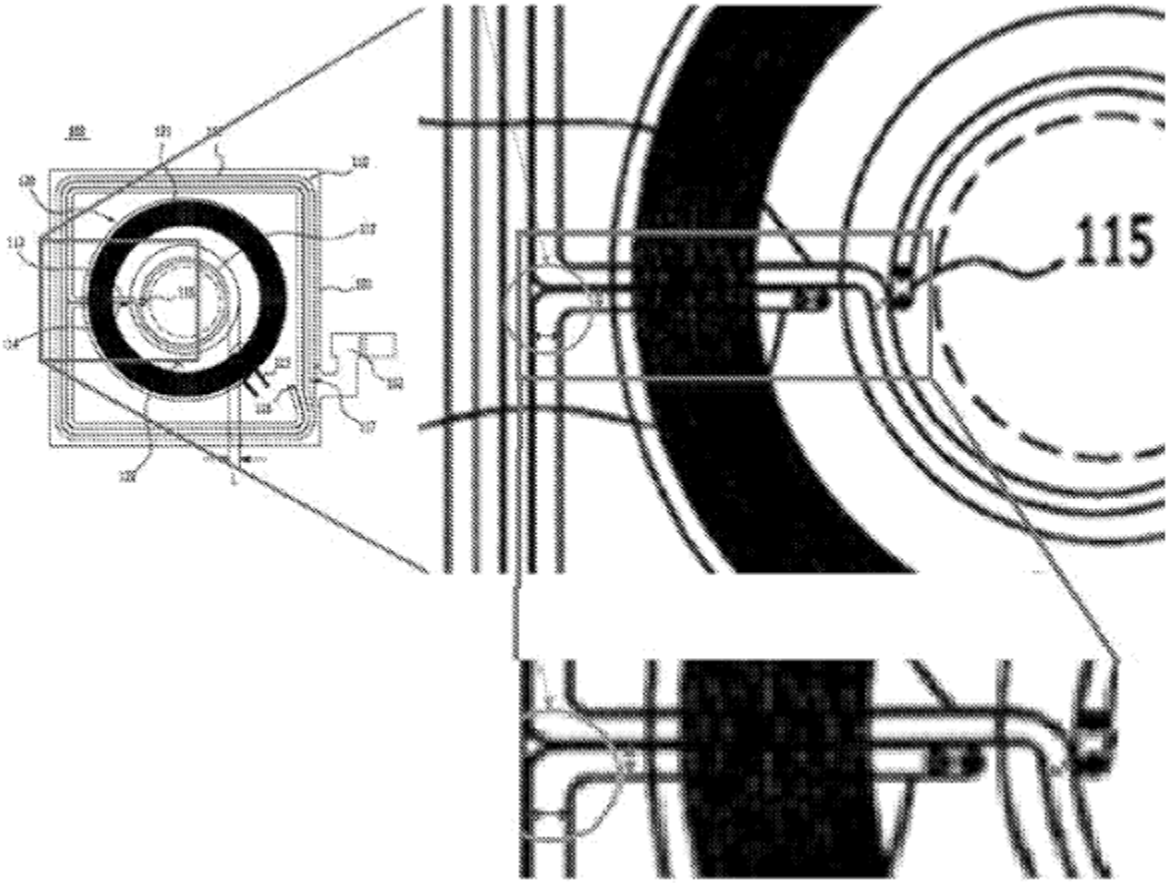


(*Id.*, FIG. 2 (annotated).)

To the extent PO contends it is improper to rely on Kim's relative dimensions, the Board has found relative dimensions in patent drawings to be sufficient in similar circumstances. *See Unified Patents, LLC v. Oceana Innovations LLC*, IPR2020-01463, Paper 27 at 49 (P.T.A.B. Feb. 14, 2022) ("relying on [the prior art's] relative horizontal and vertical dimensions"); *see also e.g.*, *In re Sato*, Appeal 2012-001276, 2014 WL 1154010, at *4-5 (P.T.A.B. Mar. 20, 2014) (affirming examiner's rejection based on "the relative size of the depicted structures"); *In re Mraz*, 455 F.2d 1069, 1072 (CCPA 1972). This is particularly true where, as here, the specification gives reason to believe that those relative dimensions are intentionally depicted. For instance, Kim's figures 1 and 2 both show the three coils (151, 130, and 153) having

different relative widths that are the same in both figures. (Ex-1005, FIGs. 1, 2; Ex-1002, ¶63.)

Moreover, even though Applicant's addition of this feature was the reason the Examiner ultimately allowed the claims, the text of the as-filed application for the '426 patent did not describe the relative widths of the coils' windings. (Ex-1004, 297, 370, 379-81, 516.) That text was added to the specification during prosecution based on its depiction in the figures. (*Id.*, 311-318, 322, 354, 370, 516.)



(Ex-1004, 366 (figure provided by Applicant to examiner allegedly showing the dimensions of claim element 1[f]).)

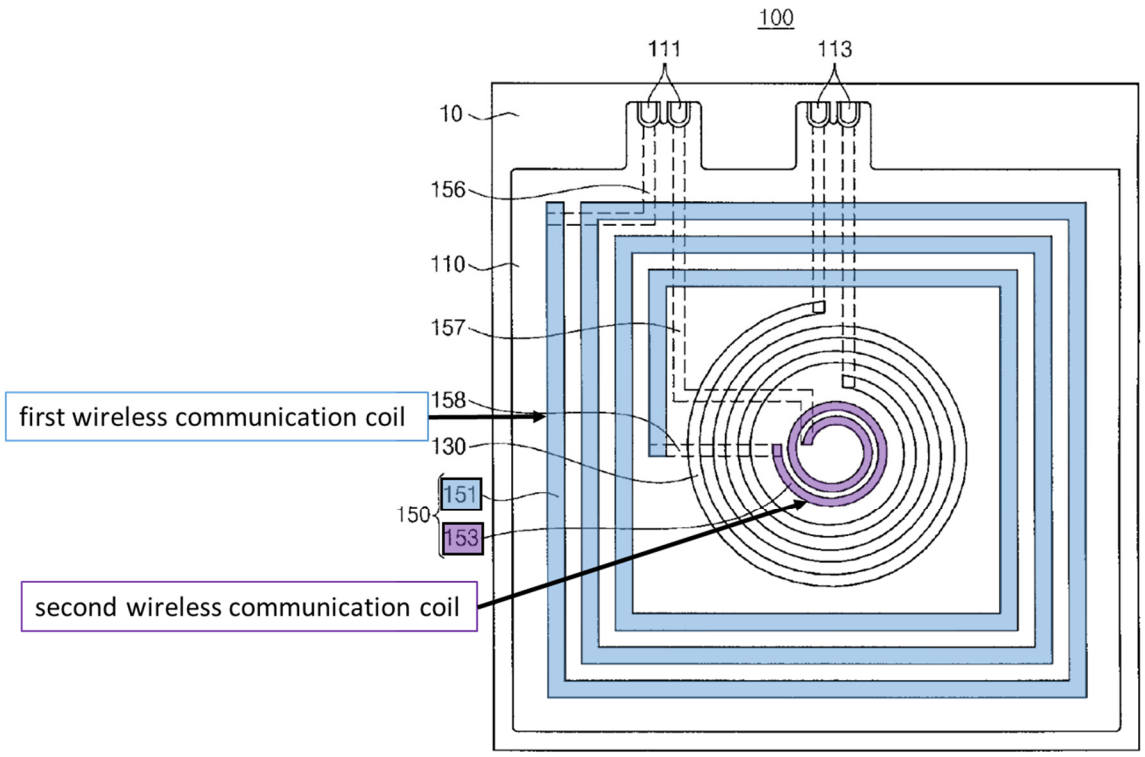
Thus, Kim provides at least as much disclosure as the as-filed application for the '426 patent. In view of the prosecution history, a finding that Kim does not disclose this feature would lead to the incongruous result that the Office is applying a *lower* bar for § 112(a) than for anticipation.[3]

2. Claim 2

a) The wireless antenna according to claim 1, wherein the first wireless communication coil and the second wireless communication coil have different shapes.

Kim discloses these features. (Ex-1002, ¶65.) For instance, Kim discloses a first loop antenna pattern 151 ("the first wireless communication coil") having a substantially rectangular shape, and a second loop antenna pattern 153 ("the second wireless communication coil") having a substantially circular shape (i.e., different shapes). (Ex-1005, FIG. 1; Ex-1002, ¶65.)

[3] Petitioner takes no position in this proceeding on whether any claim of the '426 patent has adequate written description support and reserves all rights to contend, in an appropriate proceeding, that the claims fail to meet the requirements of § 112(a).

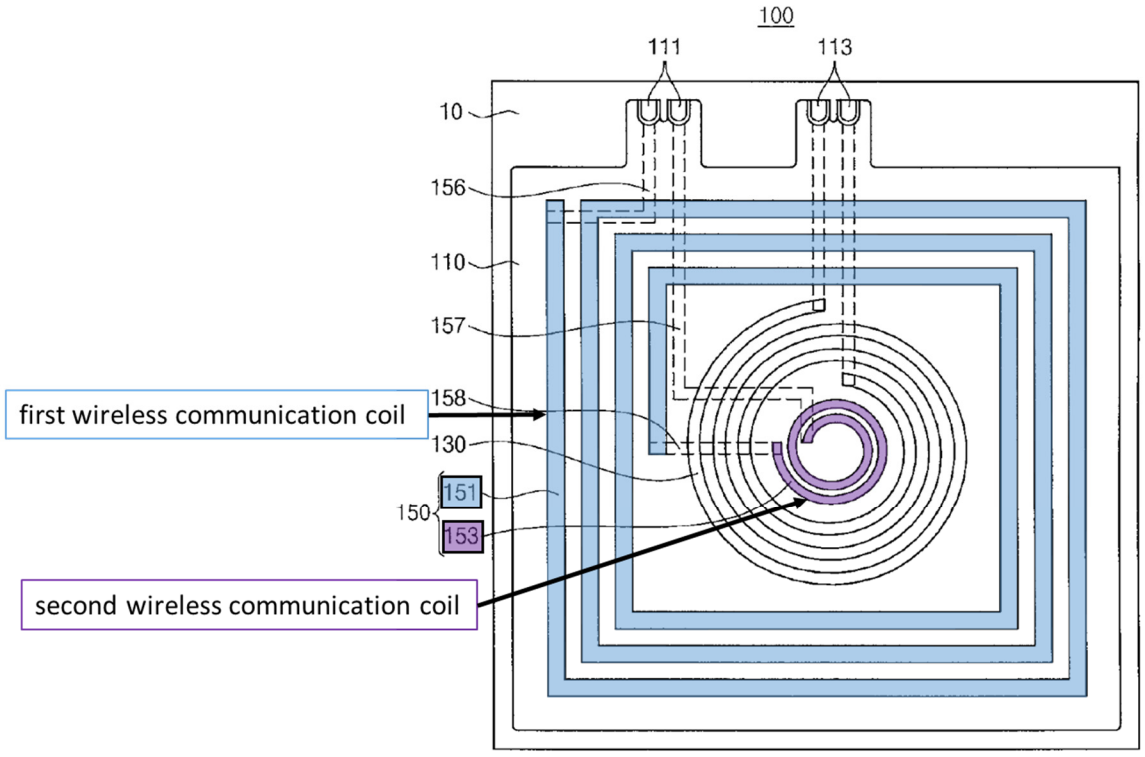


(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶65.)

3. Claim 3

a) The wireless antenna according to claim 2, wherein a shape of the first wireless communication coil is a polygonal loop pattern, and wherein a shape of the second wireless communication coil is a circular loop pattern.

Kim discloses these features. (Ex-1002, ¶66.) For instance, Kim discloses a first loop antenna pattern 151 ("first wireless communication coil") having a rectangular ("polygonal") shape with a loop pattern, and second loop antenna pattern 153 ("second wireless communication coil") having a circular shape with a loop pattern. (Ex-1005, FIG. 1; Section IX.A.2(a); Ex-1002, ¶66.)

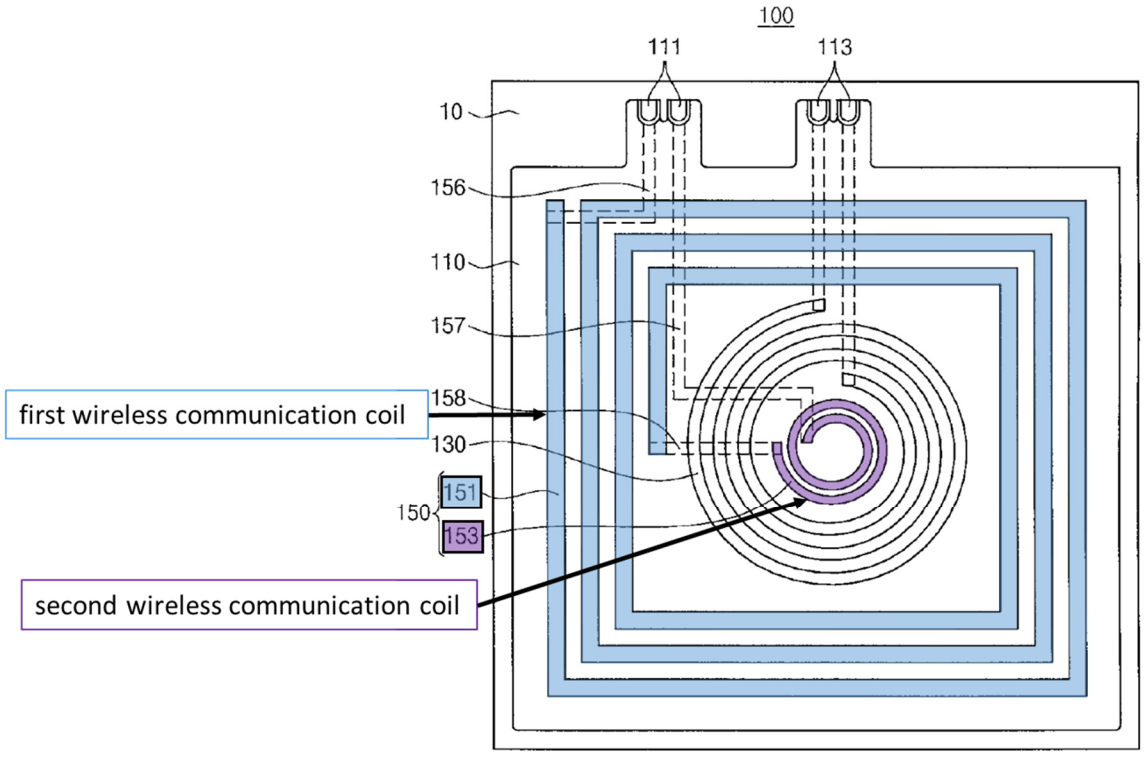


(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶66.)

4. Claim 4

a) The wireless antenna according to claim 1, wherein the first wireless communication coil and the second wireless communication coil have different curvatures.

Kim discloses these features. (Ex-1002, ¶67.) For instance, Kim discloses a first loop antenna pattern 151 ("the first wireless communication coil") having a substantially rectangular shape (curvature), and a second loop antenna pattern 153 ("the second wireless communication coil") having a substantially different circular curvature. (Ex-1005, FIG. 1; Sections IX.A.2-3; Ex-1002, ¶67.)

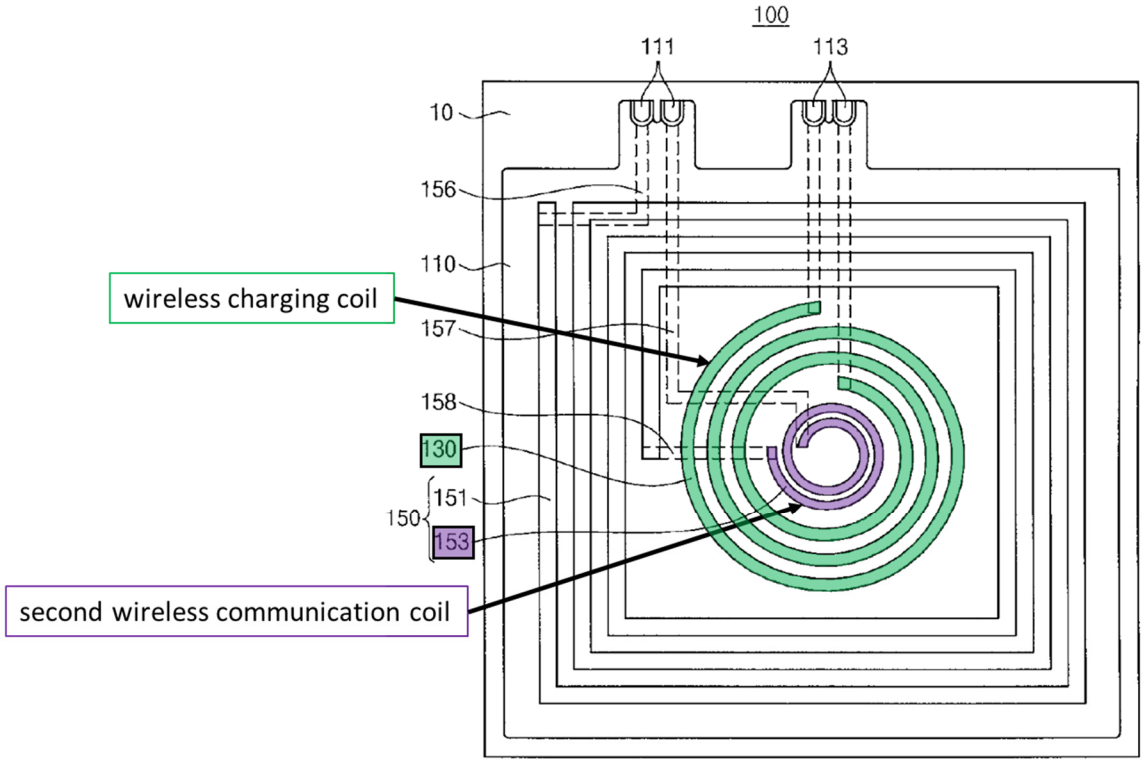


(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶67.)

5. Claim 5

a) The wireless antenna according to claim 1, wherein the wireless charging coil and the second wireless communication coil have corresponding curvatures.

Kim discloses these features. (Ex-1002, ¶68.) For instance, Kim discloses that the contactless electric power receiving coil section 130 ("wireless charging coil") and the second loop antenna pattern 153 ("the second wireless communication coil") have substantially circular ("corresponding") curvatures. (Ex-1005, FIG. 1; Ex-1002, ¶68.)



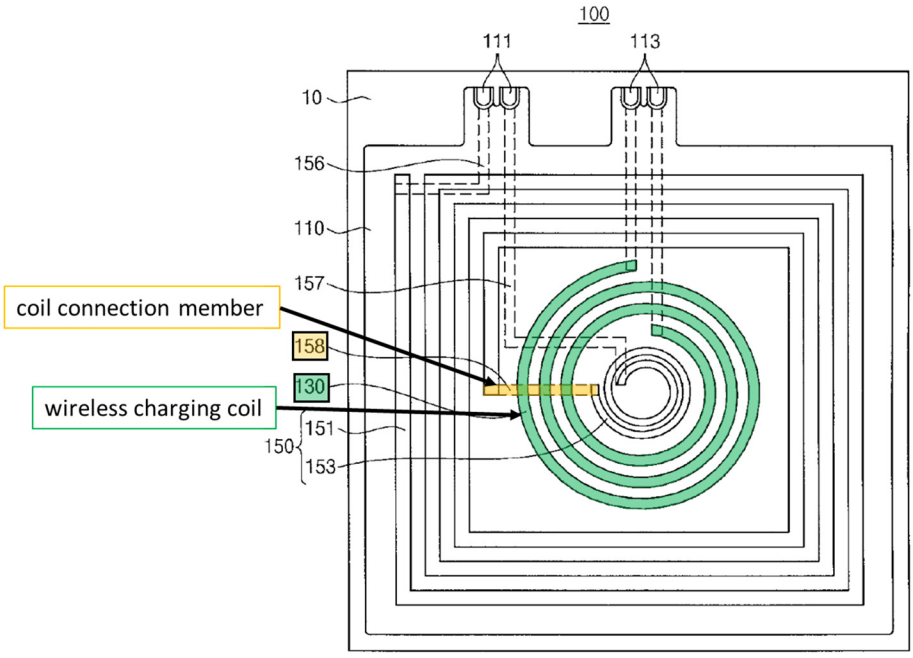
(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶68.)

6. Claim 9

a) The wireless antenna according to claim 1, wherein the coil connection member is insulated from the wireless charging coil.

Kim discloses this feature. (Ex-1002, ¶¶69-70.) Kim's second coil connection line 158 ("the coil connection member") is discussed above. (*Supra* Section IX.A.1(e); Ex-1005, FIG. 1.) For instance, Kim discloses that the coils are on one side of a flexible substrate and the "second connection line" 158 ("coil connection member") is on the opposite side. (Ex-1005, ¶¶[0013], [0018], FIG. 1.) Kim further discloses that the flexible substrate is insulating. (Ex-1005, ¶[0035]; Ex-1002, ¶70.) Kim's figure 1 shows the coil connection member 158 traversing

the wireless charging coil 130 on the opposite side of the substrate such that the connection member is insulated from the wireless charging coil. (Ex-1005, ¶¶[0013], [0018], FIG. 1; Ex-1002, ¶70.)



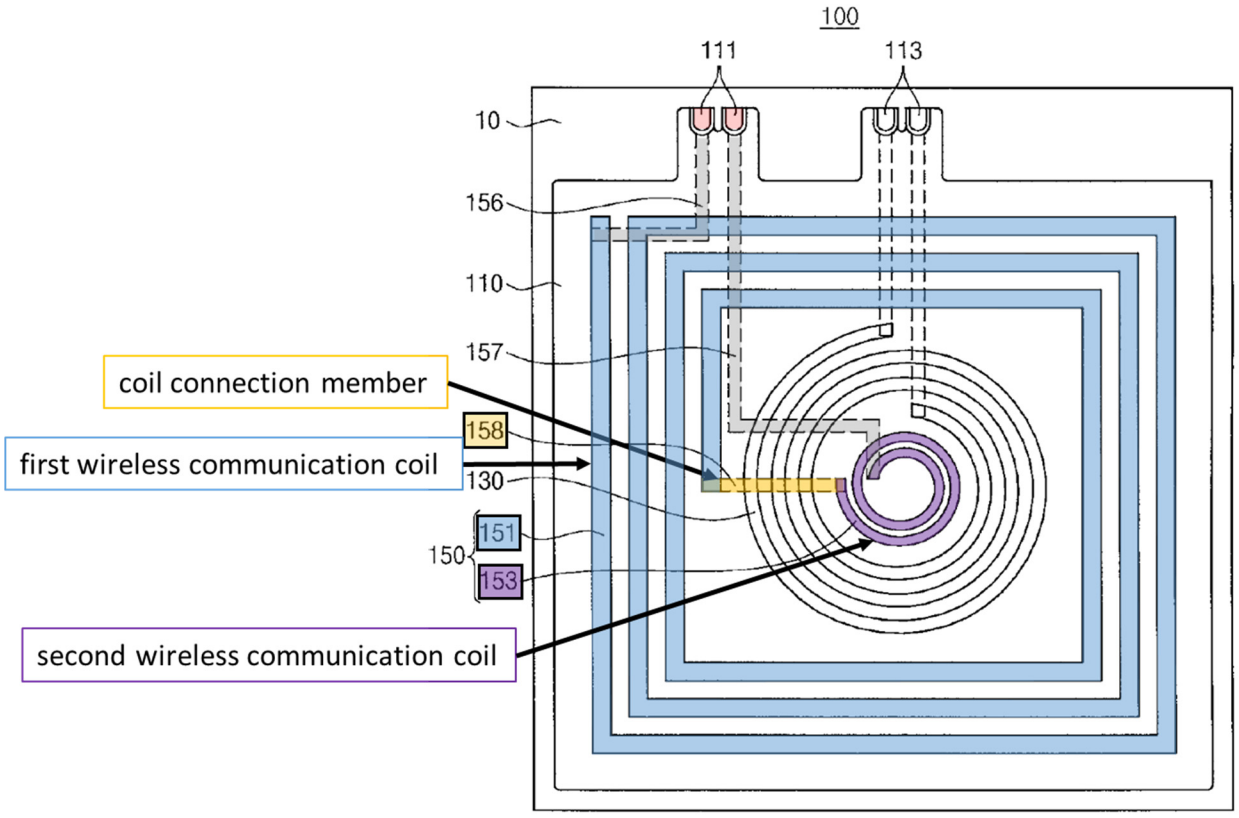
(*Id.*, FIG. 1 (annotated); Ex-1002, ¶70.)

7. Claim 10

a) The wireless antenna according to claim 1, wherein the first wireless communication coil and the second wireless communication coil are connected to each other in series, and

Kim discloses this feature. (Ex-1002, ¶¶71-72.) For instance, as discussed above for claim 1, Kim discloses a **single** connection line 158 ("coil connection member") which interconnects a first loop antenna pattern 151 ("first wireless communication coil") and a second loop antenna pattern 153 ("second wireless

communication coil"). (Section IX.A.1(e); Ex-1005, ¶¶[0032], [0035].) The opposite ends of the first and second communication coils (151, 153) are each connected to a contact pad 111, creating a single current path through the coils 151, 153, such that they are connected in series. (Ex-1005, ¶¶[0030], [0034], FIG. 1; Ex-1002, ¶71.)

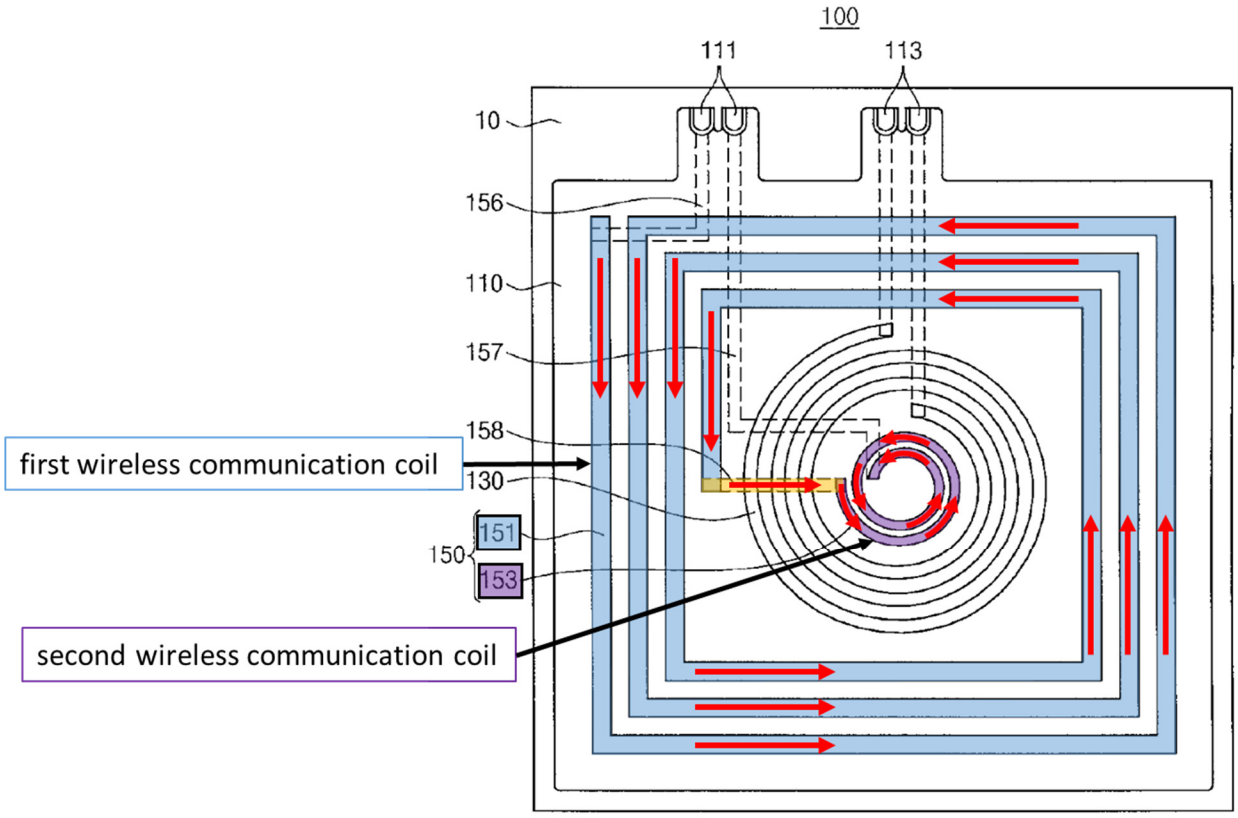


(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶¶71-72.)

b) wherein the first wireless communication coil and the second wireless communication coil are wound so as to have a same rotational direction of current.

Kim discloses this feature. (Ex-1002, ¶¶73-74.) For instance, Kim discloses the first wireless communication coil 151 is wound in the same direction

(counterclockwise) as the second wireless communication coil 153 (Ex-1005, FIG. 1), and the first and second wireless communication coils 151, 153 are connected in series (Section IX.A.7(a)). As such, current flowing through coils 151 and 153 would have the same rotational direction, as indicated by the red arrows in annotated Figure 1, below. (Ex-1002, ¶73.)

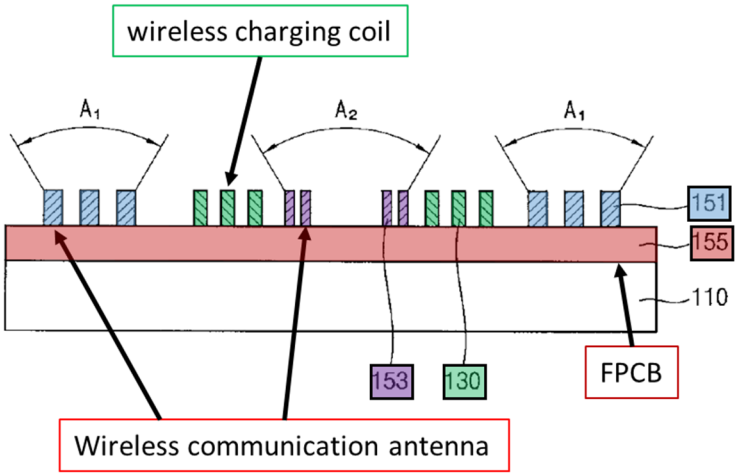


(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶¶73-74.)

8. Claim 11

a) The wireless antenna according to claim 1, wherein the wireless communication antenna and the wireless charging antenna are formed on a flexible printed circuit board.

Kim discloses this feature. (Ex-1002, ¶¶75-76.) For instance, Kim discloses that the loop antenna unit 150 ("wireless communication antenna") may further comprise a flexible substrate 155 ("flexible printed circuit board"), and that the first and second loop antenna patterns 151, 153 of the wireless communication antenna are formed on one surface of the flexible substrate 155. (Ex-1005, ¶¶[0013], [0018], [0028], [0032]-[0035], FIGs. 1, 2.)



(*Id*., FIG. 2 (annotated); Ex-1002, ¶75.)

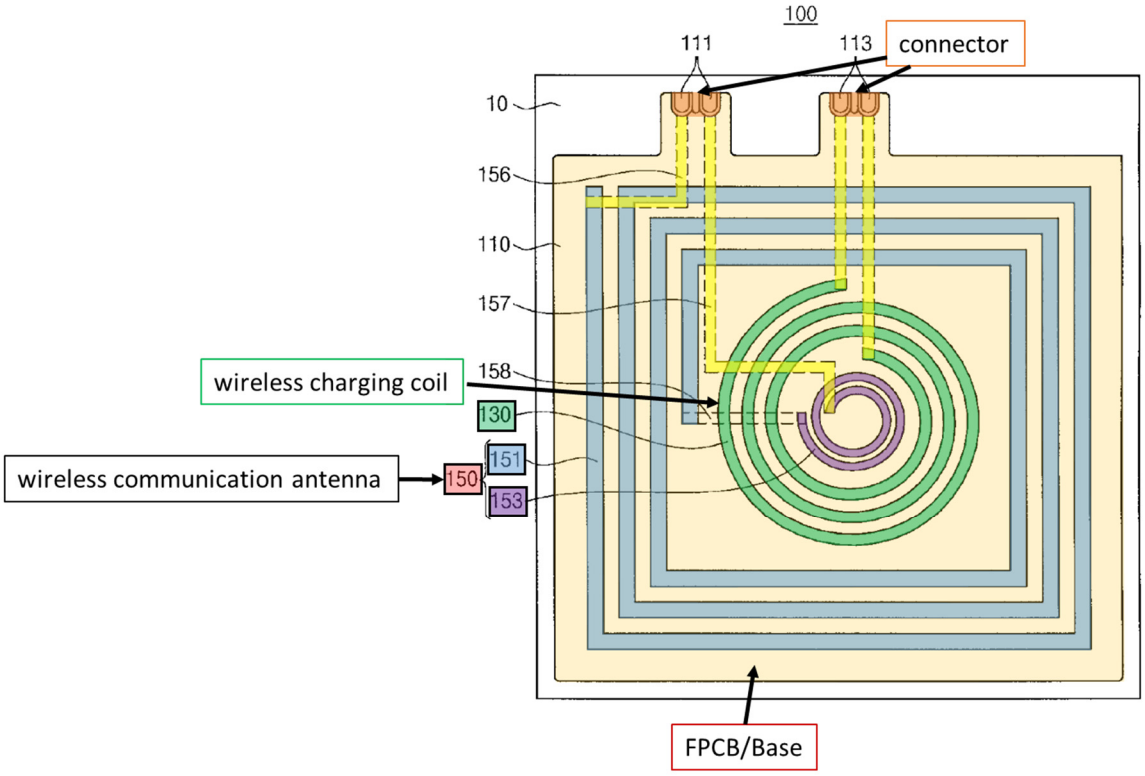
Kim further discloses that the flexible substrate 155 may comprise "an ethylene-based resin or a polyimide-based resin." (Ex-1005, ¶[0033].) A POSITA would have understood these properties to disclose a flexible printed circuit board ("FPCB"), at least because (1) the substrate is "flexible," (2) ethylene and polyimide were well-known FPCB substrate materials (Ex-1002, ¶76 (citing Ex-1012, 1:42-

51)), and (3) at the time of the alleged invention it was common to form wireless charging and communication coils on FPCB (*id*., (citing Ex-1013, 17:32-39)).

9. Claim 12

a) The wireless antenna according to claim 11, wherein the flexible printed circuit board further comprises a connector connected to the wireless communication antenna and to the wireless charging antenna.

Kim discloses this feature. (Ex-1002, ¶¶77-79.) For instance, Kim discloses that the non-contact power receiving coil unit 130 ("the wireless charging coil") and the loop antenna unit 150 ("wireless communication antenna") are connected to terminals 113 and 111 (together "a connector"). (Ex-1005, ¶¶[0028] ("power receiving coil unit (130) … is connected to charging terminals (113)"), [0030] ("loop antenna unit (150) is electrically connected to the terminals for near field communication (111)"), [0034], FIG. 1.) As explained below, terminals 113 and 111 are disposed on the FPCB ("flexible printed circuit board comprises a connector"). (Ex-1002, ¶77.)

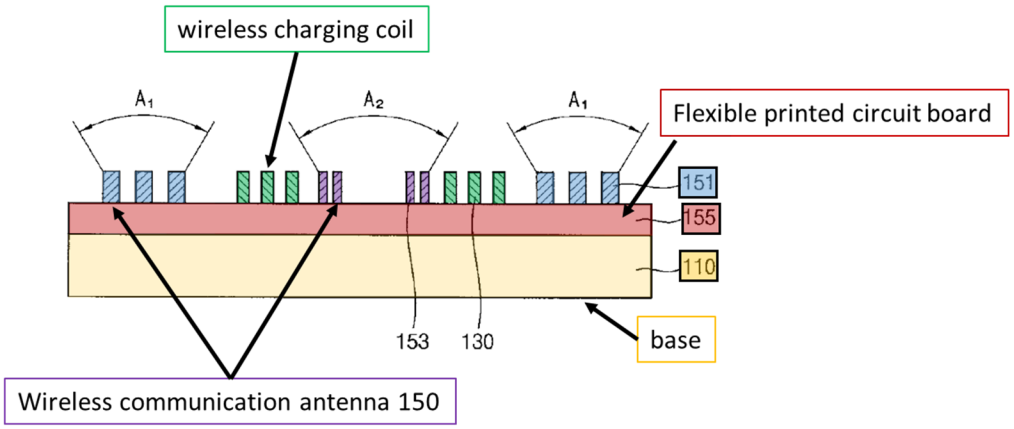


(Ex-1005, FIG. 1 (annotated).)

A POSITA would have understood Kim's terminals 111 and 113, are disposed on the FPCB because the connection lines 156, 157 (connecting the first and second antenna patterns 151, 153 to terminals 111) are formed on the opposite side of the flexible substrate 155 from the first and second antenna patterns 151, 153. (Ex-1005, ¶¶[0013], [0033], [0035] FIGs. 1, 2; Ex-1002, ¶78.) Kim also shows base 110 disposed under the connectors, and discloses that base 110 is coextensive with the FPCB 155. (Ex-1005, FIGs. 1, 2; Ex-1002, ¶78.)

Furthermore, although Kim's figure 1 shows base 110 (on the FPCB), and not FPCB 155, annotated figure 2 below, which is a cross-section of figure 1, shows base 110 is coextensive with the FPCB 155, such that because the connectors are on

base 110, they are also on FPCB 155. (Ex-1005, FIG. 2; Ex-1002, ¶79; *see also* Ex-1028, 1:6-20 (describing construction of printed circuit boards, FIG. 2; Ex-1002, ¶79).)

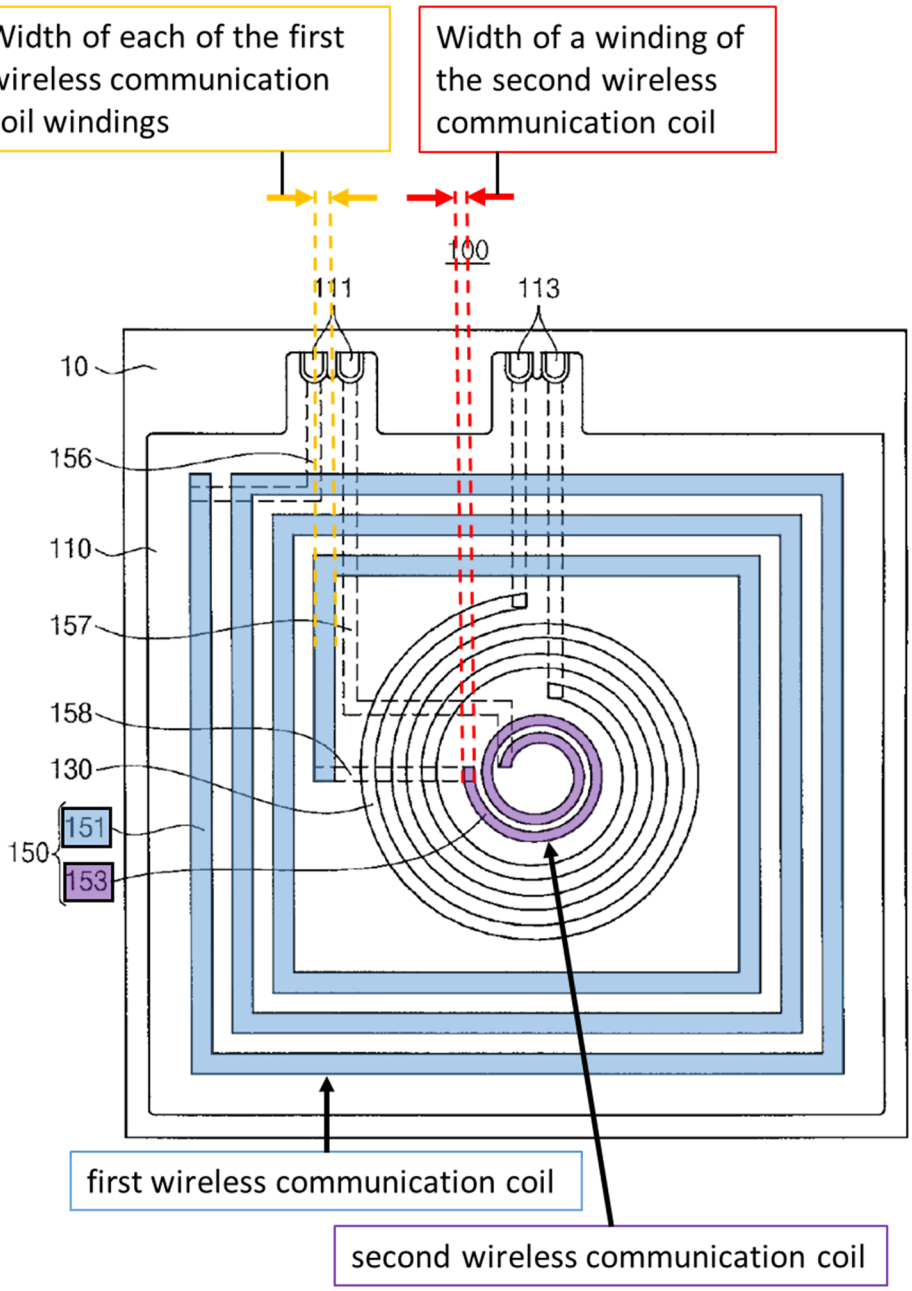


(Ex-1005, FIG. 2 (annotated); Ex-1002, ¶79.)

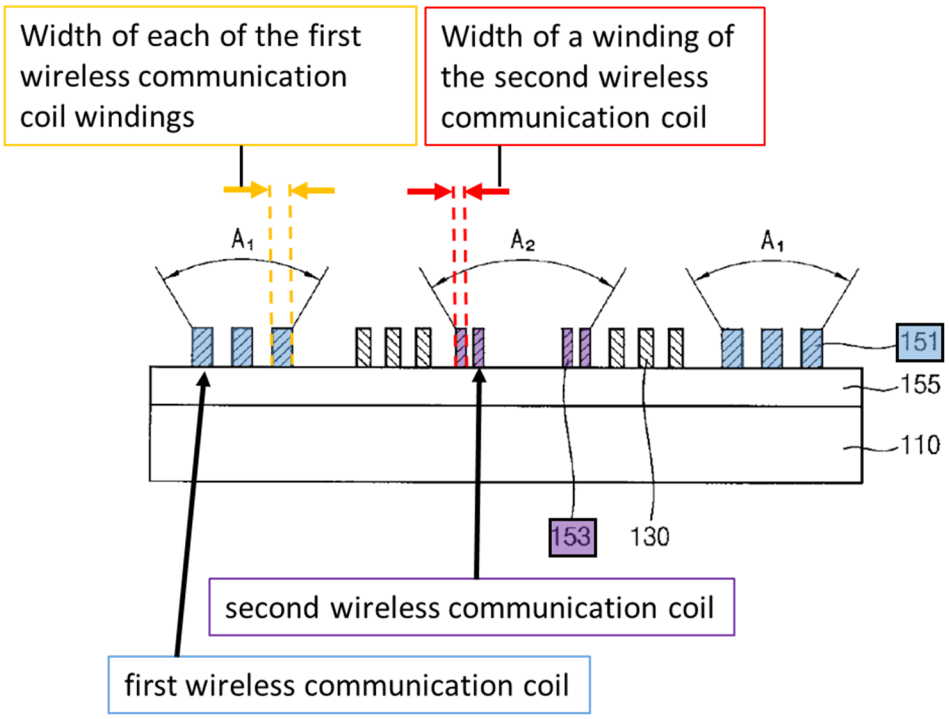
10. Claim 50

a) The wireless antenna according to claim 1, wherein each of the windings of the first communication coil has a width that is greater than the width of the winding of the second wireless communication coil.

Kim discloses this feature. (Ex-1002, ¶80.) For instance, Kim discloses that each of the windings of its first loop antenna pattern 151 has the same width, which is greater than the width of the winding of the second loop antenna pattern 153. (Ex-1005, FIGs. 1, 2; Section IX.A.1(g); Ex-1002, ¶80.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶80.)



(Ex-1005, FIG. 2 (annotated); Ex-1002, ¶80.)

B. Ground 2 – Claims 6, 17-22, 25-29, 34-39, 42-45, 51, and 52 are Obvious over Kim in View of Shostak

1. Claim 6

a) The wireless antenna according to claim 1, wherein the number of windings of the second wireless communication coil is one.

Kim in combination with Shostak discloses or suggests this feature. (Ex-1002, ¶¶81-89.) As discussed above, Kim discloses a second wireless communication coil. (Sections IX.A.1(b), (f); Ex-1005, ¶[0031].) Although Kim's second wireless communication coil 153 has two windings (Section IX.A.1(f)), in view of Shostak, it would have been obvious to configure Kim's second wireless communication coil to have one winding. (Ex-1002, ¶81.)

Shostak, which is in the same field as Kim, discloses the same general antenna structure as Kim—a two-part communication antenna with a wireless charging antenna placed in between the communication coils (Ex-1006, 4:34-40, 4:55-59, 5:5-6, FIGs. 3, 11), and further discloses that the second (interior) wireless communication coil has one winding (*id.*, 9:55-66, 10:4-12, 10:18-25, FIGs. 9, 10).

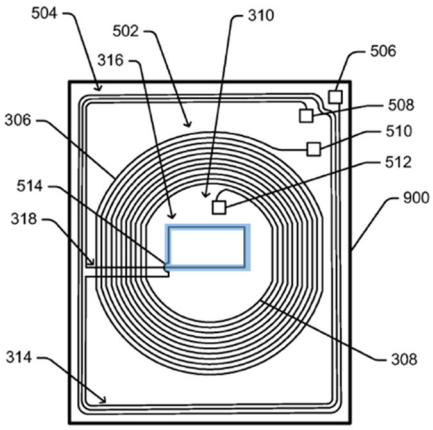


FIG. 9

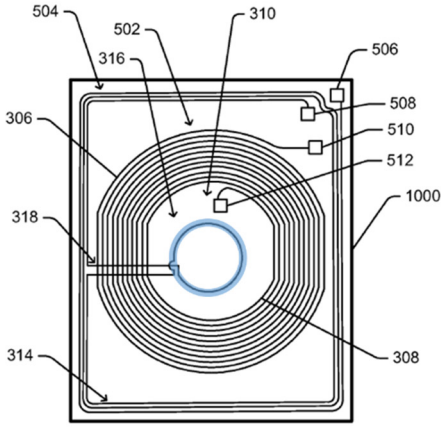


FIG. 10

(Ex-1006, FIGs. 9, 10 (annotated); Ex-1002, ¶82.)

A POSITA would have had reason to consider Shostak's teachings at least because the second (inner) communication coil in both Kim and Shostak is intended to prevent a dead zone in the center of that antenna where the first (outer) communication antenna is unable to communicate with devices. (Ex-1005, ¶[0031]; Ex-1006, 10:41-52; Ex-1002, ¶83.) Thus, Shostak's teachings regarding the second communication coil are directly applicable to Kim's antenna. (Ex-1002, ¶84.)

Having looked to Shostak, a POSITA would have had reason to consider and implement Shostak's single-winding second wireless communication coil in Kim's communication antenna. (Ex-1002, ¶85.) Doing so would have been a matter of routine optimization of a result-effective variable (the number of windings), well within a POSITA's grasp and technical ability. *See E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1010 (Fed. Cir. 2018) ("[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.") (quoting *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980)).

In addition to disclosing the one-winding interior communication coils in Figures 9 and 10, Shostak also discloses antenna designs ranging between less than a full winding (FIGs. 6-8) and, like Kim, two windings (FIG. 5). Thus, Shostak's disclosed range (less than one winding to two windings) overlaps the claimed range of one winding. *See E.I. DuPont de Nemours & Co.*, 904 F.3d at 1006-11 (concluding that a *prima facie* case of obviousness exists when the prior art range overlaps a claimed range); *In re Aller*, 220 F.2d 454, 456 (CCPA 1955) ("[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.").

The number of windings (i.e., turns) is obvious as a result-effective variable because the number of windings in a communication antenna was known to effect the inductance, resistance, and recognition distance. (Ex-1011, ¶[0139] (describing

relationship between number of turns, inductance, resistance, and recognition distance for an NFC antenna); Ex-1002, ¶86.) *See In re Applied Materials, Inc.*, 692 F.3d 1289, 1297 (Fed. Cir. 2012) ("A recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective."). This known relationship, coupled with Shostak's disclosure of a range overlapping the claimed range, as well as disclosing specific examples of the precise value claimed, is sufficient to render this claim obvious. This is especially true given that the '426 patent provides no evidence that the claimed number of turns has any criticality or produces a new or unexpected result, and admits that this feature was the result of routine optimization to satisfy known industry standards. (Ex-1001, 6:30-7:19.)

Shostak's disclosure of antenna layouts having a single-turn second wireless communication coil also confirms that a POSITA could have readily derived the claimed feature via routine optimization. (Ex-1002, ¶87.) Thus, the claimed number of windings cannot form the basis of patentability, given it is a result-effective variable that a POSITA would have found obvious to optimize.

A POSITA would have also found it obvious to implement the second wireless communication coil with one winding because Shostak identifies the single-winding interior communication coils of Figures 9 and 10 as advantageously being wound in the same direction as the outer communication coils of those antenna layouts (unlike the coils of Figures 6-8 having less than one turn), such that the magnetic fields

combine constructively, and the radiated magnetic field can be greater due to the superposition of the fields from the two coils than if the orientation/direction of the coils in the two communication antenna portions were different. (Ex-1006, 10:18-25, 8:10-22; Ex-1002, ¶88.) This advantage would have given a POSITA a good reason to consider the single-winding coils disclosed by Shostak over the antenna layouts without that advantage. (Ex-1002, ¶88.) Furthermore, fewer windings would permit greater spacing between the antenna coils, which would have had the advantage of reducing mutual inductance and interference between the coils. (*Id.*; *see also* Section IX.B.2(f).)

A POSITA would have had a reasonable expectation of success in modifying the number of windings in Kim's communication coil 153 at least there is nothing particularly difficult about changing the number of windings, and such a person would have been well aware of the effects of varying the number of windings of an NFC coil like Kim's, and would have been capable of tuning that coil antenna for a particular application by selecting an appropriate number of windings. (Ex-1002, ¶89; *see, e.g.*, Ex-1011, ¶¶[0139], [0162]-[0163], FIG. 20.)

2. Claim 17

a) 17[pre]: A wireless antenna comprising:

b) 17[a]: a wireless communication antenna comprising a first wireless communication coil and a second wireless communication coil; and

c) 17[b]: a wireless charging antenna comprising a wireless charging coil,

d) 17[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, and the second wireless communication coil is disposed inside the wireless charging coil,

e) 17[d]: wherein a number of windings of the second wireless communication coil is less than a number of windings of the first wireless communication coil,

The Kim-Shostak combination discloses or suggests these features for the reasons discussed in Sections IX.A.1(a)-(d), (f). (Ex-1002, ¶¶90-94.)

f) 17[e]: wherein a minimum distance between the second wireless communication coil and the wireless charging coil is greater than a minimum distance between the first wireless communication coil and the wireless charging coil, and

The Kim–Shostak combination discloses or suggests this feature. (Ex- 1002, ¶¶95-103.) As discussed above, Kim discloses a first wireless communication coil 151, a second wireless communication coil 153, and a wireless charging coil 130. (Sections IX.A.1(b)-(c); Ex-1005, ¶[0031].) Although Kim does not explicitly disclose that a minimum distance between the second wireless communication coil 153 and the wireless charging coil 130 is greater than a minimum distance between

the first wireless communication coil 151 and the wireless charging coil 130, Shostak discloses this feature, and, in view of Shostak, a POSITA would have had good reason to implement it in Kim's antenna. (Ex-1002, ¶95.)

For instance, Shostak discloses a minimum distance between the second (inner) wireless communication coil 316 and the wireless charging coil 502 is greater than a minimum distance between the first (outer) wireless communication coil 314 and the wireless charging coil 502. (Ex-1006, FIGs. 9, 10; Ex-1002, ¶96.)

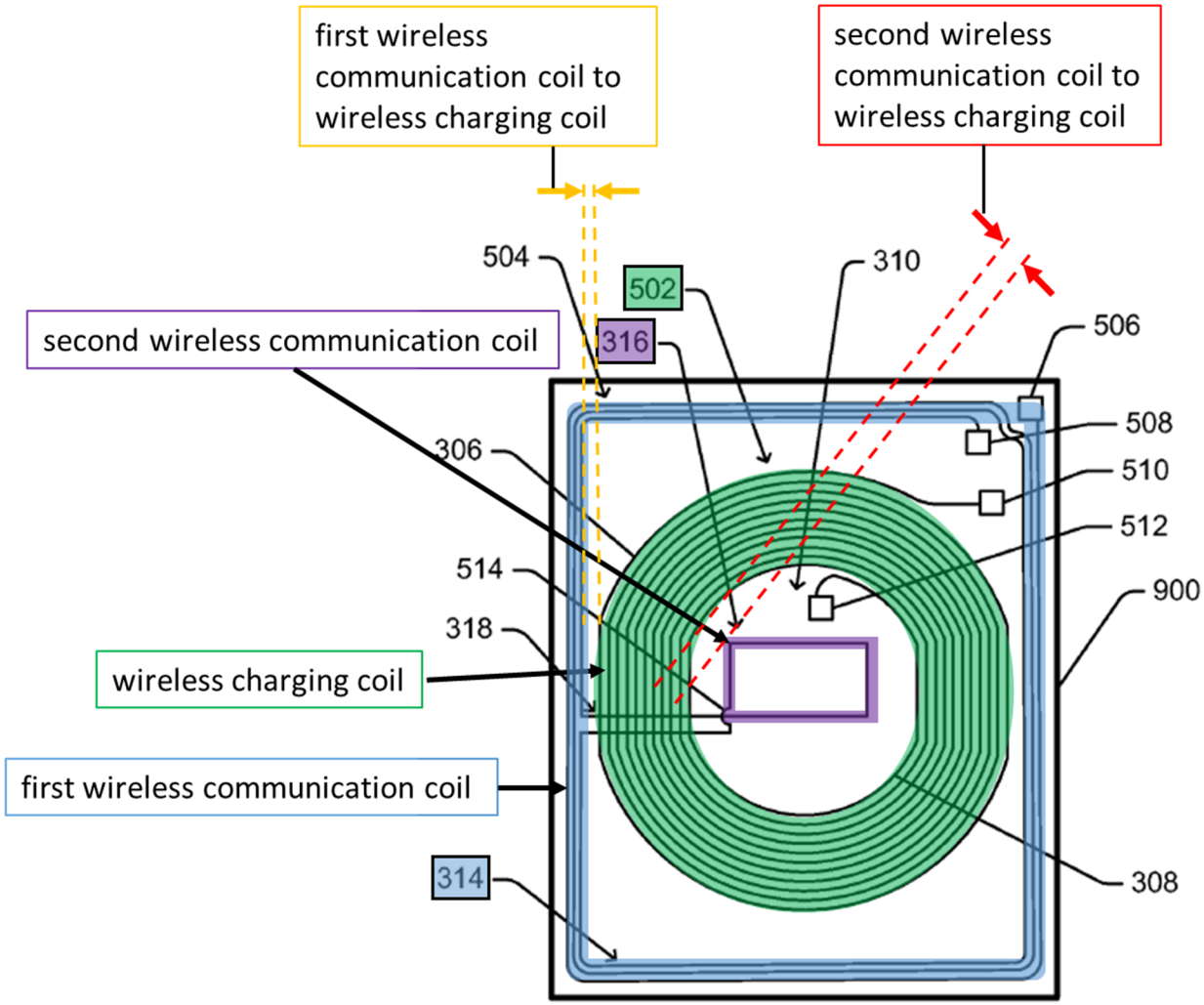


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶96.)

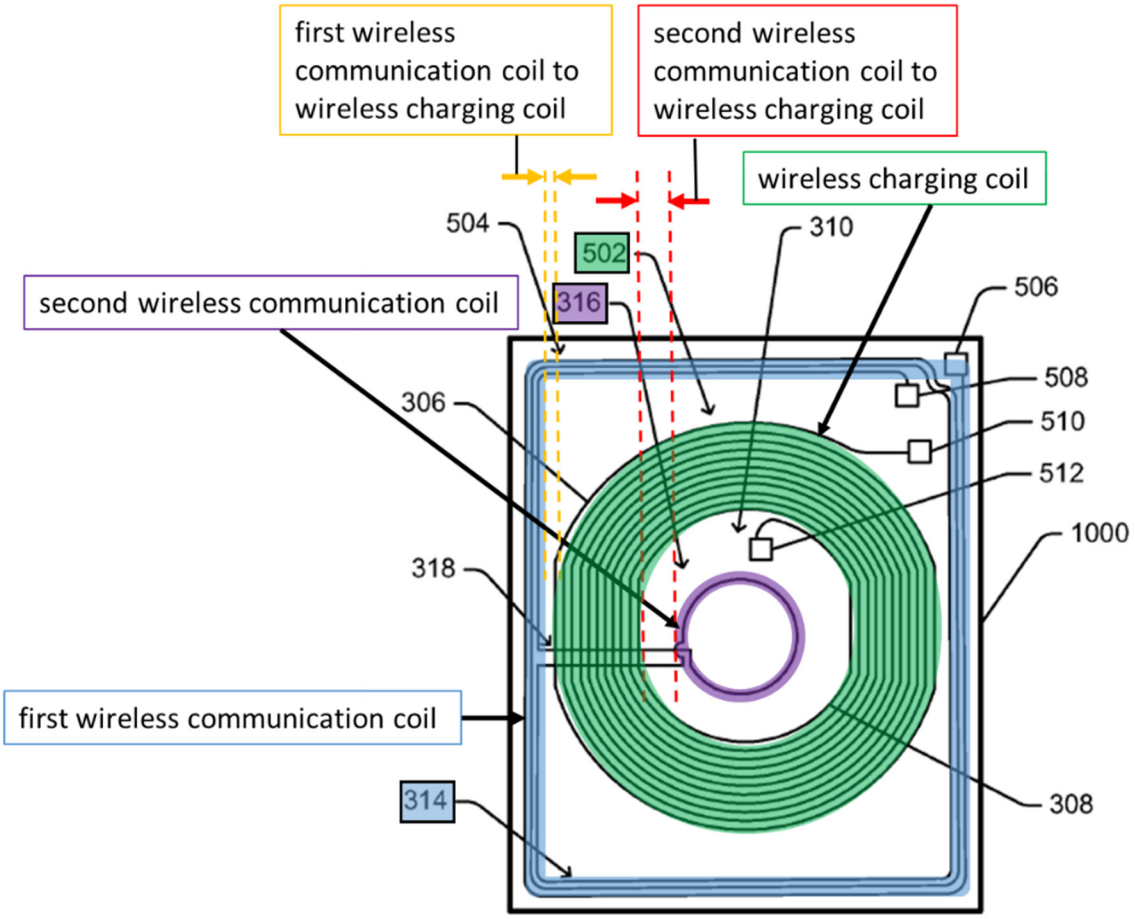


FIG. 10

(Ex-1006, FIG. 10 (annotated); Ex-1002, ¶96.)

As discussed above, Shostak discloses the same general antenna structure as Kim. (Section IX.B.1(a); Ex-1006, 4:34-40, 4:55-58, 5:5-6, 7:20-50, FIGs. 3, 9, 10; Ex-1002, ¶97.) Shostak also discloses that "a separation is maintained" between the second wireless communication coil 316 and the wireless charging coil 302 (502 in FIG. 10), and between the first wireless communication coil 314 and the wireless

charging coil 302 (502 in FIG. 10). (Ex-1006, 5:33-41.) Shostak explains that the separation distances influence the mutual coupling between the coils, and maintaining appropriate separation prevents magnetic fields between the coils from interfering with one another. (*Id*.) Shostak further discloses that "this separation is at least approximately 2 millimeters, although other amounts of separation can alternatively be used." (*Id*.) Indeed, Shostak's figures, annotated above, disclose using different separation distances between the coils. (*Id.*, FIGs. 9, 10; Ex-1002, ¶97.)

Although the claimed separation distances are nothing more than an obvious design choice, A POSITA would have understood the benefits of using a minimum distance between the second (inner) wireless communication coil and the wireless charging coil that is greater than a minimum distance between the first (outer) wireless communication coil and the wireless charging coil, and thus would have had good reason to implement that feature in the Kim-Shostak antenna. (Ex-1002, ¶98.) For example, in addition to Shostak's disclosure that selecting an appropriate separation prevents magnetic fields between the coils from interfering with each other—a well-understood design consideration (Ex-1026, ¶¶[0049]-[0077])—it was known that magnetic fields are more concentrated where the coil windings have sharper curves (e.g., a smaller radius). (Ex-1010, 19:18-20:17, FIG. 8A; Ex-1002, ¶98.) Thus, it was understood that the minimum antenna size can be achieved

without problematic magnetic interference between adjacent coils by bringing the coils close together where flux is less concentrated (straighter coil portions) and increasing separation where the coil bends are sharper. (Ex-1010, 10:26-27, 19:18-67; 19:34-67; FIG. 8a; Ex-1002, ¶¶98-99.) This knowledge is reflected in Shostak's figures. (Ex-1006, FIG. 9, 10; Ex-1002, ¶100.)

Applying these teachings to Kim's antenna, a POSITA would have had good reason to implement Shostak's relative spacing between the three coils. (Ex-1002, ¶101.) For example, such a skilled person would have understood that magnetic flux is more concentrated around second loop antenna pattern 153 ("second wireless communication coil") because it has a small radius, and therefore should be spaced further from the wireless charging coil 130 than the first loop antenna pattern 151 ("first wireless communication coil"), which—like Shostak—has straight sides in the area adjacent to the wireless charging coil such that flux is not concentrated in those areas. (*Id.*) Using this spacing would achieve "a favorable balance ... between a reduction in size, improvement of power transmission efficiency, and improvement of communication efficiency" in Kim's antenna. (Ex-1010, 19:34-67; Ex-1002, ¶101.)

Moreover, given that there are only three possible configurations—(1) equal spacing, (2) the first communication coil is spaced further from the charging coil than the second communication coil, or (3) the second communication coil is spaced

further from the charging coil than the first communication coil—even without Shostak's disclosure of the optimal configuration or Koyanagi's teachings explaining why a POSITA would select that configuration, a POSITA would have found it obvious to try the three options. (Ex-1002, ¶102.)

A POSITA would have had a reasonable expectation of success. (Ex-1002, ¶103.) Such a person would have understood the impacts of adjusting the relative spacing between the coils, as discussed above. (*Id.*) It would have been well within a POSITA's ability to make such changes to Kim's antenna at least because there is nothing particularly complicated or difficult about adjusting the relative spacing between adjacent coils. (*Id.*)

g) 17[f]: wherein a width of a winding of the second wireless communication coil is less than a width of a winding of the first communication coil.

Kim discloses or suggests this feature for the reasons discussed above for claim element 1[f]. (Ex-1002, ¶104; Section IX.A.1(g).)

3. Claim 18

a) The wireless antenna according to claim 17, wherein the first wireless communication coil and the second wireless communication coil have different shapes.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim 2. (Ex-1002, ¶105; Section IX.A.2(a).)

4. Claim 19

a) The wireless antenna according to claim 18, wherein a shape of the first wireless communication coil is a polygonal loop pattern, and wherein a shape of the second wireless communication coil is a circular loop pattern.

The Kim–Shostak combination discloses or suggests these features for the reasons discussed above for claim 3. (Ex-1002, ¶106; Section IX.A.3(a).)

5. Claim 20

a) The wireless antenna according to claim 17, wherein the first wireless communication coil and the second wireless communication coil have different curvatures.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim 4. (Ex-1002, ¶107; Section IX.A.4(a).)

6. Claim 21

a) The wireless antenna according to claim 17, wherein the wireless charging coil and the second wireless communication coil have corresponding curvatures.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim 5. (Ex-1002, ¶108; Section IX.A.5(a).)

7. Claim 22

a) The wireless antenna according to claim 17, wherein the number of windings of the second wireless communication coil is one.

The Kim–Shostak combination in combination with Shostak discloses or suggests this feature for the reasons discussed above for claim 6. (Ex-1002, ¶109; Section IX.B.1(a).)

8. Claim 25

a) The wireless antenna according to claim 17, wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil so as to interconnect the first wireless communication coil and the second wireless communication coil.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim element 1[d]. (Ex-1002, ¶110; Section IX.A.1(e).)

9. Claim 26

a) The wireless antenna according to claim 25, wherein the coil connection member is insulated from the wireless charging coil.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim 9. (Ex-1002, ¶111; Section IX.A.6(a).)

10. Claim 27

a) The wireless antenna according to claim 17, wherein the first wireless communication coil and the second wireless communication coil are connected to each other in series, and wherein the first wireless communication coil and the second wireless communication coil are wound in a same rotational direction of current.

The Kim–Shostak combination in discloses or suggests this feature for the reasons discussed above for claim elements 10[a] and 10[b]. (Ex-1002, ¶¶112-113; Sections IX.A.7(a), (b).)

11. Claim 28

a) The wireless antenna according to claim 17, wherein the wireless communication antenna and the wireless charging antenna are formed on a flexible printed circuit board.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim 11. (Ex-1002, ¶114; Section IX.A.8(a).)

12. Claim 29

a) The wireless antenna according to claim 28, wherein the flexible printed circuit board further comprises a connector connected to both the wireless communication antenna and the wireless charging antenna.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed above for claim 12. (Ex-1002, ¶115; Section IX.A.9(a).)

13. Claim 34

a) 34[pre]: A wireless antenna comprising:

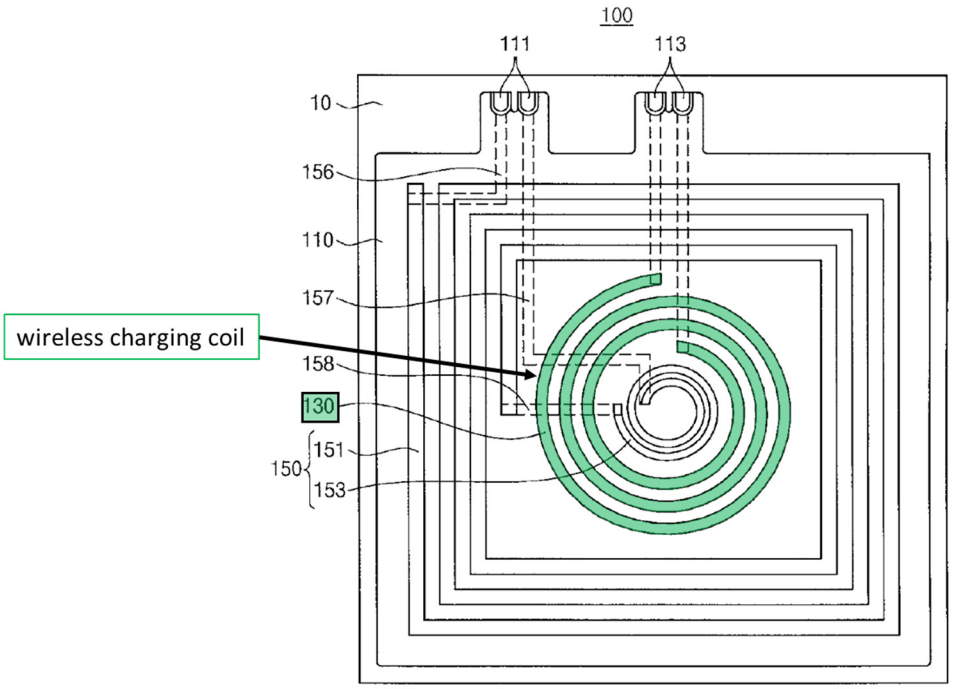
To the extent the preamble is limiting, Kim discloses or suggests this feature for the reasons discussed for claim element 1[pre]. (Ex-1002, ¶116; Section IX.A.1(a).)

b) 34[a]: a wireless communication antenna comprising a first wireless communication coil having a polygonal loop pattern and a second wireless communication coil having a circular loop pattern; and

Kim discloses or suggests this feature for the reasons discussed for claim 3. (Ex-1002, ¶117; Section IX.A.3(a).)

c) 34[b]: a wireless charging antenna comprising a wireless charging coil having a circular loop pattern,

Kim discloses this feature. (Ex-1002, ¶¶118.) For instance, Kim discloses a non-contact power receiving coil unit 130 ("wireless charging antenna comprising a wireless charging coil") with a circular loop pattern. (Section IX.A.5(a); Ex-1005, ¶[0028], FIG. 1; Ex-1002, ¶118.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶118.)

d) 34[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, and the second wireless communication coil is disposed inside the wireless charging coil,

Kim discloses or suggests this feature for the reasons discussed for claim element 1[c]. (Ex-1002, ¶119; Section IX.A.1(d).)

e) 34[d]: wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil so as to interconnect the first wireless communication coil and the second wireless communication coil,

Kim discloses or suggests this feature for the reasons discussed for claim element 1[d]. (Ex-1002, ¶120; Section IX.A.1(e).)

f) 34[e]: wherein a minimum distance between the second wireless communication coil and the wireless charging coil is greater than a minimum distance between the first wireless communication coil and the wireless charging coil, and

Kim in combination with Shostak discloses or suggests this feature for the reasons discussed for claim element 17[e]. (Ex-1002, ¶121; Section IX.B.2(f).)

g) 34[f]: wherein a width of a winding of the second wireless communication coil is less than a width of a winding of the first communication coil.

Kim discloses or suggests this feature for the reasons discussed for claim element 1[f]. (Ex-1002, ¶122; Section IX.A.1(g).)

14. Claim 35

a) The wireless antenna according to claim 34, wherein the first wireless communication coil and the second wireless communication coil have different curvatures.

Kim discloses or suggests this feature for the reasons discussed for claim 4. (Ex-1002, ¶123; Section IX.A.4(a).)

15. Claim 36

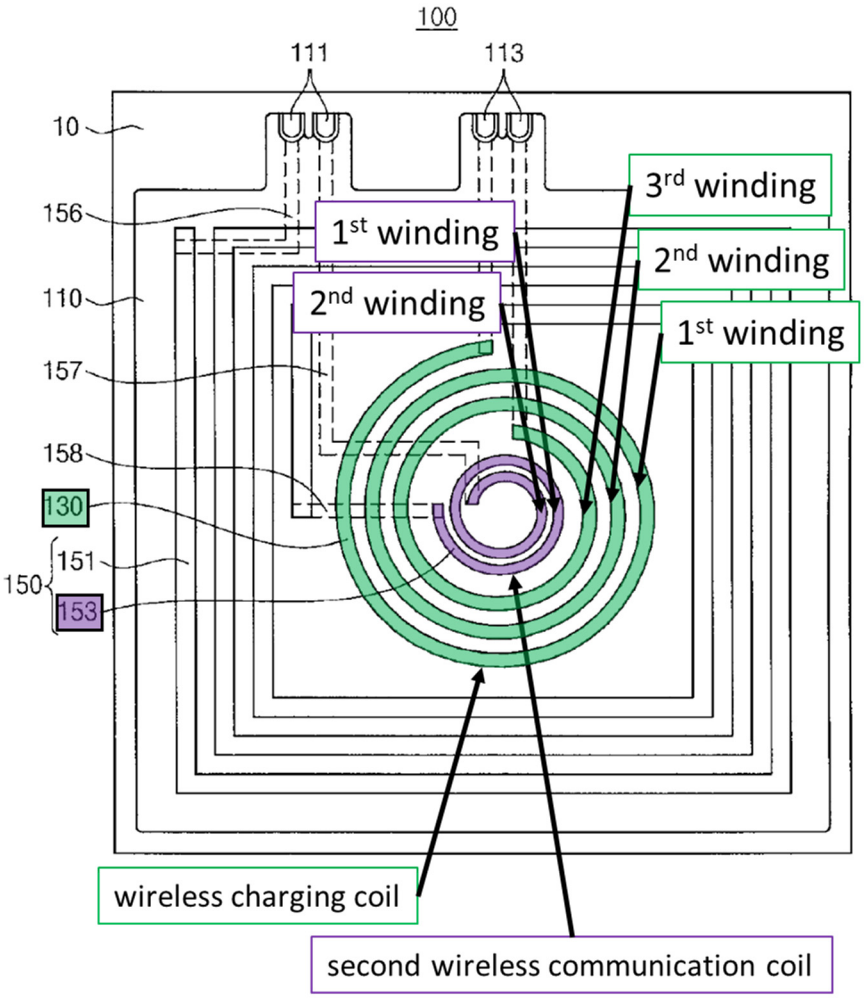
a) The wireless antenna according to claim 34, wherein the wireless charging coil and the second wireless communication coil have corresponding curvatures.

Kim discloses or suggests this feature for the reasons discussed for claim 5. (Ex-1002, ¶124; Section IX.A.5(a).)

16. Claim 37

a) The wireless antenna according to claim 34, wherein a number of windings of the wireless charging coil is different from a number of windings of the second wireless communication coil.

The Kim–Shostak combination discloses or suggests this feature. (Ex-1002, ¶125.) For instance, Kim discloses that the non-contact power receiving coil unit 130 ("wireless charging coil") has three windings, and the second loop antenna pattern 153 ("the second wireless communication coil") has two windings. (Ex-1005, FIGs. 1, 2; Ex-1002, ¶125.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶125.)

17. Claim 38

a) The wireless antenna according to claim 34, wherein a number of windings of the second wireless communication coil is one.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 6. (Ex-1002, ¶126; Section IX.B.1(a).)

18. Claim 39

a) The wireless antenna according to claim 34, wherein a number of windings of the second wireless communication coil is less than a number of windings of the wireless charging coil.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 37. (Ex-1002, ¶127; Section IX.B.16(a).)

19. Claim 42

a) The wireless antenna according to claim 34, wherein the coil connection member is insulated from the wireless charging coil.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 9. (Ex-1002, ¶128; Section IX.A.6(a).)

20. Claim 43

a) The wireless antenna according to claim 34, wherein the first wireless communication coil and the second wireless communication coil are connected to each other in series, and

b) wherein the first wireless communication coil and the second wireless communication coil are wound so as to have a same rotational direction of current.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim elements 10[a] and 10[b]. (Ex-1002, ¶¶129-130; Sections IX.A.7(a), (b).)

21. Claim 44

a) The wireless antenna according to claim 34, wherein the wireless communication antenna and the wireless charging antenna are formed on a flexible printed circuit board.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 11. (Ex-1002, ¶131; Section IX.A.8(a).)

22. Claim 45

a) The wireless antenna according to claim 44, wherein the flexible printed circuit board further comprises a connector connected to both the wireless communication antenna and the wireless charging antenna.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶132; Section IX.A.9(a).)

23. Claim 51

a) The wireless antenna according to claim 17, wherein each of the windings of the first communication coil has a width that is greater than the width of the winding of the second wireless communication coil.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 50. (Ex-1002, ¶133; Section IX.A.10(a).)

24. Claim 52

a) The wireless antenna according to claim 34, wherein each of the windings of the first communication coil has a width that is greater than the width of the winding of the second wireless communication coil.

The Kim–Shostak combination discloses or suggests this feature for the reasons discussed for claim 50. (Ex-1002, ¶134; Section IX.A.10(a).)

C. Ground 3 – Claims 7 and 8 are Obvious over Kim in View of Kim '681

1. Claim 7

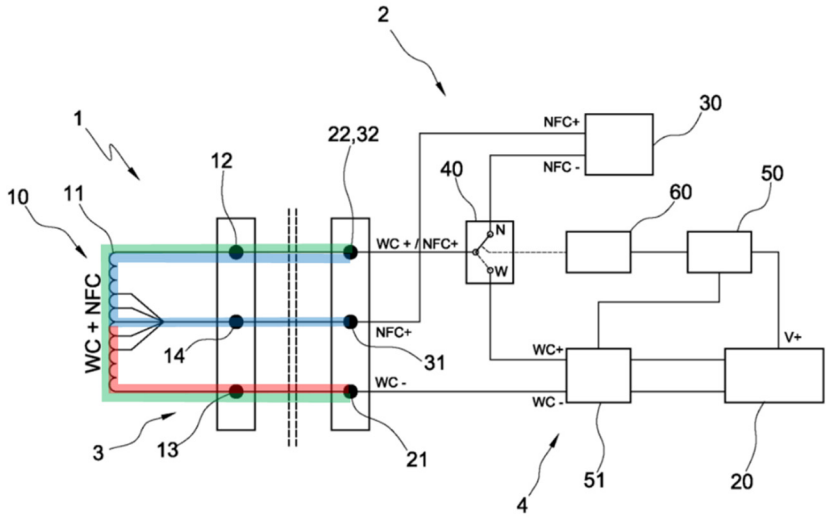
a) The wireless antenna according to claim 1, wherein a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil.

Kim in combination with Kim '681 discloses or suggests this feature. (Ex-1002, ¶¶135-142.) As discussed above, Kim discloses a wireless antenna including non-contact power receiving coil unit 130 ("wireless charging coil") and first loop antenna pattern 151 ("first wireless communication coil"). (Sections IX.A.1(a)-(c); Ex-1005, ¶¶[0026], [0031].) Kim does not explicitly disclose that coil unit 130 has a greater number of windings than antenna pattern 151, but Kim '681 discloses that a wireless charging coil may have more windings than a wireless communication coil, and, in view of Kim '681, a POSITA would have found it obvious to implement Kim's antenna with more windings in the power receiving coil 130 than the loop antenna 151. (Ex-1002, ¶135.)

Kim ’681 is in the same field as Kim, relating to an antenna for wireless charging and near field communication. (Ex-1007, ¶[0001].) Therefore a POSITA implementing Kim’s antenna would have had reason to look to Kim ’681. (Ex-1002, ¶136.) Kim ’681 describes a single-coil antenna capable of both wireless charging and near-field communication, where a portion of the coil antenna is used for near-field communication, and the entire coil antenna is used for wireless charging. (Ex-1007, Abstract, ¶¶[0019]-[0021], [0044]-[0046].)

Kim ’681 teaches that all windings of coil antenna 10 (between terminal 12 and terminal 13; path highlighted green below) are used for wireless charging. (Ex-1007, ¶¶[0046], [0059].) However, only a subset of the coil windings (between terminal 12 and 14; path highlighted blue) are used for wireless communication. (*Id.*, ¶¶[0046], [0059]-[0060].)

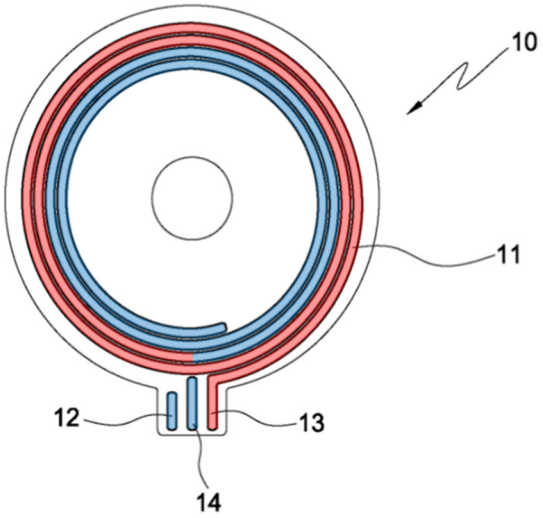
Fig. 2



(Ex-1007, FIG. 2 (annotated); Ex-1002, ¶137.)

Kim '681's coil antenna unit 10 is illustrated below in annotated Figure 1. The coil antenna is divided into red and blue sections to illustrate how only the portion between terminals 12 and 14 (blue section)—fewer than all windings—are used for wireless communication, whereas the portion between terminals 12 and 13 (red and blue sections together)—all windings—are used for wireless charging.[4] (Ex-1007, ¶¶[0044]-[0046].)

Fig. 1



(Ex-1007, FIG. 1 (annotated); Ex-1002, ¶138.)

[4] Figure 1's annotations are illustrative of Kim '681's teachings, and are not intended to represent the precise division of the coil windings used for communication versus charging.

It would have been obvious to a POSITA to modify Kim's antenna based on Kim '681 such that the wireless charging coil has more windings than the first wireless communication coil. (Ex-1002, ¶139.) As taught by Kim '681, using a greater number of coil windings for wireless charging than for wireless communication ensures that the antenna is able to generate an induced electromotive force during both NFC and wireless charging. (Ex-1007, ¶[0046].) Although Kim '681 concerns using different sections of the same coil antenna, a POSITA would have understood that its teachings regarding the respective number of coil windings needed for charging and communication are equally applicable to two different coils. (Ex-1002, ¶139.)

Indeed, it was well-understood at the time of the alleged invention that a wireless charging coil may have more windings than a near-field communication coil like Kim and Kim '681's communication coils. (Ex-1002, ¶140; *see, e.g.*, Ex-1025, ¶¶[0018], [0101], [102], FIG. 11; Ex-1006, 1:58-61, 5:10-19, 5:45-56, FIGs. 5-10; Ex-1009, 2:51-61, FIGs. 3, 18-20, 25; Ex-1018, 5:45-49, 5:57-67, FIGs. 3-6; Ex-1024, 12:8-13, 13:4-10, FIGs. 3, 4.) Therefore it would have been obvious, and a POSITA would have had good reason, to implement Kim's wireless charging coil with more windings than its first wireless communication coil to ensure proper functioning during charging and communication. (Ex-1002, ¶141.)

Indeed, a POSITA would have understood that the number of turns of each antenna coil is nothing more than a design choice, ordinarily considered when designing a coil. (Ex-1002, ¶141.) It is also a result-effective variable, as it was known how to change the number of coil windings to achieve a desired result (e.g., inductance, resistance, quality factor, or resonant frequency). (*Id*., ¶142) Therefore, a POSITA would have been aware of the general parameters regarding coil design, and would have understood that, in that context, selecting a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil would have been obvious. (*Id*.)

A POSITA would have had a reasonable expectation of success in modifying the number of windings in Kim's coils at least because such a person would have been well aware of the effects of varying the number of windings of a wireless charging coil and an NFC coil, and would have been capable of tuning the antennas for those applications by selecting an appropriate number of windings. (*Id.*; *see, e.g.*, Ex-1011, ¶¶[0139], [0162]-[0163], FIG. 20 (describing how inductance and resistance of an NFC coil changes with the number of windings); Ex-1016, 1277-78 (describing how inductance of a wireless charging coil changes with the number of windings).) Additionally, there is nothing particularly difficult about changing the number of coil windings in Kim's antennas. (Ex-1002, ¶142.)

2. Claim 8

a) The wireless antenna according to claim 7, wherein the number of windings of the wireless charging coil is greater than the number of windings of the second wireless communication coil.

The Kim-Kim '681 combination discloses or suggests this feature. (Ex-1002, ¶143.) For instance, as discussed above, Kim discloses that the non-contact power receiving coil unit 130 ("wireless charging coil") has three windings, and the second loop antenna pattern 153 ("the second wireless communication coil") has two windings. (Ex-1005, FIGs. 1, 2; Section IX.B.16.)

D. Ground 4 – Claims 12, 29, and 45 are Obvious over Kim in View of An

1. Claim 12[5]

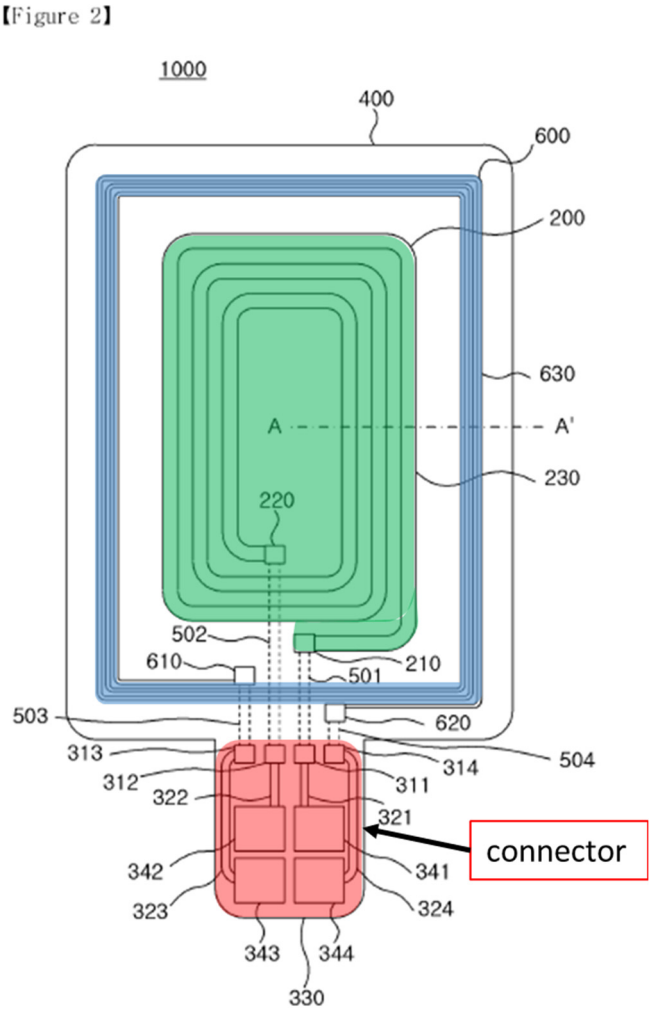
As discussed in Ground 1, Section IX.A.9(a), Kim discloses this feature. To the extent PO disputes that Kim discloses this feature, Kim in combination with An discloses or suggests this feature. (Ex-1002, ¶¶144-150.) An discloses an antenna having a connector disposed on a FPCB that is connected to a wireless communication antenna and a wireless charging antenna, and, in view of An, a

[5] The language of each challenged claim is included the first time the claim appears (Grounds 1-3 and 5).

POSITA would have had good reason to implement a similar connector in Kim's antenna. (*Id.*, ¶144.)

Similar to Kim, An discloses an antenna assembly 1000 ("wireless antenna") including an inner antenna 200 which may be a wireless charging antenna and an outer antenna 600 which may be a near field communication antenna. (Ex-1008, ¶¶[6]-[7], [64]-[66], [70]-[72], FIGs. 2, 3.) An further discloses a substrate 330, including contact portion 300 ("connector"), which may be integrally formed with the flexible printed circuit board 400 on which the charging and communication coils are disposed. (Ex-1008, ¶¶[70], [82]-[83], [85].) Connector 300 includes connection terminals 310, connection conductive wires 320, and contact terminals 340 ("connector") as a "conductive pattern" that is "formed on the substrate (330)." (Ex-1008, ¶¶[70], [82]-[83], FIG. 2.)

As shown in annotated figure 2 below, connection terminals 310 (first to fourth connection terminals 311 to 314), connection conductive wires 320 (including first to fourth connection conductive wires 321 to 324), and contact terminals 340 (including first to fourth contact terminals 341 to 344) together form a connector, with contact terminals 343 and 344 connected to the wireless communication antenna 600 and contact terminals 341 and 342 connected to the wireless charging antenna 200. (*Id*., ¶[76], FIG. 2; Ex-1002, ¶147.)



(*Id.*, FIG. 2 (annotated); Ex-1002, ¶147.)

It would have been obvious for a POSITA to modify Kim's antenna with An's connector. (Ex-1002, ¶¶148-149.) Such a person would have had a reasonable expectation of success, as there is nothing particularly difficult or challenging about adding additional connection lines and terminals to Kim's antenna, making it predictable and well within a POSITA's skill. (Ex-1002, ¶149.) Indeed, Kim's terminals 111 and 113 are similar to An's first to fourth connection terminals 311 to 314. (*Id.*) Thus, to the extent Kim does not already disclose the claimed connector,

a POSITA would have only needed to add An's conductive lines 321 to 324, and contact terminals 341 to 344, or a similar structure to Kim's FPCB to form a "connector." (*Id.*)

A POSITA would have had good reason to make such a modification. (Ex-1002, ¶150.) For instance, An discloses that the antenna assembly may be buried in the back cover of a device, and when coupled to the device, the contact terminals (i.e., the connector) make an electrical connection to the device. (Ex-1008, ¶[68].) A connector having all connection terminals located in the same place would make it easier to connect the antenna to the mobile device. (Ex-1002, ¶150.) An also explains that connecting antennas to its connector simplifies the antenna fabrication process. (Ex-1008, ¶[12] ("[A]ccording to the embodiment, the inner terminal of the spiral antenna pattern is connected to the connector provided at the outside of the spiral antenna pattern through the conductive bridge, **so that the fabrication process of the antenna assembly can be simplified**.") (emphasis added).) Thus, a POSITA would have appreciated the benefits of using An's connector, and had good reason to form a convenient single connector on Kim's FPCB as disclosed by An. (Ex-1002, ¶150.)

2. Claim 29

Kim in view of An discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶151; Section IX.D.1.)

3. Claim 45

Kim in view of An discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶152; Section IX.D.1.)

E. Ground 5 – Claims 23, 24, 40, and 41 are Obvious over Kim in View of Shostak and Kim '681

Claims 23, 24, 40, and 41 recite the same features recited in claims 7 and 8, which, as discussed in Section IX.C, would have been obvious based on the combination of Kim and Kim '681. (Ex-1002, ¶153.) Claims 23, 24, 40, and 41 would have been obvious based on the Kim-Shostak combination in further view of Kim '681 for the same reasons set forth in Section IX.C, because the inclusion of Shostak's teachings does not detract from the modification based on Kim '681. (Ex-1002, ¶153.)

1. Claim 23

a) The wireless antenna according to claim 17, wherein a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil.

Kim in combination with Shostak and Kim '681 discloses or suggests this feature for the reasons discussed for claim 7. (Ex-1002, ¶154; Section IX.C.1(a).)

2. Claim 24

a) The wireless antenna according to claim 23, wherein the number of windings of the wireless charging coil is greater than the number of windings of the second wireless communication coil.

The Kim-Shostak-Kim '681 combination discloses or suggests this feature for the reasons discussed for claim 8. (Ex-1002, ¶155; Section IX.C.2(a).)

3. Claim 40

a) The wireless antenna according to claim 39, wherein the number of windings of the wireless charging coil is greater than a number of windings of the first wireless communication coil.

Kim in combination with Shostak and Kim '681 discloses or suggests this feature for the reasons discussed for claim 7. (Ex-1002, ¶156; Section IX.C.1(a).)

4. Claim 41

a) The wireless antenna according to claim 40, wherein the number of windings of the wireless charging coil is greater than the number of windings of the second wireless communication coil.

The Kim-Shostak-Kim '681 combination discloses or suggests this feature for the reasons discussed for claim 8. (Ex-1002, ¶157; Section IX.C.2(a).)

F. Ground 6 – Claims 1-12, 17-29, 34-45, and 50-52 are Obvious over Shostak in View of Kim

1. Claim 1

a) 1[pre]

To the extent the preamble of claim 1 is limiting, Shostak discloses the features therein. (Ex-1002, ¶¶158-59.) For instance, Shostak discloses "antenna apparatus 900" ("wireless antenna"), which "includes a wireless charging antenna that is the wireless charging coil 502," and "a wireless communication antenna that is the wireless communication coil 504 … including portions 314, 316, and 318." (Ex-1006, 9:55-66; *id.*, 1:58-61, 2:11-22 FIG. 9; Ex-1002, ¶158.)

b) 1[a]

Shostak discloses this feature. (Ex-1002, ¶160.) For instance, Shostak discloses "a wireless communication antenna that is the wireless communication coil 504" ("a wireless communication antenna"). (Ex-1006, 9:64-65, FIG. 9.) Shostak's wireless communication antenna includes an outer coil portion 314 ("first wireless communication coil"), an inner coil portion 316 ("second wireless communication coil"). (*Id.*, 9:55-66; FIG. 9; Ex-1002, ¶160.)

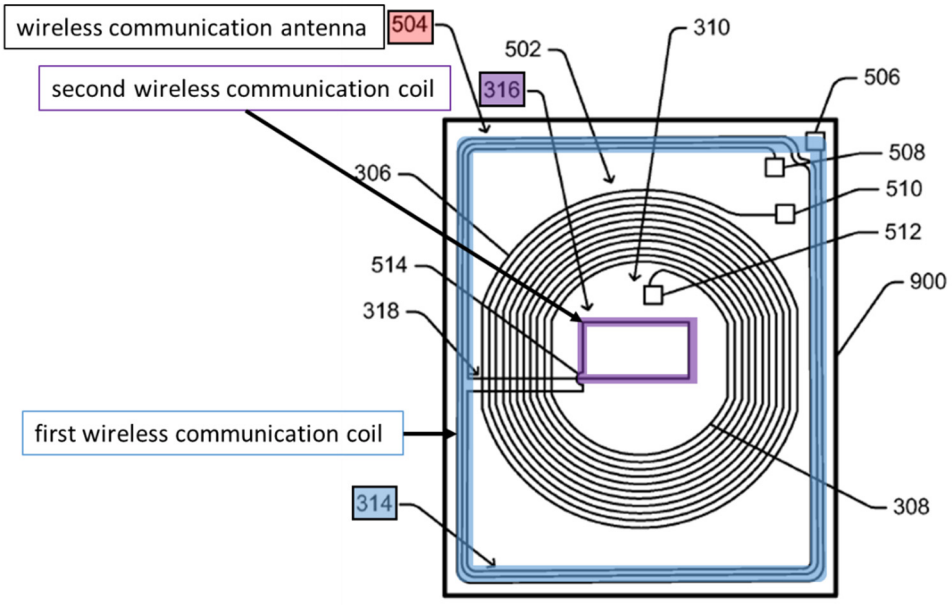


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶160.)

c) 1[b]

Shostak discloses this feature. (Ex-1002, ¶161.) For instance, Shostak discloses "a wireless charging antenna that is the wireless charging coil 502." (Ex-1006, 9:58-60.)

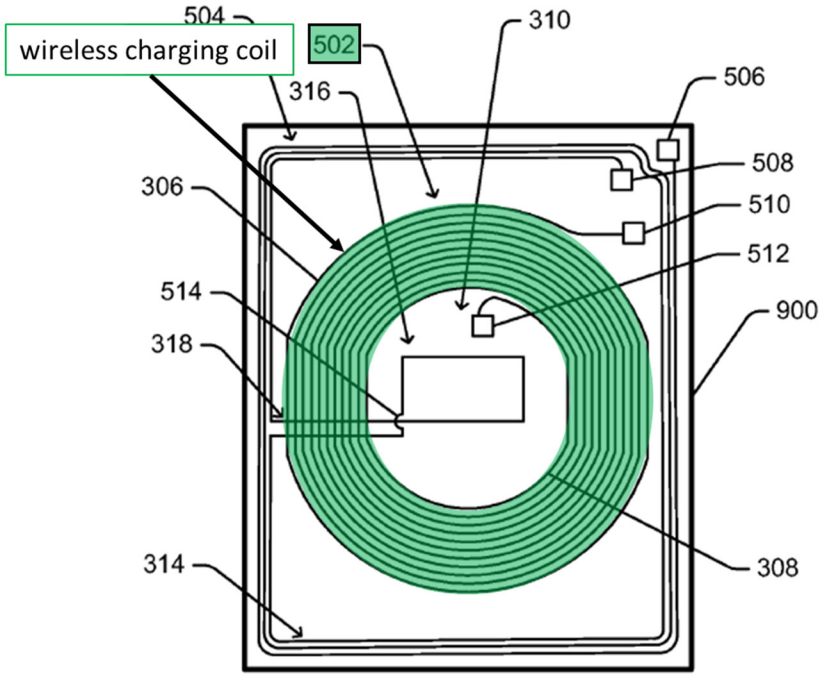


FIG. 9

(*Id.*, FIG. 9 (annotated); Ex-1002, ¶161.)

d) 1[c]

Shostak discloses this feature. (Ex-1002, ¶162.) For instance, Shostak discloses that the wireless charging antenna 302 (502 in FIG. 9) ("wireless charging coil") is positioned between the outer portion 314 ("first wireless communication coil") and the inner portion 316 ("second wireless communication coil") of the wireless communication antenna 304. (*Id.*, 4:58-60, 5:5-6, 9:55-57, FIGs. 3, 9.)

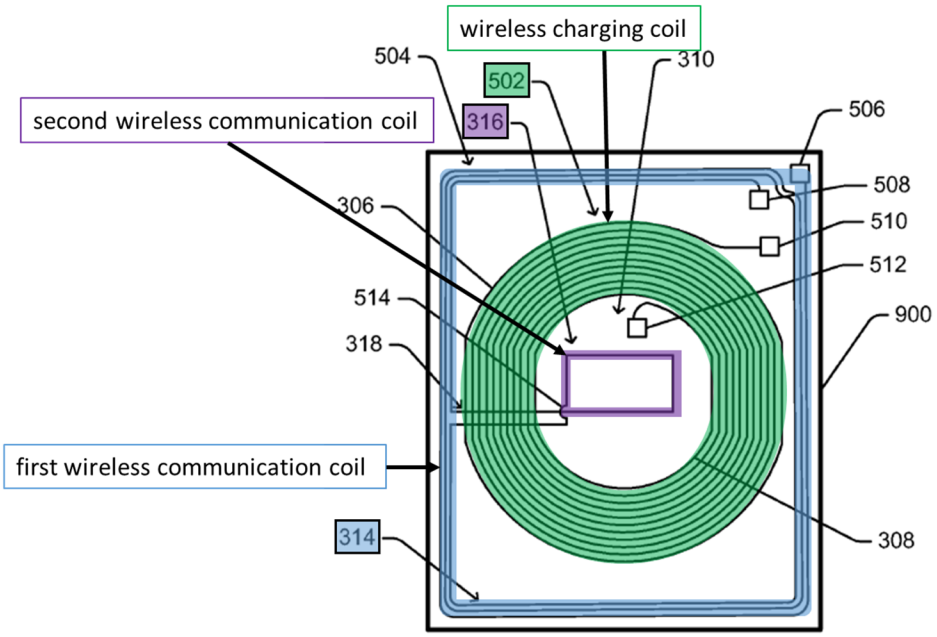


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶162.)

e) 1[d]

Shostak discloses or suggests this feature. (Ex-1002, ¶¶163-164.) For example, Shostak discloses "portion 318" ("coil connection member") which "traverses the [wireless charging coil], interconnecting the portions 314 and 316 of the antenna 304." (Ex-1006, 5:13-14; FIGs. 3, 9; *see also id.*, 4:34-40; 9:63-66, FIG. 4; Ex-1002, ¶163)

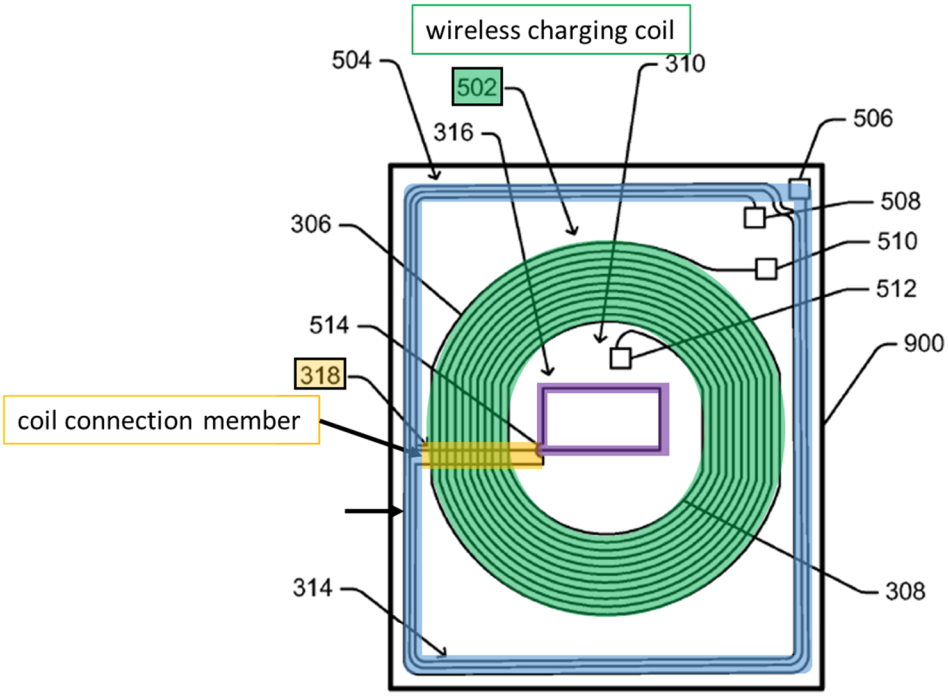


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶164.)

f) 1[e]

Shostak discloses or suggests this feature. (Ex-1002, ¶165.) For instance, Shostak discloses that wireless communication coil portion 316 ("the second wireless communication coil") has one winding, and wireless communication coil portion 314 ("the first wireless communication coil") has three windings. (Ex-1006, FIG. 9; Ex-1002, ¶165.)

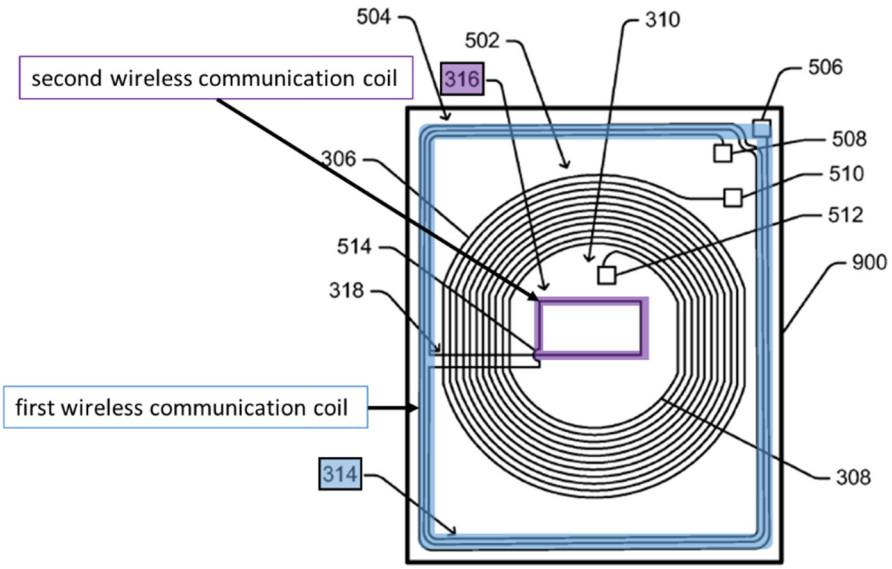


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶165.)

g) 1[f]

Shostak in combination with Kim discloses or suggests this feature. (Ex-1002, ¶¶166-174.) As discussed in Ground 1, Kim discloses a wireless antenna design similar to that of Shostak. (Sections IX.A.1(a)-(g).) Kim also discloses that a width of a winding of second loop antenna pattern 153 (the "second wireless communication coil") is less than a width of a winding of the first loop antenna pattern 151 (the "first communication coil"). (Ex-1005, FIGs. 1, 2; Section IX.A.1(g); Ex-1002, ¶¶166-167.)

Shostak is silent on the relative widths of the first and second wireless communication coils. (Ex-1002, ¶168.) Therefore, a POSITA would have looked

to similar references in the same field, such as Kim, for further guidance on how to implement Shostak's antenna. (*Id*.) Kim discloses or would have suggested to a person of ordinary skill to select a width of a winding of the first communication coil to be wider than a width of a winding of a second communication coil. (*Id.*)

As explained in Ground 1, the '426 patent identifies nothing important—let alone critical—about this feature. (Section IX.A.1(g).) A POSITA would have understood that selecting widths of the windings of the wireless communication coils is nothing more than a design choice. (Ex-1002, ¶169.) In fact, there are only three options for the relative winding widths of the first communication coil and the second communication coils: (1) same width; (2) the first communication coil having a width of a winding that is less than a width of a winding of the second communication coil; or (3) the second communication coil having a width of a winding that is less than a width of a winding of the first communication coil. (*Id.*) Kim's disclosure of only one of these options—a winding of the second communication coil narrower than a winding of the first communication coil—would have directed a POSITA towards that option. (*Id.*) Moreover, three options present a finite number of predictable options, each of which would have been obvious to try. *See ACCO Brands Corp. v. Fellowes, Inc.*, 813 F.3d 1361, 1367 (Fed. Cir. 2016) (explaining that where an "ordinary artisan would ... be left with two design choices ... [e]ach of these two design choices is an obvious

combination"); *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1339 (Fed. Cir. 2020) (holding the Board erred by not finding obvious because two possible options presented a "simple design choice"). Indeed, a POSITA would have found it obvious to make a width of a winding of the second wireless communication coil less than a width of a winding of the first communication coil, because having a narrower first communication coil winding is one of a finite number of possible alternatives, all of which would have worked and each of which a POSITA would have been encouraged to try. (Ex-1002, ¶169.)

A POSITA would have also had good reasons to implement Kim's relative winding widths in Shostak's antenna. (Ex-1002, ¶170.) For example, A POSITA would have understood that a wider coil winding reduces the resistance of the coil, which is desirable in some applications. (*Id.*; Ex-1014, 871 ("As the width of the coil increases, R_S of the coil decreases. The coil with the biggest W achieved the smallest R_S.").) POSITA would have further understood that in many applications a high quality factor (Q) coil is desirable, where having a wider coil results in a higher Q. (Ex-1002, ¶170; Ex-1014, 872, FIG. 8.) In addition, making the winding width of the second wireless communication coil narrower in such a manner could have been used to realize the desired coil characteristics in a coil configuration in which other variables for the coil (e.g., trace spacing, coil dimensions, trace

thickness) are constrained, such as by the finite space for an antenna within a mobile device. (Ex-1002, ¶170.)

The relationship between coil width and coil properties was also well understood, and thus a POSITA would have known that the width of the coil windings is one of a number of variables that can be manipulated to configure the performance of a coil by, for example, adjusting the inductance, resistance, and quality factor (Q) of the coil. (Ex-1002, ¶171; Ex-1015, ¶[0046] ("The width and the length of each antenna coil ... are set in accordance with the desired communication performance."); Ex-1016, 1276, 1278, 1281 (disclosing that inductive parameters of a coil vary with factors including conductor width); Ex-1014, 871-72 (describing how winding width impacts coil properties), FIGs. 6-9.)

A POSITA would have had good reason to select a width of a winding of the first communication coil to be wider than a width of a winding of a second communication coil in Shostak's antenna. For instance, Shostak's first and second wireless communication coils taken together are effectively a single coil inductor with a gap between the two portions. (Ex-1002, ¶172.) It was known long before the alleged invention in the '426 patent that there are advantages to making a coil inductor with windings that are narrower on the inside of the coil than at the outside. (*Id.*; *see generally*, Ex-1022.) Such a design has the advantages of saving space (desirable in the small mobile devices Shostak's antenna is designed for), while

maintaining substantially the same performance as a coil where all traces are the width of the widest trace. (Ex-1002, ¶172; Ex-1022, 2:38-59, FIG. 1.) Using an innermost communication coil with narrower traces that takes up less space would also have the added benefit of freeing up room to optimize the geometry of the antenna as a whole (e.g., spacing between coils, charging coil winding width, shape, etc.). (Ex-1002, ¶172.)

Therefore a POSITA would have had good reason and found it obvious to make a width of a winding of the second wireless communication coil less than a width of a winding of the first communication coil. (Ex-1002, ¶173.) *See Uber Techs.*, 957 F.3d at 1339; *In re Aller*, 220 F.2d at 456 ("[I]t is not inventive to discover the optimum or workable ranges by routine experimentation.").

A POSITA would have had a reasonable expectation of success in implementing Shostak's antenna with a width of a winding of the coil portion 316 ("second wireless communication coil") that is less than a width of a winding of Shostak's coil portion 314 ("first wireless communication coil"). (Ex-1002, ¶174.) A POSITA would have understood the impact of the coil winding widths on antenna properties, and further understood how to implement coils with appropriate widths. (*Id.*) Moreover, a POSITA would have had a reasonable expectation of success in the combination because of the similarities between Kim and Shostak's two-coil communication antennas. (*Id.*) Additionally, there is nothing particularly difficult

about selecting or changing the widths of the coil windings in Shostak's antenna, and doing so would be well within a POSITA's ability. (*Id.*)

2. Claim 2

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶¶175-176.) For instance, Shostak discloses that wireless communication coil portion 314 ("the first wireless communication coil") has a substantially rectangular shape, and wireless communication coil portion 316 ("the second wireless communication coil") has a substantially circular shape (i.e., different shapes). (Ex-1006, FIG. 10; Ex-1002, ¶175.)

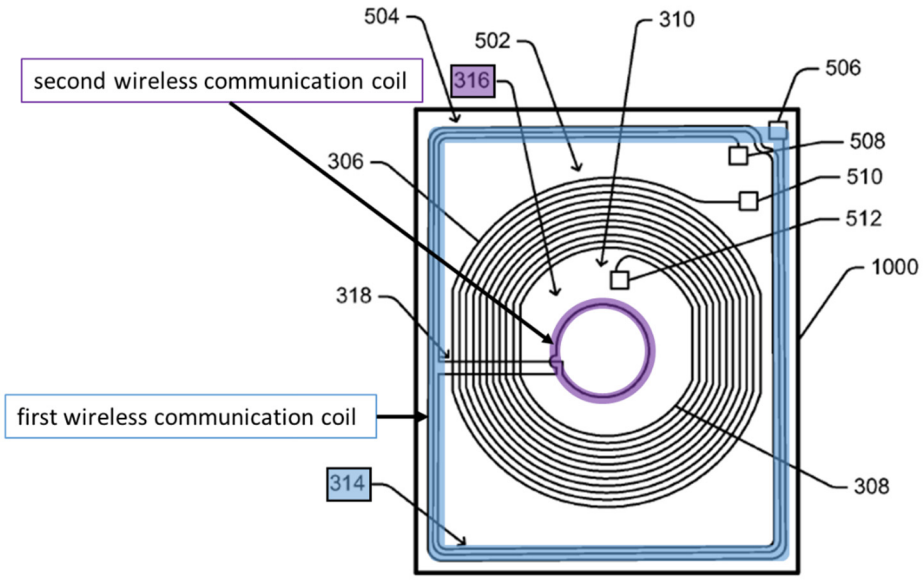


FIG. 10

(Ex-1006, FIG. 10 (annotated); Ex-1002, ¶175.)

Shostak's figure 10 antenna is "analogous to" the figure 9 antenna discussed above in Section IX.F.1(a)-(g) for claim 1, except that is has a circular coil portion 316. (Ex-1006, 10:26-40.)

3. Claim 3

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶177.) For instance, Shostak discloses that wireless communication coil portion 314 ("the first wireless communication coil") has a substantially rectangular ("polygonal") shape, disclosed as a loop pattern, and wireless communication coil portion 316 ("the second wireless communication coil") has a substantially circular shape, disclosed as a loop pattern. (Ex-1006, FIG. 10; Ex-1002, ¶177; Section IX.F.2(a).)

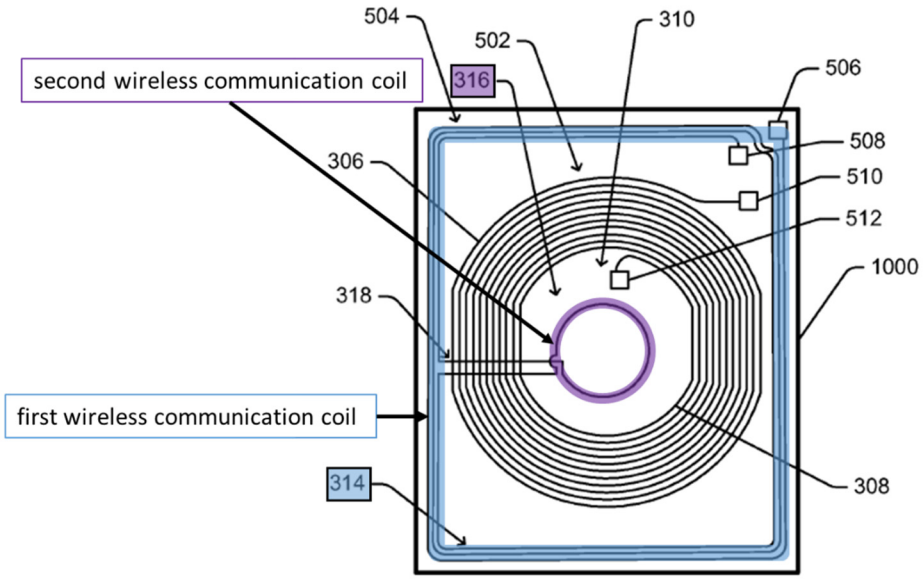


FIG. 10

(Ex-1006, FIG. 10 (annotated); Ex-1002, ¶177.)

4. Claim 4

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶178.) For instance, Shostak discloses that wireless communication coil portion 314 ("the first wireless communication coil") has a substantially rectangular shape (curvature), and wireless communication coil portion 316 ("the second wireless communication coil") has a different, substantially circular shape ("different curvatures"). (Ex-1006, FIG. 10; Sections IX.F.2-3; Ex-1002, ¶178.)

5. Claim 5

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶179.) For example, Shostak discloses wireless charging coil 502 and wireless communication coil portion 316 ("the second wireless communication coil"), each with substantially circular ("corresponding") curvatures. (Ex-1006, FIG. 10; Ex-1002, ¶179.)

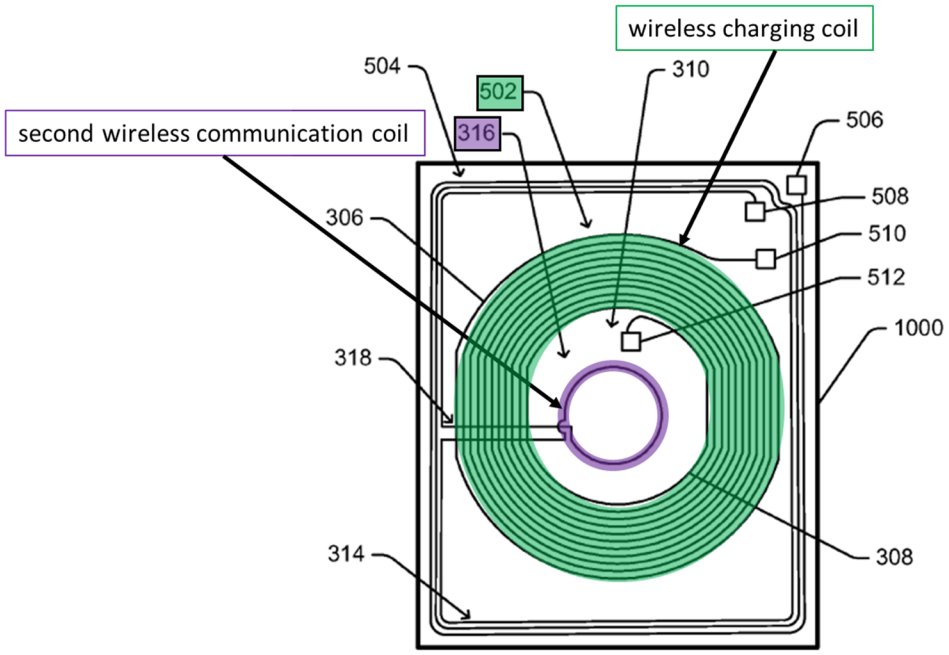


FIG. 10

(Ex-1006, FIG. 10 (annotated); Ex-1002, ¶179.)

6. Claim 6

The Shostak-Kim combination discloses this feature. (Ex-1002, ¶180.) For example, as discussed above, Shostak discloses that the interior portion of the

wireless communication antenna 316 ("second wireless communication coil") has only one winding. (Section IX.B.1(a); Ex-1005, 10:4-12, FIGs. 9, 10; Ex-1002, ¶180.)

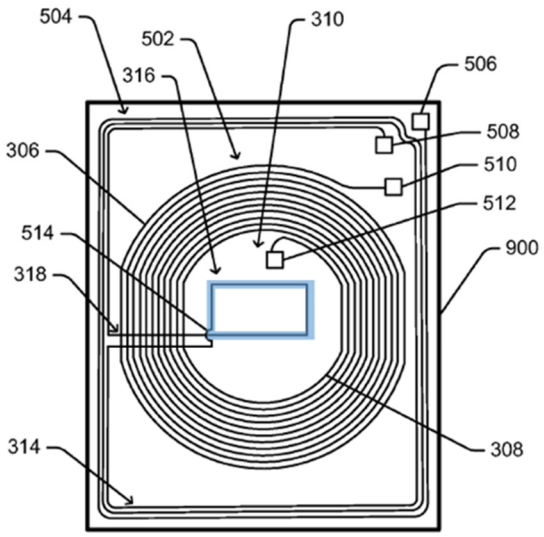


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶180.)

7. Claim 7

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶181.) For example, Shostak discloses that the wireless charging coil 502 has eleven windings and the first wireless communication coil 314 has three windings. (Ex-1006, FIGs. 9, 10; Ex-1002, ¶181.)

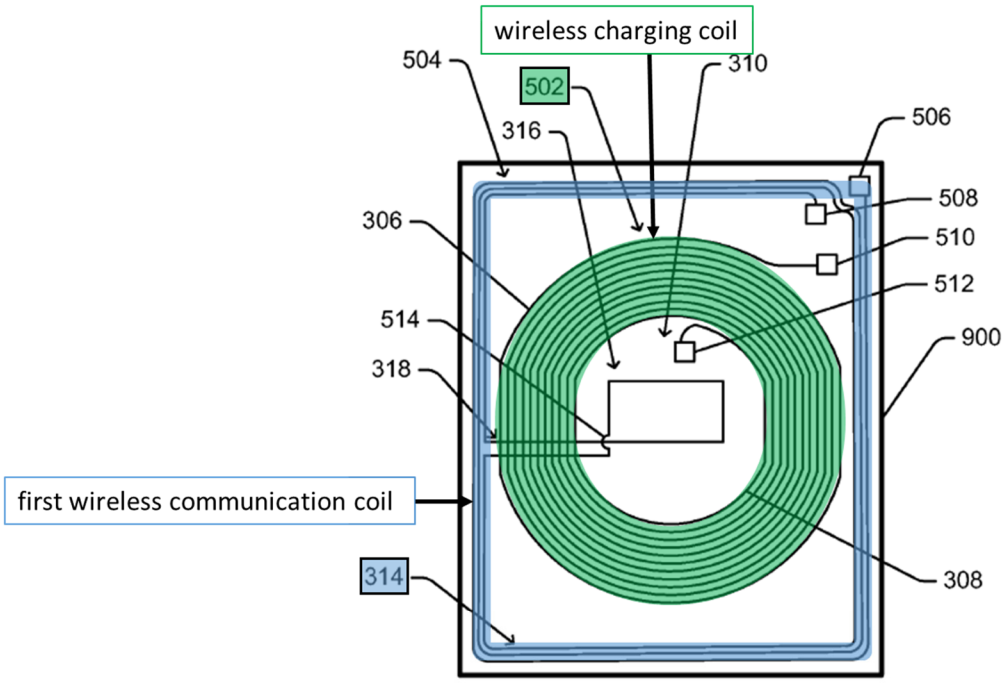


FIG. 9

(*Id.*, FIG. 9 (annotated); Ex-1002, ¶181.)

8. Claim 8

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶182.) For example, as discussed above in Sections IX.B.1(a), IX.F.6(a) and 7(a), Shostak discloses that the wireless charging coil has eleven windings and the second wireless communication coil has one winding. (Ex-1006, FIG. 9.)

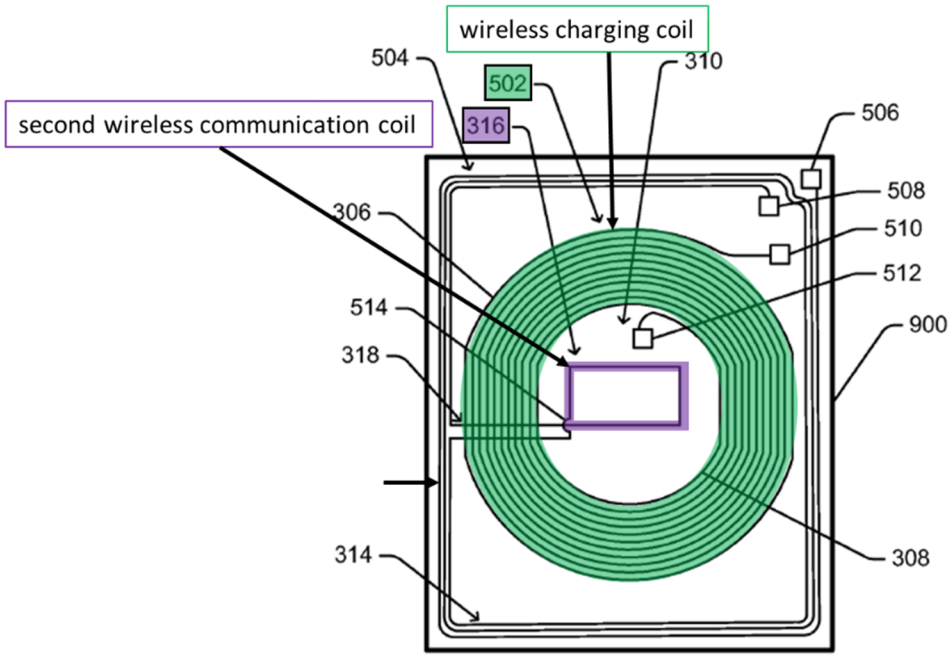


FIG. 9

(Ex-1006, FIG. 9; Ex-1002, ¶182.)

9. Claim 9

The Shostak-Kim combination discloses or suggest this feature. (Ex-1002, ¶¶183-184.) For example, Shostak discloses that where the coil connection member 318 (labeled 418 in Figure 4) traverses the wireless charging coil, "[a] dielectric or shield material can be positioned between the portion 318 and the antenna 302 to prevent the portion 318 and antenna 302 from coming into physical contact with one another" ("the coil connection member is insulated from the wireless charging coil"). (Ex-1006, 5:13-24, FIGs. 3, 4; Section IX.F.1(e).)

10. Claim 10

a) 10[a]

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶185.) For instance, as discussed above, Shostak discloses a coil connection member 318, which interconnects an outer coil portion 314 ("first wireless communication coil") to an inner coil portion 316 ("second wireless communication coil"). (Section IX.F.1(e).) Annotated figure 9 below shows that the coil connection member 318 connects the first wireless communication coil 314 and the second wireless communication coil 316 in series because there is a single current path through the second communication coil. (Ex-1006, FIG. 9; Ex-1002, ¶185.)

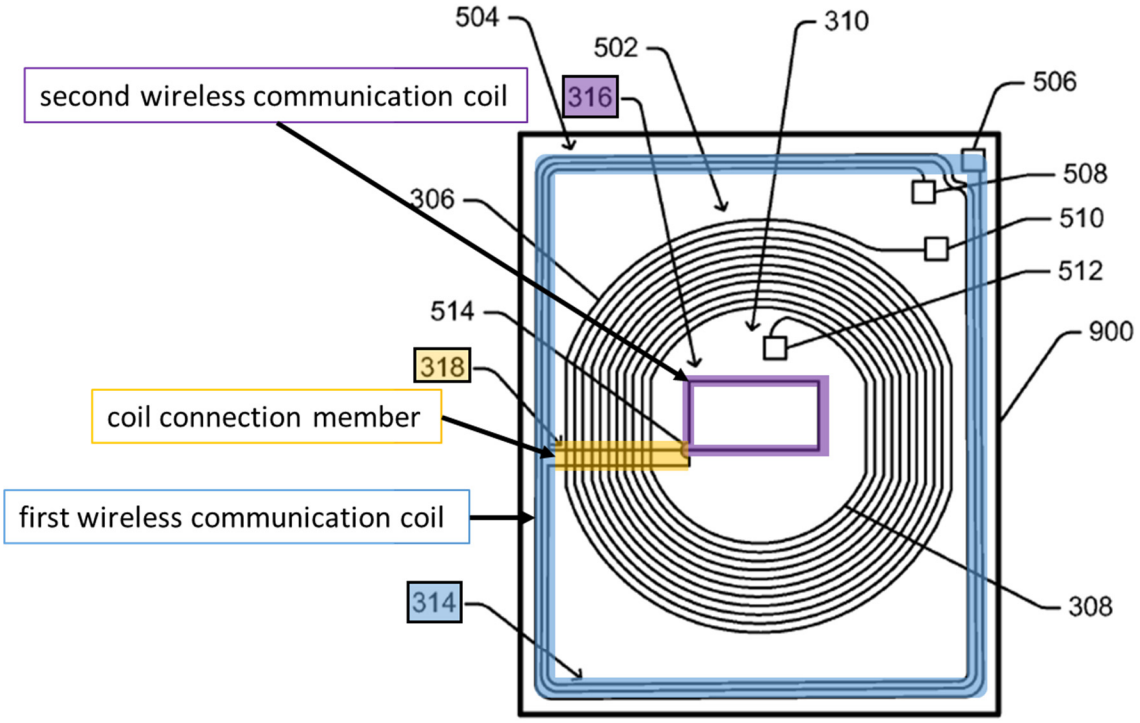


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶185.)

b) 10[b]

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶186.) For instance, Shostak discloses that the first wireless communication coil 314 is wound in the same direction as the second wireless communication coil 316, and those coils are connected in series as discussed above, such that current flowing through the coils would rotate in the same direction. (Section IX.F.10(a); Ex-1006, 8:10-22, 10:18-25, FIG. 9; Ex-1002, ¶186.)

11. Claim 11

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶¶187-189.) For instance, Shostak discloses with reference to figure 3 and the cross-section in figure 4 that wireless communication antenna 314 (412, 414, and 416 in figure 4), and wireless charging antenna 302 (420 and 422 in figure 4), are formed on base layer 402 ("flexible printed circuit board").[6] (Ex-1006, 4:34-36, 6:21-27, 6:43-50, FIGs. 3-4.) Shostak further discloses "base layer 402 can be any of a variety of … flexible sheets made of any of a variety of non-conductive materials." (*Id*., 6:36-38.) A POSITA would have understood from Shostak's disclosure of flexible sheets having circuitry for a wireless antenna disposed thereon that Shostak's flexible sheets were a FPCB. (Ex-1002, ¶187.)

[6] Figures 3 and 4 illustrate an example layout of Shostak's antenna 204, with figures 5-10 providing specific implementations. (Ex-1006, 7:24-28.) Shostak uses a different numbering convention in figure 4 than the other figures. (*See* Ex-1006, 6:42-50.)

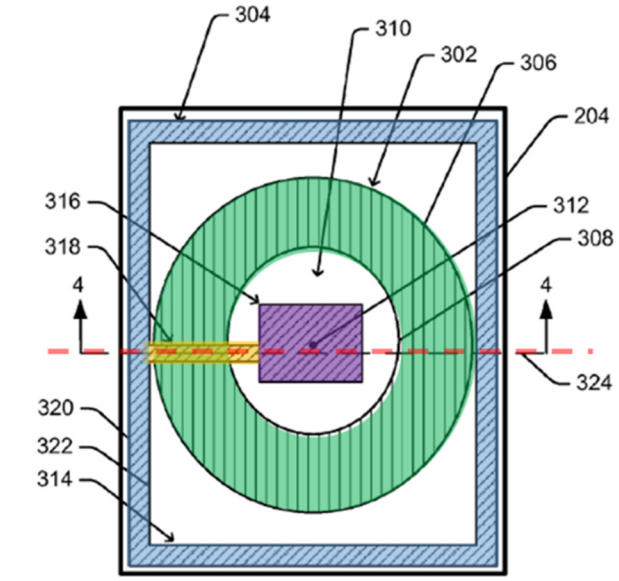


FIG. 3

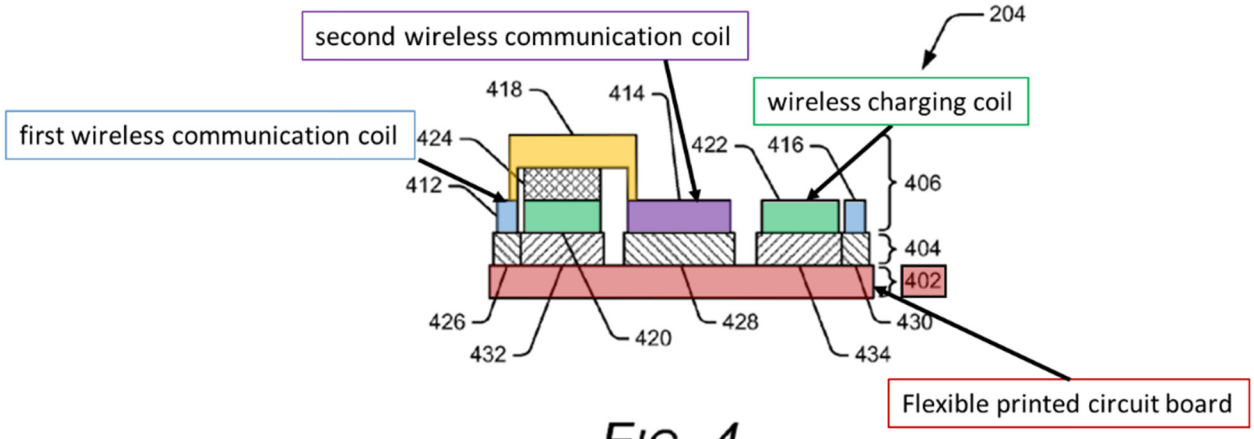


FIG. 4

(*Id*., FIGs. 3 (annotated), 4 (annotated); Ex-1002, ¶187.)

To the extent PO contends that Shostak does not disclose or suggest this feature, Kim discloses this feature, and it would have been obvious for a POSITA to implement the antenna of the Shostak-Kim combination sucht that the wireless

communication antenna and the wireless charging antenna are formed on FPCB. (Ex-1002, ¶188.), Kim discloses that "the loop antenna unit (150) may further comprise a flexible substrate (155)," where the flexible substrate 155 discloses or suggests a FPCB as previously discussed. (Section IX.A.8(a).)

A POSITA would have had good reason to use a FPCB, as disclosed by Kim, with Shostak's antenna at least because it was well-known at the time of the alleged invention that FPCBs provided multiple advantages. (Ex-1002, ¶189.) For example, FPCBs enabled wireless coil antennas to "be significantly slim," capable of "attach[ing] to a structure such as the case of a cellular phone using simple attachment methods such as the use of double sided tape, whereby a manufacturing cost and process cost may be reduced," and "simply attached even to an electronic device having a curved shape." (Ex-1017, ¶¶[0067]-[0068]; *see also id*. ¶[0021] ("The flexible substrate may be a polyimide type flexible printed circuit board (FPCB)....").) Given these known benefits, it would have been obvious to implement Shostak's flexible sheet as a FPCB such that Shostak's wireless communication antenna and wireless charging antenna are formed on a FPCB. (Ex-1002, ¶189.) A POSITA would have had a reasonable expectation of success because implementing Shostak's antennas on a FPCB would have involved nothing more than applying known techniques to Shostak's antenna design in a routine way. (*Id.*)

12. Claim 12

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶¶190-191.) For instance, Shostak discloses that "antenna apparatus 900 also includes communication connector contacts 506 and 508 for coupling to a wireless communication circuit and wireless charging connector contacts 510 and 512 for coupling to a wireless charging circuit" (contacts 506, 508, 510, and 512 together form a "connector"). (Ex-1006, 9:66-10:3, FIG. 9.)

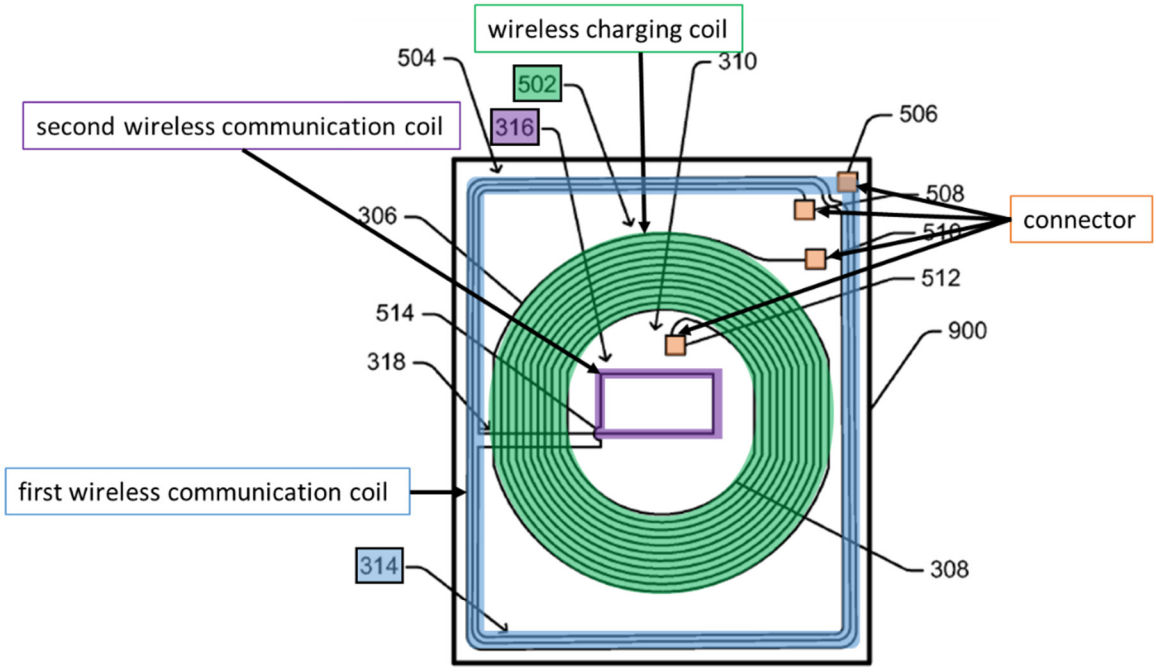


FIG. 9

(*Id*., FIG. 9 (annotated); Ex-1002, ¶190.)

As discussed above, the cross-section in Shostak's annotated figure 4 below shows the FPCB 402, which is depicted as spanning the entire antenna. (Section

IX.F.11(a); Ex-1006, 6:25-26, FIG. 4.) A POSITA would thus have understood that the connector is on the antenna, and, as such, is disposed on the FPCB. (Ex-1002, ¶191.)

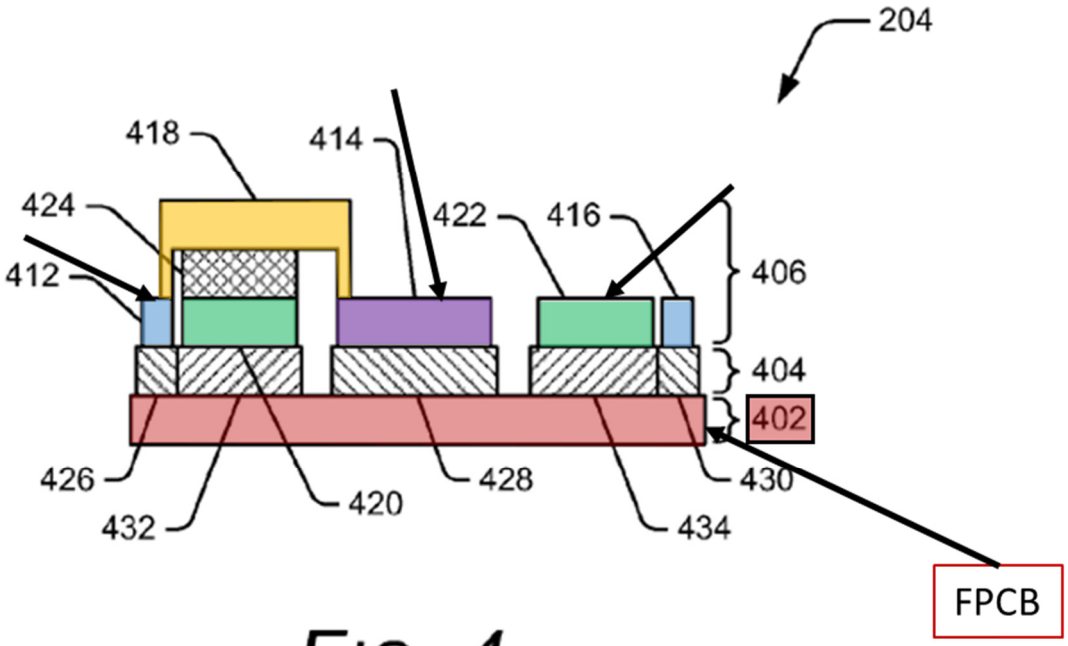


FIG. 4

(*Id.*, FIG. 4 (annotated); Ex-1002, ¶191.)

13. Claim 17

a) 17[pre]

b) 17[a]

c) 17[b]

d) 17[c]

e) 17[d]

Shostak discloses or suggests these features for the reasons discussed in Sections IX.F.1(a)-(d), (f). (Ex-1002, ¶¶192-196.)

f) 17[e]

Shostak discloses or suggests this feature as discussed above for claim element 17[e] in Ground 2. (Ex-1002, ¶197; Section IX.B.2(f).)

g) 17[f]

Shostak in view of Kim discloses or suggests this feature for the reasons discussed above for claim element 1[f]. (Ex-1002, ¶198; Section IX.F.1(g).)

14. Claim 18

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim 2. (Ex-1002, ¶199; Section IX.F.2(a).)

15. Claim 19

The Shostak-Kim combination discloses or suggests these features for the reasons discussed above for claim 3. (Ex-1002, ¶200; Section IX.F.3(a).)

16. Claim 20

The Shostak-Kim combination discloses or suggests these features for the reasons discussed above for claim 4. (Ex-1002, ¶201; Section IX.F.4(a).)

17. Claim 21

The Shostak-Kim combination discloses or suggests these features for the reasons discussed above for claim 5. (Ex-1002, ¶202; Section IX.F.5(a).)

18. Claim 22

The Shostak-Kim combination discloses or suggests these features for the reasons discussed above for claim 6. (Ex-1002, ¶203; Section IX.F.6(a).)

19. Claim 23

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 7. (Ex-1002, ¶204; Section IX.F.7(a).)

20. Claim 24

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 8. (Ex-1002, ¶205; Section IX.F.8(a).)

21. Claim 25

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim element 1[d]. (Ex-1002, ¶206; Section IX.F.1(e).)

22. Claim 26

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 9. (Ex-1002, ¶207; Section IX.F.9(a).)

23. Claim 27

a) 27[a]

b) 27[b]

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim elements 10[a] and 10[b]. (Ex-1002, ¶¶208-209; Sections IX.F.10(a), (b).)

24. Claim 28

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 11. (Ex-1002, ¶210; Section IX.F.11(a).)

25. Claim 29

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶211; Section IX.F.12(a).)

26. Claim 34

a) 34[pre]

To the extent the preamble is limiting, Shostak discloses or suggests this feature for the reasons discussed for claim element 1[pre]. (Ex-1002, ¶212; Section IX.F.1(a).)

b) 34[a]

Shostak discloses or suggests this feature for the reasons discussed for claim 3. (Ex-1002, ¶213; Section IX.F.3(a).)

c) 34[b]

Shostak discloses this feature. (Ex-1002, ¶214.) For instance, Shostak discloses "a wireless charging antenna that is the wireless charging coil 502" with a circular loop pattern. (Ex-1006, 9:58-60, FIGs, 9, 10.)

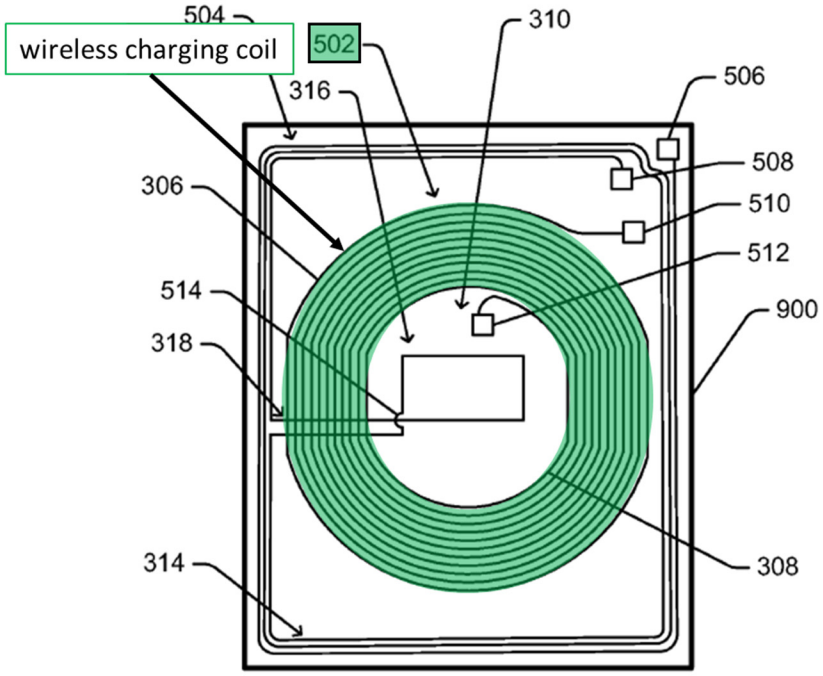


FIG. 9

(*Id.*, FIG. 9 (annotated); Ex-1002, ¶214.)

d) 34[c]

Shostak discloses or suggests this feature for the reasons discussed for claim element 1[c]. (Ex-1002, ¶215; Section IX.F.1(d).)

e) 34[d]

Shostak discloses or suggests this feature for the reasons discussed for claim element 1[d]. (Ex-1002, ¶216; Section IX.F.1(e).)

f) 34[e]

Shostak discloses or suggests this feature for the reasons discussed for claim element 17[e]. (Ex-1002, ¶217; Section IX.F.13(f).)

g) 34[f]

Shostak in combination with Kim discloses or suggests this feature for the reasons discussed for claim element 1[f]. (Ex-1002, ¶218; Section IX.F.1(g).)

27. Claim 35

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 4. (Ex-1002, ¶219; Section IX.F.4(a).)

28. Claim 36

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 6. (Ex-1002, ¶220; Section IX.F.6(a).)

29. Claim 37

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶221.) For example, as discussed above in Sections IX.B.1(a), IX.F.6(a)-8(a), Shostak discloses that the wireless charging coil 502 has eleven windings and the second wireless communication coil 316 has one winding. (Ex-1006, FIG. 9.)

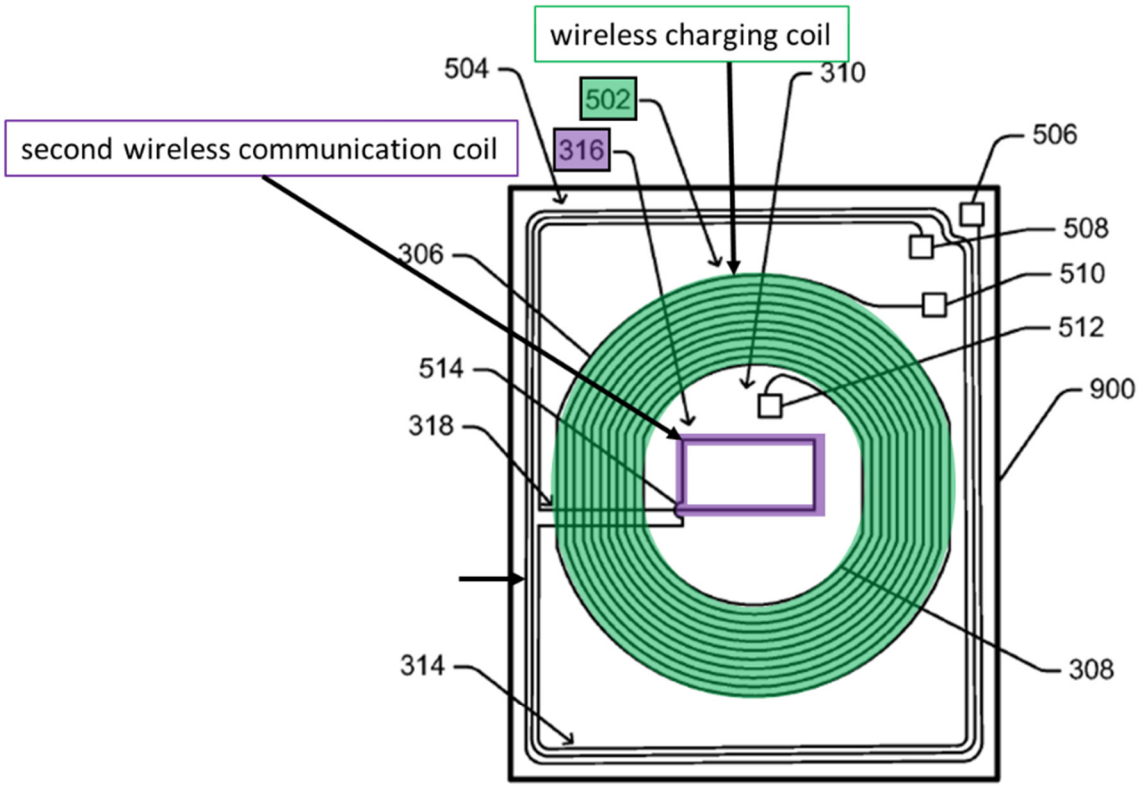


FIG. 9

(Ex-1006, FIG. 9; Ex-1002, ¶221.)

30. Claim 38

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 6. (Ex-1002, ¶222; Section IX.F.6(a).)

31. Claim 39

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 37. (Ex-1002, ¶223; Section IX.F.29(a).)

32. Claim 40

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 7. (Ex-1002, ¶224; Section IX.F.7(a).)

33. Claim 41

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 8. (Ex-1002, ¶225; Section IX.F.8(a).)

34. Claim 42

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 9. (Ex-1002, ¶226; Section IX.F.9(a).)

35. Claim 43

a) 43[a]

b) 43[b]

The Shostak-Kim combination discloses or suggests these features for the reasons discussed for claim elements 10[a] and 10[b]. (Ex-1002, ¶¶227-228; Sections IX.F.10(a), (b).)

36. Claim 44

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 11. (Ex-1002, ¶229; Section IX.F.11(a).)

37. Claim 45

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶230; Section IX.F.12(a).)

38. Claim 50

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim element 1[f]. (Ex-1002, ¶231; Section IX.F.1(g).) A POSITA would have found it obvious to implement each of the windings of the first communication coil with a width that is greater than the width of the winding of the second wireless communication coil for the same reasons. (Ex-1002, ¶231.)

39. Claim 51

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 50. (Ex-1002, ¶232; Section IX.F.38(a).)

40. Claim 52

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 50. (Ex-1002, ¶233; Section IX.F.38(a).)

G. Ground 7 – Claims 12, 29, and 45 are Obvious over Shostak in View of Kim and An

1. Claim 12

As discussed above, the Shostak-Kim combination discloses or suggests this feature. (Section IX.F.12(a).) To the extent PO contends the Shostak-Kim combination does not disclose or suggest this feature, the Shostak-Kim combination in further view of An discloses or suggests this feature. (Ex-1002, ¶¶234-240.) Similar to Shostak and Kim, An discloses an antenna having a connector disposed on a FPCB that is connected to a wireless communication antenna and a wireless

charging antenna, and, in view of An, a POSITA would have had good reason to implement a similar connector in the Shostak-Kim's antenna. (*Id.*, ¶234.)

The details of An's antenna assembly and connector are discussed above in Ground 4, along with the reasons it would have been obvious to implement a connector on the FPCB that is connected to the wireless communication antenna and charging antenna. (Section IX.D.1(a); Ex-1002, ¶¶144-150, 235-239.)

A POSITA would have found it obvious to modify the antenna of the Shostak-Kim combination with An's connector and would have had a reasonable expectation of success for the same reasons discussed above with respect to the Kim-An combination. (Section IX.D.1(a); Ex-1002, ¶¶239-240.) Indeed, Shostak's terminals 506, 508, 510, and 512 are similar to An's terminals 620, 610, 210, and 220, respectively. (*Id.*, ¶239.) Thus, to the extent the Shostak-Kim antenna does not already disclose the claimed connector, a POSITA would have only needed to add An's sub-connection parts 501 to 504, conductive lines 321 to 324, and contact terminals 341 to 344, or a similar structure, to the Shostak-Kim antenna's FPCB to form a "connector" as disclosed by An. (*Id.*, ¶239.)

2. Claim 29

Shostak in combination with Kim and An discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶241; Section IX.G.1(a).)

3. Claim 45

Shostak in combination with Kim and An discloses or suggests this feature for the reasons discussed for claim 12. (Ex-1002, ¶242; Section IX.G.1(a).)

X. DISCRETIONARY DENIAL IS NOT APPROPRIATE

As explained below, the Board should not exercise its discretion to deny the present Petition.

A. § 314(a)

The six factors set out in *Fintiv* do not justify denying institution. *See Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential).

The **first factor** (stay) is at best neutral because Petitioner has not yet moved to stay the district court case and the PTAB does not infer how the district court would rule should a stay be requested. *See, e.g., Hulu LLC v. SITO Mobile R&D IP, LLC et al.*, IPR2021-00298, Paper 11 at 10-11 (PTAB May 19, 2021).

The **second factor** (proximity of trial) is neutral. While jury selection is currently set for June 26, 2023, "an early trial date" is "non-dispositive" and simply means that "the decision whether to institute will likely implicate other factors," which, as explained, favor institution. *Fintiv*, IPR2020-00019, Paper 11 at 5, 9; *see also Intuitive Surgical, Inc. v. Ethicon LLC*, IPR2018-01703, Paper 7 at 12 (PTAB Feb. 19, 2019) (recognizing that, even if an earlier trial, institution is appropriate to "give[] the district court the opportunity, at its discretion, to conserve judicial

resources by staying the litigation until the review is complete," which helps "satisfy[] the AIA's objective"); *Unilioc USA, Inc. v. RingCentral, Inc.*, No. 2-17-cv-00354-JRG (E.D. Tex. Feb. 12, 2018), at *1 (observing that a stay pending IPR will "streamline the scope of th[e] case to an appreciable extent").

The **third factor** (investment in parallel proceedings) weighs strongly in favor of institution. The district court case is in its infancy and the Parties' have made little investment to date. PO filed its district court complaint on January 10, 2022, Petitioner filed its answer just over a month ago on April 14, 2022, and PO served its infringement contentions on May 4, 2022. Petitioner's diligence in pursuing this petition shortly after receiving the infringement contentions weighs in favor of institution. *Facebook, Inc. v. USC IP P'ship*, *L.P.*, IPR2021-00033, Paper 13 at 13 (PTAB April 30, 2021).

Moreover, the most cost-intensive period in the case will occur after the Board's institution decision, including the January 25, 2023, *Markman* hearing, close of fact and expert discovery, and dispositive motions. *See Precision Planting, LLC. v. Deere & Co.*, IPR2019-01044, Paper 17 at 14-15 (PTAB Dec. 2, 2019) (finding a case at a similar stage not at "an advanced stage"); *Abbott Vascular, Inc. v. FlexStent, LLC*, IPR2019-00882, Paper 11 at 30 (Oct. 7, 2019) (same).

Because the investment in the trial has been minimal and Petitioner acted diligently, this factor favors institution. *See, e.g., Hulu*, Paper 11 at 13.

The **fourth factor** (overlap) also weighs in favor of institution, because Petitioner has not yet served its invalidity contentions in the parallel district court proceeding, and thus there is currently no overlap.

Regarding the **fifth factor**, the Board should give no weight to the fact that Petitioner and PO are the same parties as in district court. *See Weatherford U.S., L.P., v. Enventure Global Tech., Inc.*, Paper 16 at 11-13 (April 14, 2021).

The **sixth factor** (other circumstances) weighs heavily in favor of institution given the undeniable similarity between Petitioner's references and the '426 patent. *See Align Technology, Inc. v. 3Shape A/S*, IPR2020-01087, Paper 15 at 42-43 (PTAB Jan 20, 2021); *see also* Section IX. There is also a significant public interest against "leaving bad patents enforceable," and institution will further that interest. *Thryv, Inc v. Click-To-Call Techs., LP*, 140 S. Ct. 1367, 1374 (2020).

B. § 325(d)

The Board should likewise not exercise its discretion under § 325(d).

Petitioner only relies on two prior art references presented to the Office during prosecution, Shostak (Ex-1006) and An (Ex-1008). (Ex-1004, 517-19, 531, 564-66.) The Examiner concluded that Shostak did not disclose claim element 1[f] (and its equivalents in other claims) (*id*., 297), but the Examiner failed to consider whether that limitation would have been obvious in view of any other reference. Moreover, the Examiner was not presented with Kim, which discloses claim element

1[f], as described above in Section IX. Nor did the examiner have the benefit of Petitioner's analysis or expert testimony.

An's counterpart was cited to the Office on an IDS, but none of its teachings were cited by the examiner.

Therefore, Petitioner relies on evidence and arguments that are not the same or substantially the same as those previously presented to the Office. *See Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (Feb. 13, 2020) (precedential). But even if the Board finds otherwise, for the reasons discussed above, the Office erred in a manner material to the patentability of the challenged claims. *Id.*

XI. CONCLUSION

For the foregoing reasons, Petitioner requests IPR and cancellation of Claims 1-12, 17-29, 34-45, and 50-52 of the '426 patent.

Respectfully submitted,

Dated: May 24, 2022

By: /Naveen Modi/
Naveen Modi (Reg. No. 46,224)
Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 10,461,426 contains, as measured by the word-processing system used to prepare this paper, 13,458 words. This word count does not include the items excluded by 37 C.F.R. § 42.24(a).

Respectfully submitted,

Dated: May 24, 2022

By: /Naveen Modi/
Naveen Modi (Reg. No. 46,224)
Counsel for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on May 24, 2022, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. Patent No. 10,461,426 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on PAIR:

Vorys, Sater, Seymour and Pease LLP
1909 K Street, N.W., 9th Floor
Washington, DC 20006-11582

The Petition and supporting exhibits were also served upon counsel of record for Patent Owner in the litigation pending before the U.S. District Court for the Eastern District of Texas entitled *Scramoge Technology Ltd. v. Samsung Electronics Co. Ltd. et al.*, Case No. 2:22-cv-00015-JRG-RSP (E.D. Tex.) by electronic mail at the following addresses:

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