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. 10,727,592

PETITION FOR INTER PARTES REVIEW OF
U.S. PATENT NO. 10,727,592

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I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") requests *inter partes* review ("IPR") of Claims 1-19 ("challenged claims") of U.S. Patent No. 10,727,592 ("the '592 Patent," Ex-1001). According to PTO records, the '592 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 UNDER 37 C.F.R. § 42.8

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 '592 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 ’592 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 1-19 of the ’592 Patent should be cancelled as unpatentable based on the following grounds:

Ground 1: Claims 1, 2, 5, 7-9, 12, and 14-16 are anticipated by Korean Patent Application Publication No. KR10-2015-0010063 (“Kim”) (Ex-1005);

Ground 2: Claims 3, 10 and 17 are rendered obvious by Kim in view of Korean Patent No. 10-1185681 (“Kim ’681”) (Ex-1007);

Ground 3: Claims 4, 6, 11, 13, 18 and 19 are rendered obvious by Kim in view of U.S. Patent No. 9,276,642 (“Shostak”) (Ex-1006); and

Ground 4: Claims 1-19 are rendered obvious by Shostak in view of Kim.

The ’592 Patent issued on July, 28, 2020, from U.S. Patent App. No. 16/575,217 (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) and Kim '681 issued on September 24, 2012 (Ex-1007). Therefore each of these references is 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, which claims priority to U.S. Provisional App. No. 62/017,297, filed June 26, 2014 (Ex-1006) and is therefore prior art at least under AIA 35 U.S.C. § 102(a)(2).

Other than Shostak, none of these references were considered during prosecution. (*See generally* Ex-1004.) Shostak's Pre-Grant Publication No. 2015/0381239 was cited by the examiner during prosecution of a parent patent. (*See, e.g.*, Ex-1023, 354-57.) However, as discussed below in Section X.B, inclusion of Shostak in Grounds 3 and 4 does not warrant discretionary denial because Petitioner presents Shostak in a new light in combination with Kim, which was not previously considered by the Patent Office. (Section X.B.)

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art as of the claimed priority date of the '592 patent ("POSITA") would have had a bachelor's degree in electrical engineering,

[1] Petitioner does not concede that the '592 Patent is entitled to its claimed priority date.

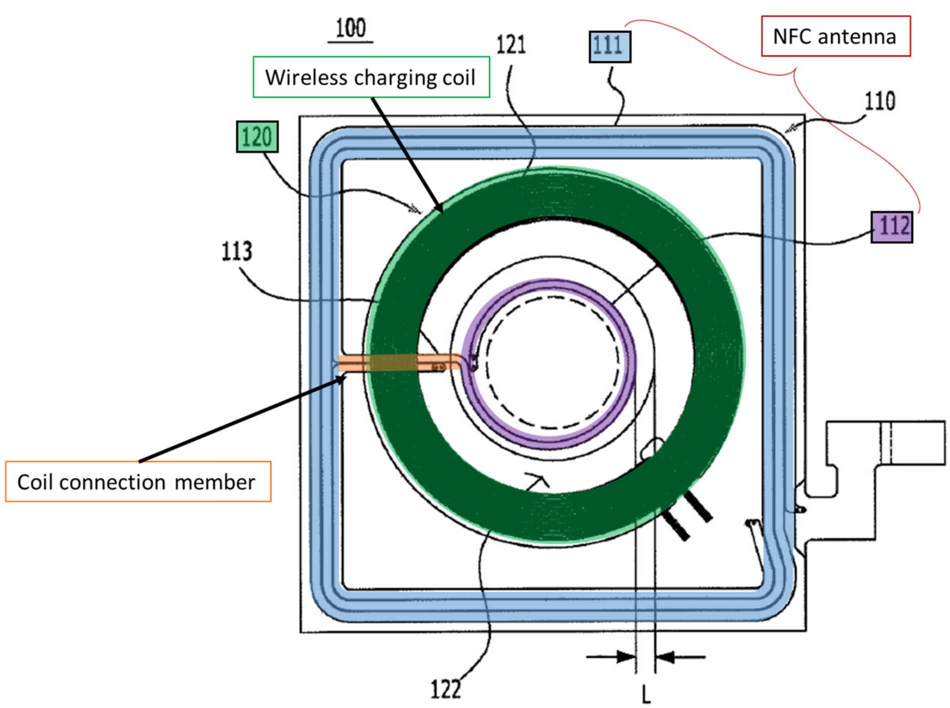
computer engineering, applied physics, or a related field, and at least one year of experience in the research, design, development, and/or testing of wireless charging systems, or the equivalent. (Ex-1002, ¶20.)[2] More education can supplement practical experience and vice versa. (*Id.*)

VII. OVERVIEW OF THE ’592 PATENT

The ’592 Patent, titled “Wireless Antenna for Wireless Charging and NFC Communication and Wireless Terminal to Which Same is Applied,” relates to “a wireless antenna capable of simultaneously supporting wireless charging and near field communication (NFC).” (Ex-1001, Title, 1:23-26; Ex-1002, ¶¶27-28.) The ’592 Patent intends to address limitations of conventional antennas that have both a wireless charging antenna and an antenna for near-field communication (“NFC”). (Ex-1001, 1:40-65.) 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, 1:52-57.) Thus, the ’592 Patent provides “a wireless antenna designed such that a loop antenna that supports an NFC function is added inside a loop antenna that supports wireless charging, and a wireless terminal to which the same is applied.” (*Id.*, 1:61-65.)

[2] Petitioner submits the testimony of Dr. R. Jacob Baker (Ex-1002, ¶¶1-167), an expert in the field of the ’592 Patent. (*Id.*, ¶¶5-15; Ex-1003.)

With respect to figure 1 below, the ’592 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, 3:45-63, 4:41-59.) “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.*, 2:13-17, 4:60-5:5.)



(*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). Under *Phillips*, claim terms are typically given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention. *Phillips*, 415 F.3d at 1313; *see also id.,* 1312-16. 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, 2, 5, 7-9, 12, and 14-16 are Anticipated by Kim

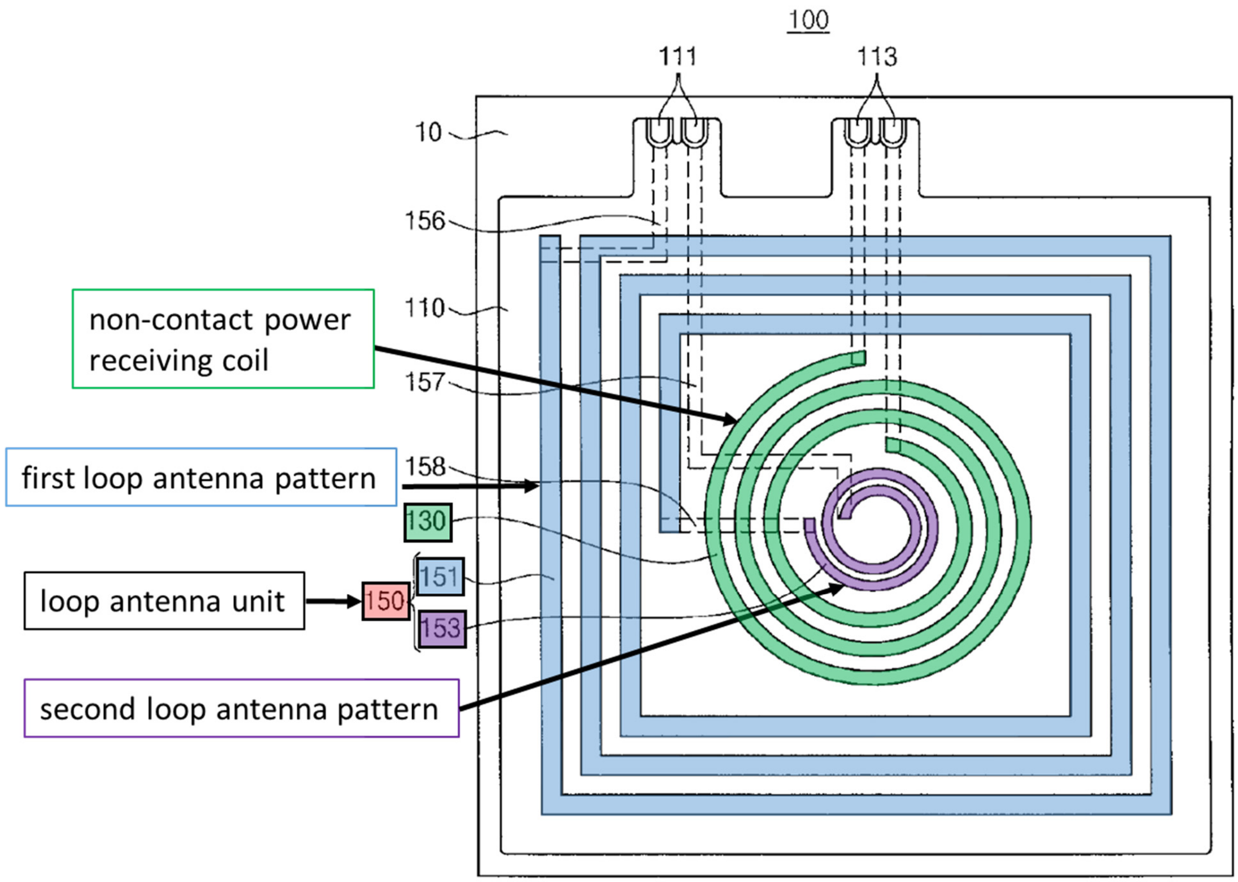
1. Claim 1

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

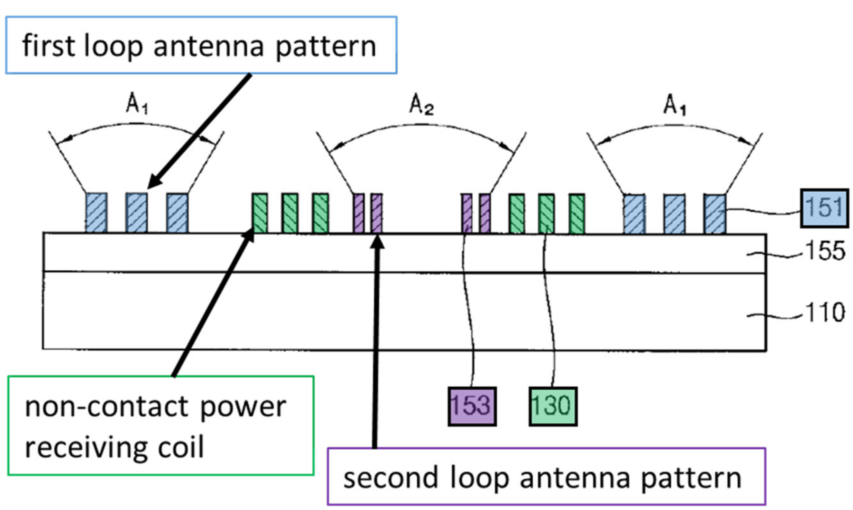
To the extent the preamble of claim 1 is limiting, Kim discloses the features therein. (Ex-1002, ¶¶43-44.) For instance, Kim discloses "an **antenna structure** for near field communication capable of **non-contact charging** and **near field communication** by generating an induced electromotive force." (Ex-1005, ¶[0001]

(emphasis added); *see also id.*, Title, Abstract, ¶¶[0012], [0025]-[0026], [0031], FIGs. 1, 2; Ex-1019, ¶[0006] and Ex-1020, ¶[0006] (explaining near-field communication ("NFC"); Ex-1027, ¶¶[0003], [0005]-[0007], [0048]-[0049], [0052]-[0054] (explaining wireless charging); Ex. 1002, ¶¶30, 43.)

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.*)



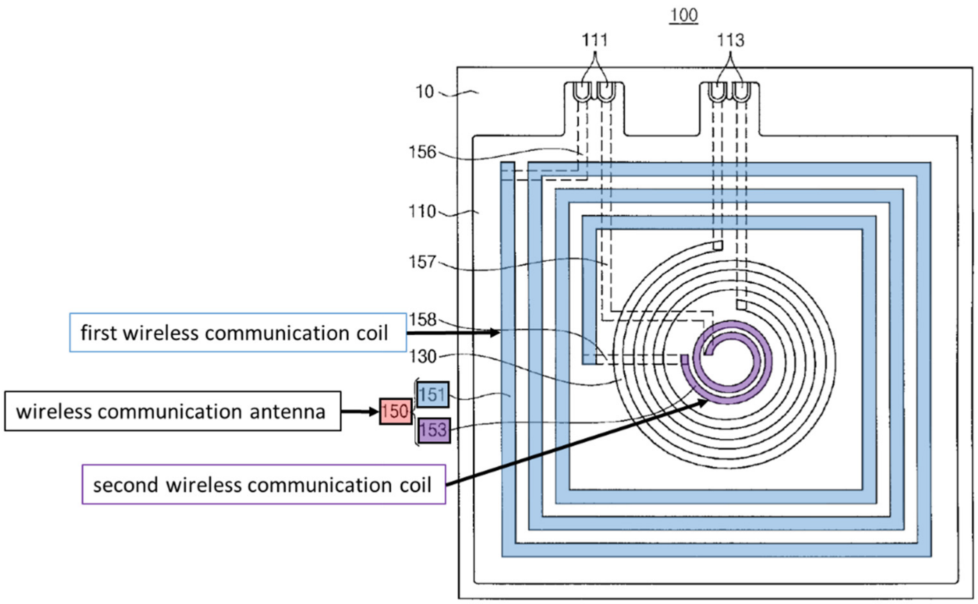
(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶44.)



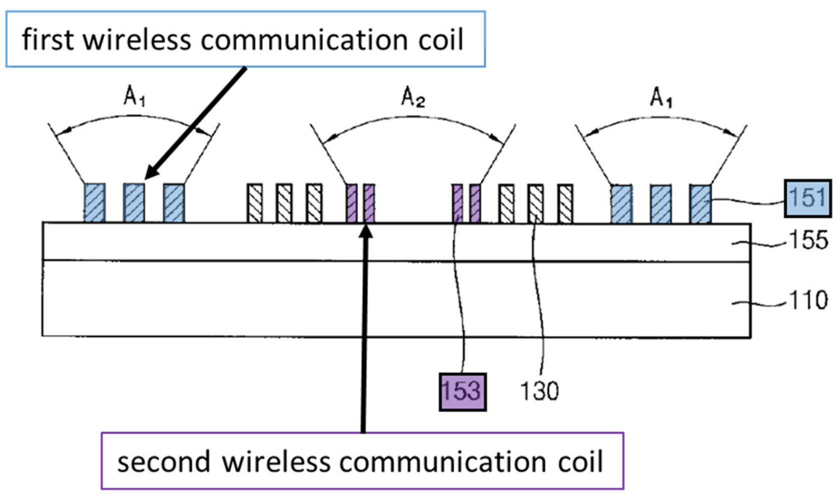
(Ex-1005, FIG. 2 (annotated); Ex-1002, ¶44.)

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, ¶¶45-47.) 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.) Annotated figures 1 and 2 below show first loop antenna pattern 151 surrounding a non-contact power receiving coil unit 130, and second loop antenna pattern 153 inside of the non-contact power receiving coil. (*Id.*, ¶[0031], FIGs. 1, 2.) The first loop antenna pattern 151 and the second loop antenna pattern 153 are each depicted as coils. (*Id.*, FIG. 1; Ex-1002, ¶45.) Indeed, Kim calls the "non-contact power receiving coil unit" 130 a **coil**, and there is no structural difference between coil unit 130 and the first loop antenna pattern 151 and the second loop antenna pattern 153. (Ex-1005, ¶[0026], FIG. 1; Ex-1002, ¶45.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶45.)

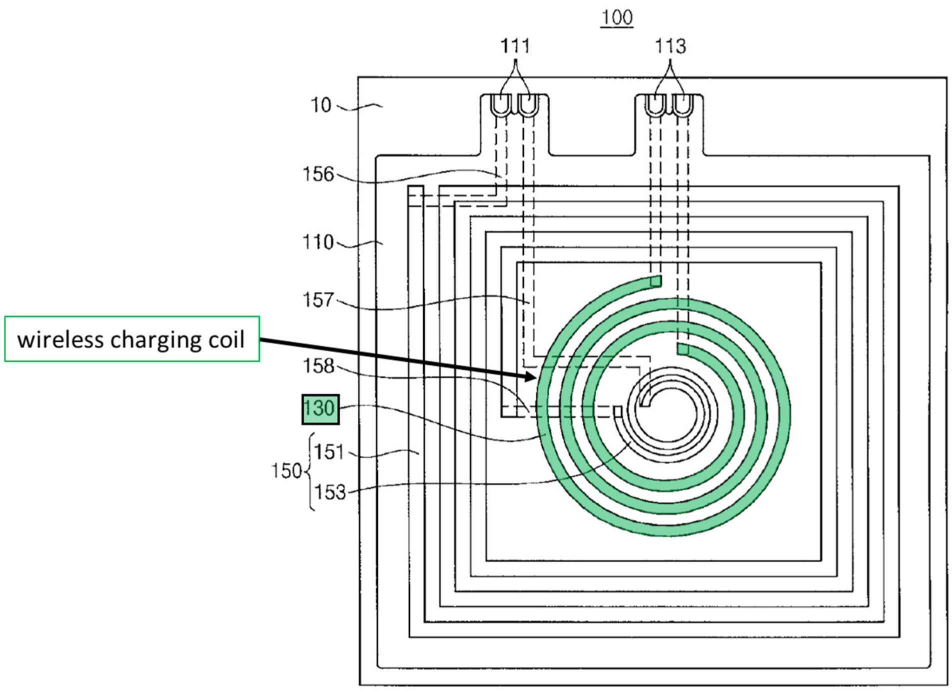


(Ex-1005, FIG. 2 (cross-section of FIG. 1) (annotated); Ex-1002, ¶45.)

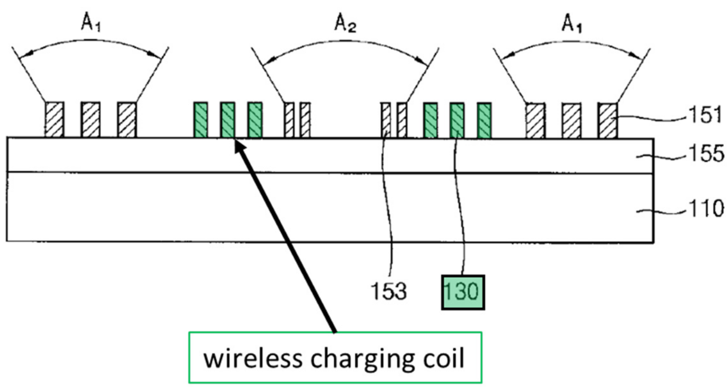
Kim discloses that "[t]he loop antenna unit (150) enables near field **communication**," and "is electrically connected to the terminals for near field **communication** (111)." (Ex-1005, ¶[0030]-[0031] (emphasis added).) Kim further discloses that "the first loop antenna pattern (151) enables near field **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, ¶46.)

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

Kim discloses this feature. (Ex-1002, ¶¶48-50.) For instance, Kim discloses a non-contact power receiving coil unit 130 ("wireless charging antenna comprising: a wireless charging coil"). (Ex-1005, ¶[0028] ("The non-contact power receiving coil unit (130) is a part of a WPC (wireless power charger) and is connected to charging terminals (113), which allows it to charge the battery (10) in a non-contact manner."), FIGs. 1, 2.) As shown below in the annotated figures from Kim, the non-contact power receiving coil unit 130 is disclosed as a spiral-shaped coil. (*Id.*, ¶[0028], FIGs. 1, 2; Ex-1002, ¶48)



(*Id.*, FIG. 1 (annotated); Ex-1002, ¶48.)



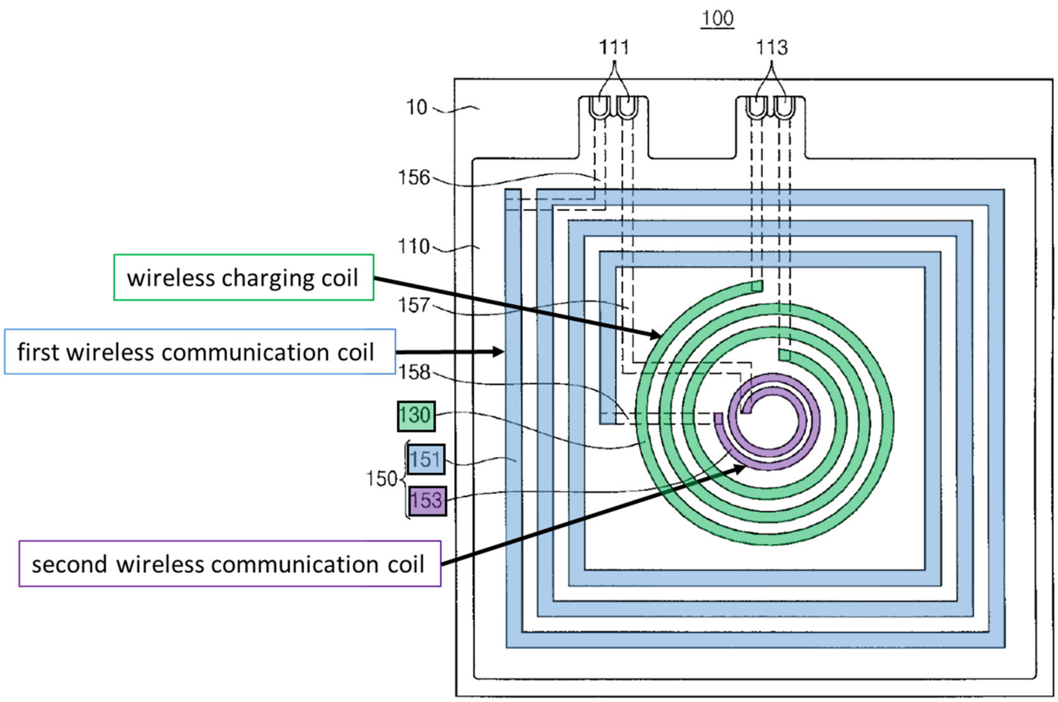
(*Id.*, FIG. 2 (annotated); Ex-1002, ¶48.)

Kim explains that a "non-contact (wireless) charging" utilizes "a loop **antenna** in the form of a **spiral coil**." (Ex-1005, ¶¶[0004]-[0005] (emphasis added).) Kim further discloses that "[w]hen the non-contact power receiving coil unit (130) is positioned on top of the primary coil installed in a non-contact charger (not shown), an induced electromotive force is generated in a frequency band of several hundred kHz (e.g., 300 kHz or less) between the coil unit (130) and the primary coil, making it possible to charge the battery (10) equipped with the antenna structure for near field communication (100).” (*Id*., ¶[0029].)

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

Kim discloses this feature. (Ex-1002, ¶¶51-53.) For instance, as discussed above for claim elements 1[a] and 1[b], Sections IX.A.1(b)-(c), 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. (*Id*., ¶[0031].)

Annotated figure 1 below shows non-contact power receiving coil unit 130 (“wireless charging coil”) disposed inside a first loop antenna pattern 151 (“first wireless communication coil”), and a second loop antenna pattern 153 (“second wireless communication coil”) disposed inside the non-contact power receiving coil unit 130. (*Id.*, ¶[0031], FIG. 1; Ex-1002, ¶52.)

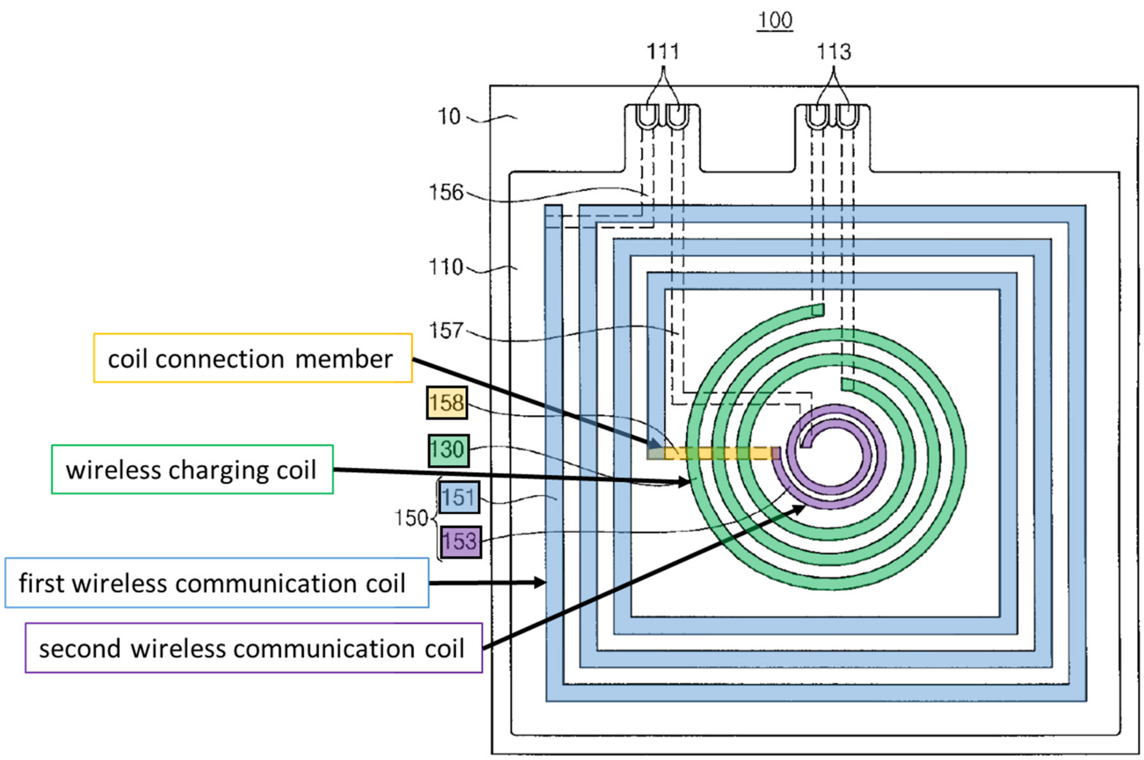


(*Id.*, FIG. 1 (annotated); Ex-1002, ¶52.)

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

Kim discloses this feature. (Ex-1002, ¶¶54-55.) For instance, as discussed above with respect to claim element 1[a], Kim discloses a loop antenna unit 150 ("wireless communication antenna") comprising 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(b); Ex-1005, ¶[0031], FIGs. 1, 2.) Kim further discloses that the loop antenna unit 150 comprises second connection line 158 ("coil connection member"), where "[t]he second connection line (158) interconnects the first and second loop antenna patterns (151, 153)" by traversing the wireless charging coil 130. (Ex-1005, ¶[0032] ("[T]he loop antenna unit (150) may further comprise … a second connection line (158)."), ¶[0035] ("The second connection line (158) can interconnect the first and second loop antenna patterns (151, 153) through contact vias (not shown) formed by penetrating the flexible substrate (155)."), FIG. 1); *see also* Ex-1028, 1:6-20 (describing the construction of printed circuit boards, FIG. 2; Ex-1002, ¶¶23-26).)

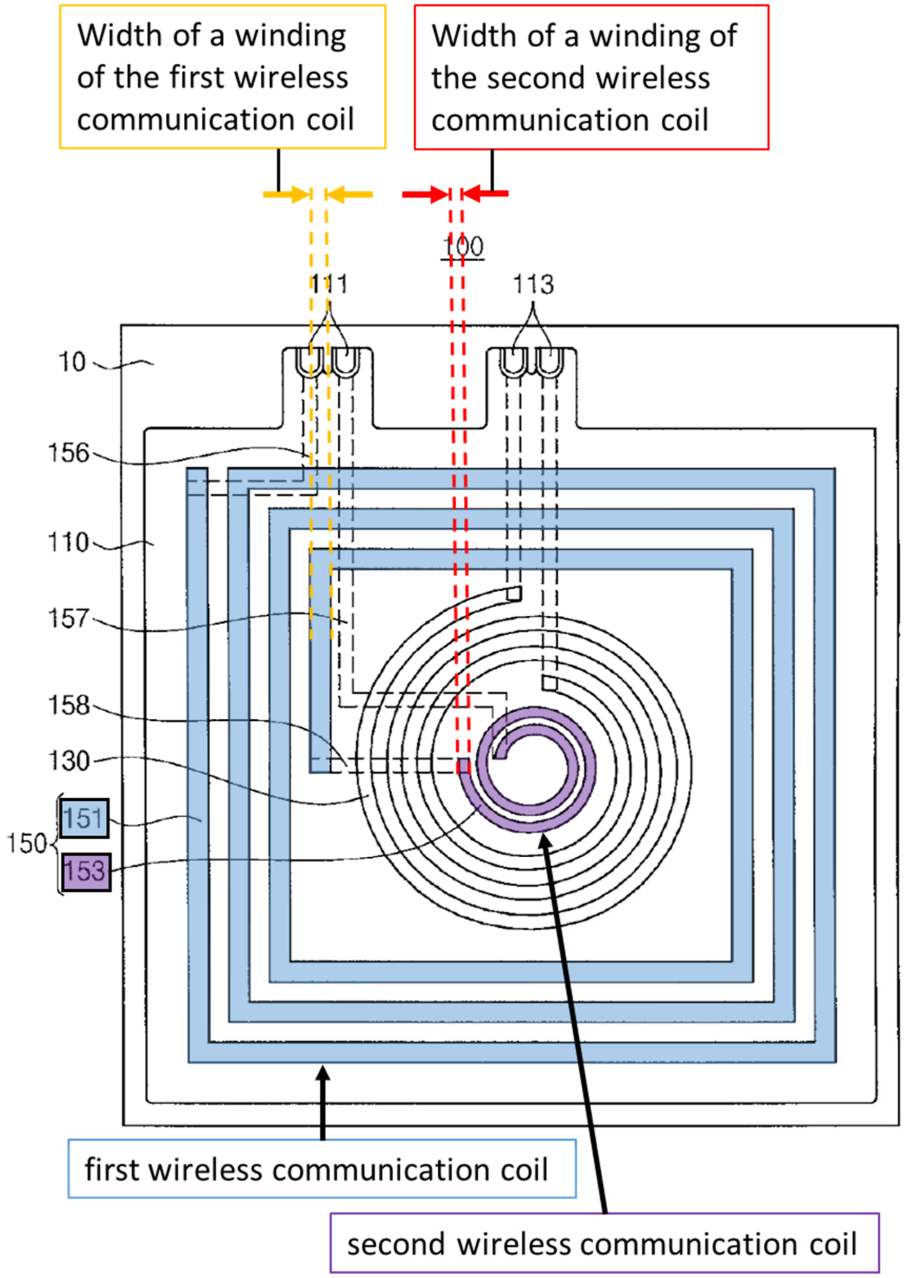
Kim shows the coil connection member in figure 1, annotated below, where the second connection line 158 ("coil connection member") (orange) is disclosed interconnecting the first loop antenna pattern 151 ("first wireless communication coil") with the second loop antenna pattern 153 ("second wireless communication coil") by traversing the wireless charging coil 130. (Ex-1002, ¶55.)



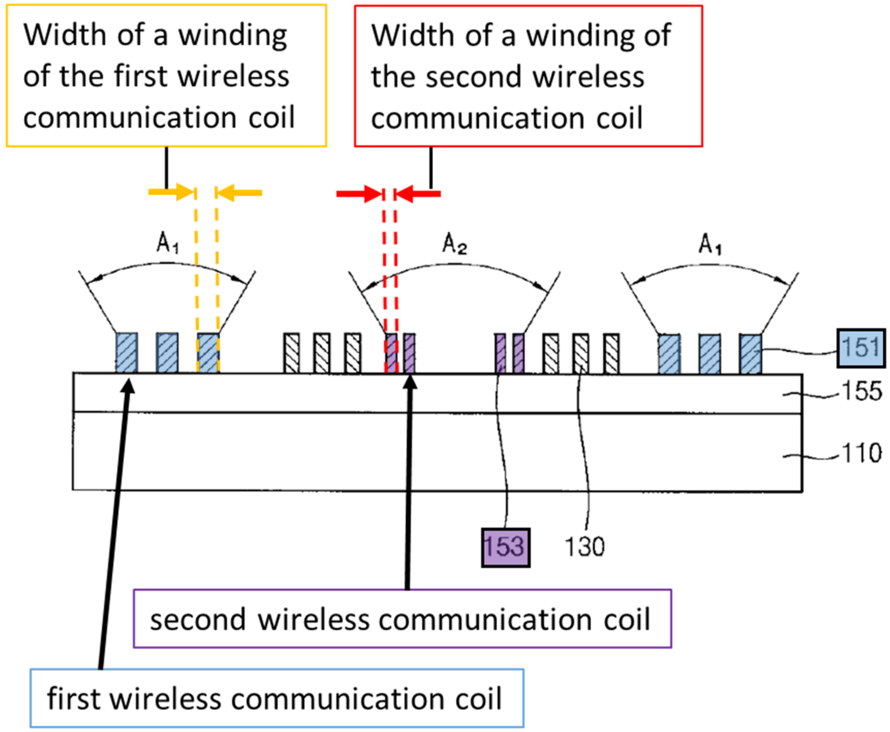
(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶55.)

f) 1[e]: 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, ¶¶56-58.) 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.). Kim's figures, which are annotated below, show a width of a winding (the outermost winding) of the second loop antenna pattern 153 ("second wireless communication coil") that is less than the width of a winding (the innermost winding) of the first loop antenna pattern 151 (the "first communication coil"). (Ex-1002, ¶56.).



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶56.)

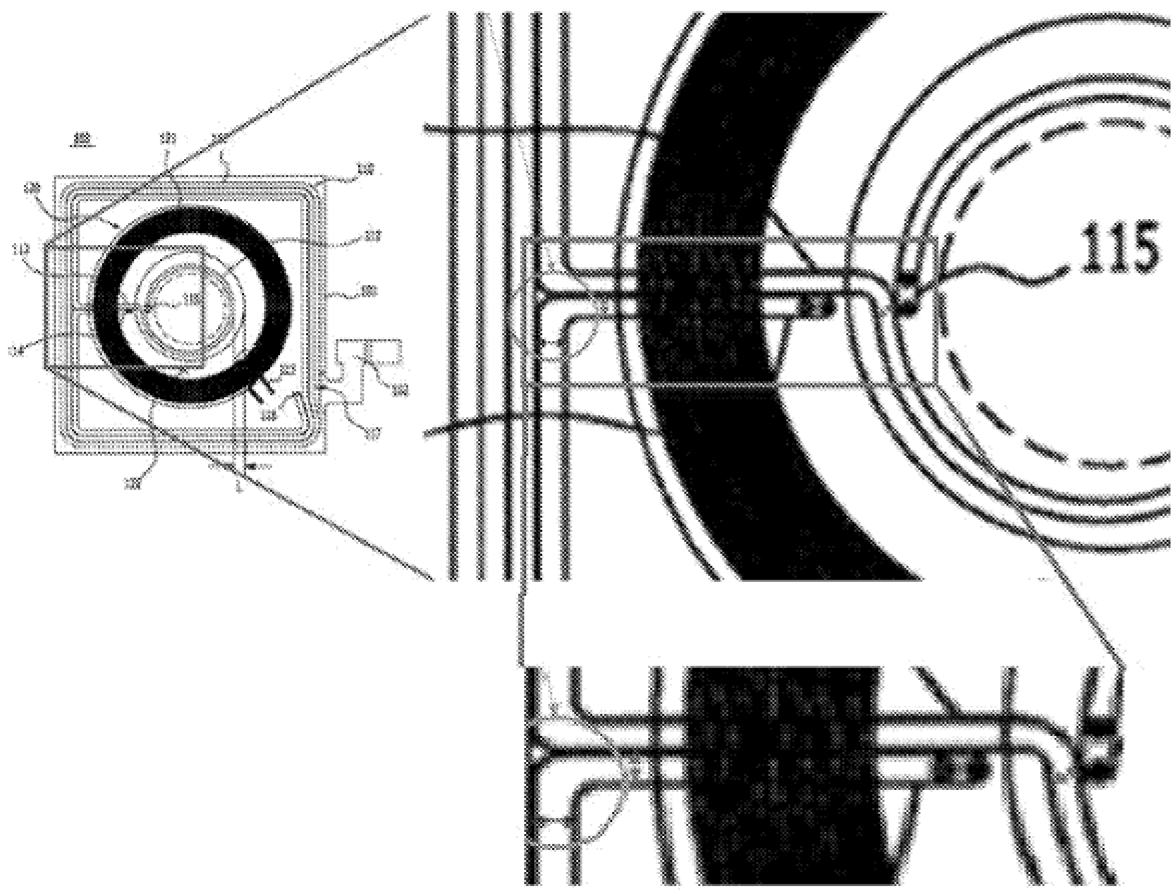


(Ex-1005, FIG. 2 (annotated); Ex-1002, ¶56.)

The Board condoned reliance on relative dimensions in patent drawings 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, ¶57.)

Petitioner also notes that the parent U.S. application for the '592 patent, as filed, did not describe the relative widths of the coils' windings. (Ex-1023, 297, 370, 379-81, 516.) That description was added to the specification, with the Applicant relying on the patent drawings (and an inventor's affidavit) to rebut the examiner's rejection for failing to comply with the written description requirement. (*Id.*, 311-318, 322, 354, 370, 516.)



(Ex-1023, 366 (figure provided by Applicant to examiner allegedly showing the dimensions of claim element 1[e]).)

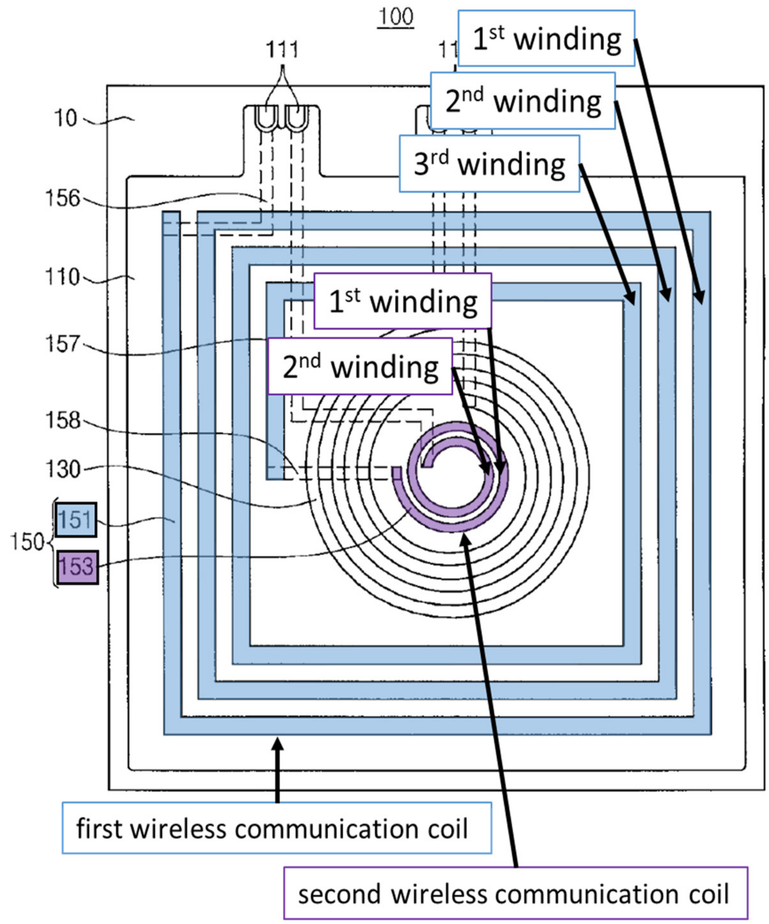
Thus, Kim provides disclosure of this claim feature in at least as much detail as the priority patents. In view of this prosecution history, a finding that Kim does not disclose this feature would lead to the incongruous result that the Office is applying a *lower* bar for satisfying § 112(a) than for anticipation.[3]

2. Claim 2

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

Kim discloses this feature. (Ex-1002, ¶¶59-60.) For instance, Kim discloses a second loop antenna pattern 153 ("the second wireless communication coil") with two windings, and a first loop antenna pattern 151 ("the first wireless communication coil") with three windings. (Ex-1005, FIGs. 1, 2; Ex-1002, ¶59.)

[3] Petitioner takes no position in this proceeding on whether any claim of the '592 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).



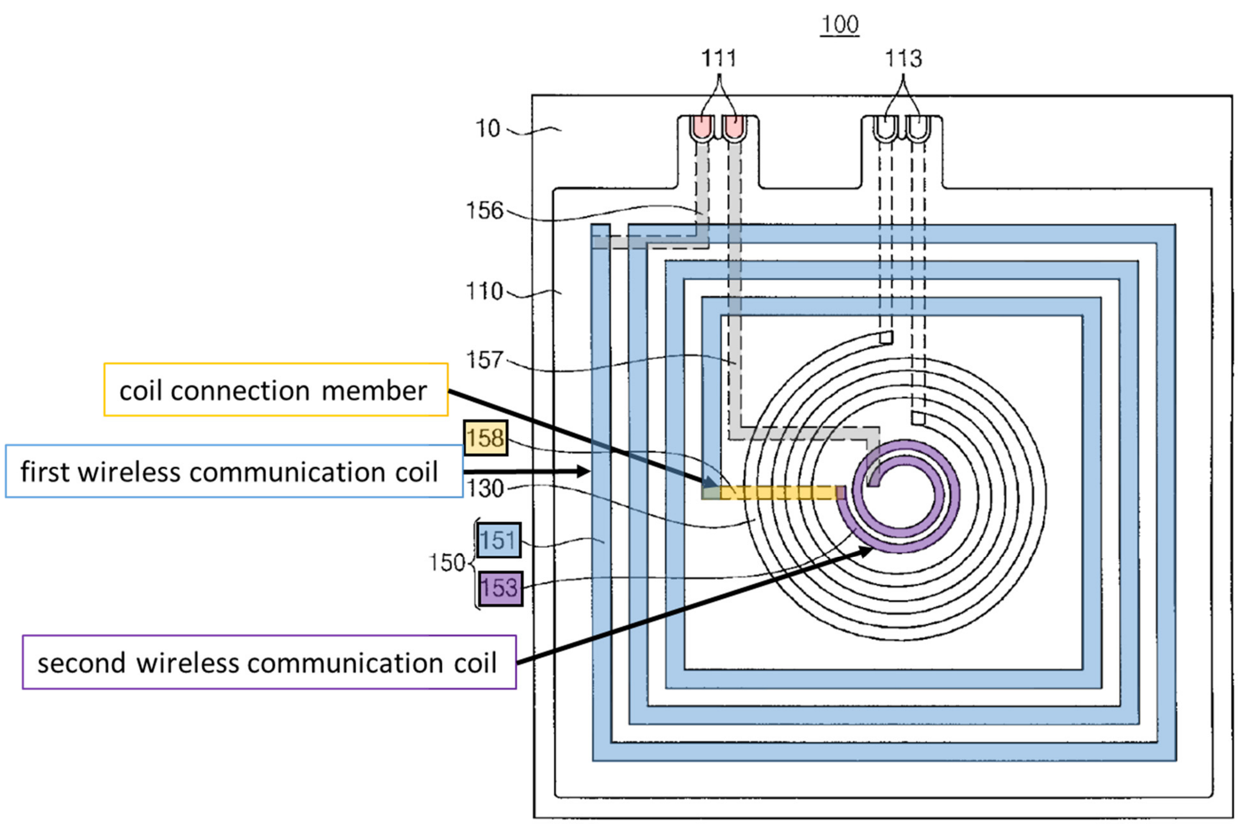
(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶59.)

3. Claim 5

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, ¶¶61-62.) For instance, as discussed above in Section IX.A.1(e) for claim element 1[d], 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)—that is, those ends not connected to the coil connection member 158—are each connected to a contact pad 111, creating a single current path through the coils 151, 153. (Ex-1005, ¶[0030] ("The loop antenna unit (150) is electrically connected to the terminals for near field communication (111)."); ¶[0034] ("The first connection lines (15[6], 157) connect the first and second antenna patterns (151, 153) to pads for near field communication (111), respectively."), FIG. 1; Ex-1002, ¶61.)

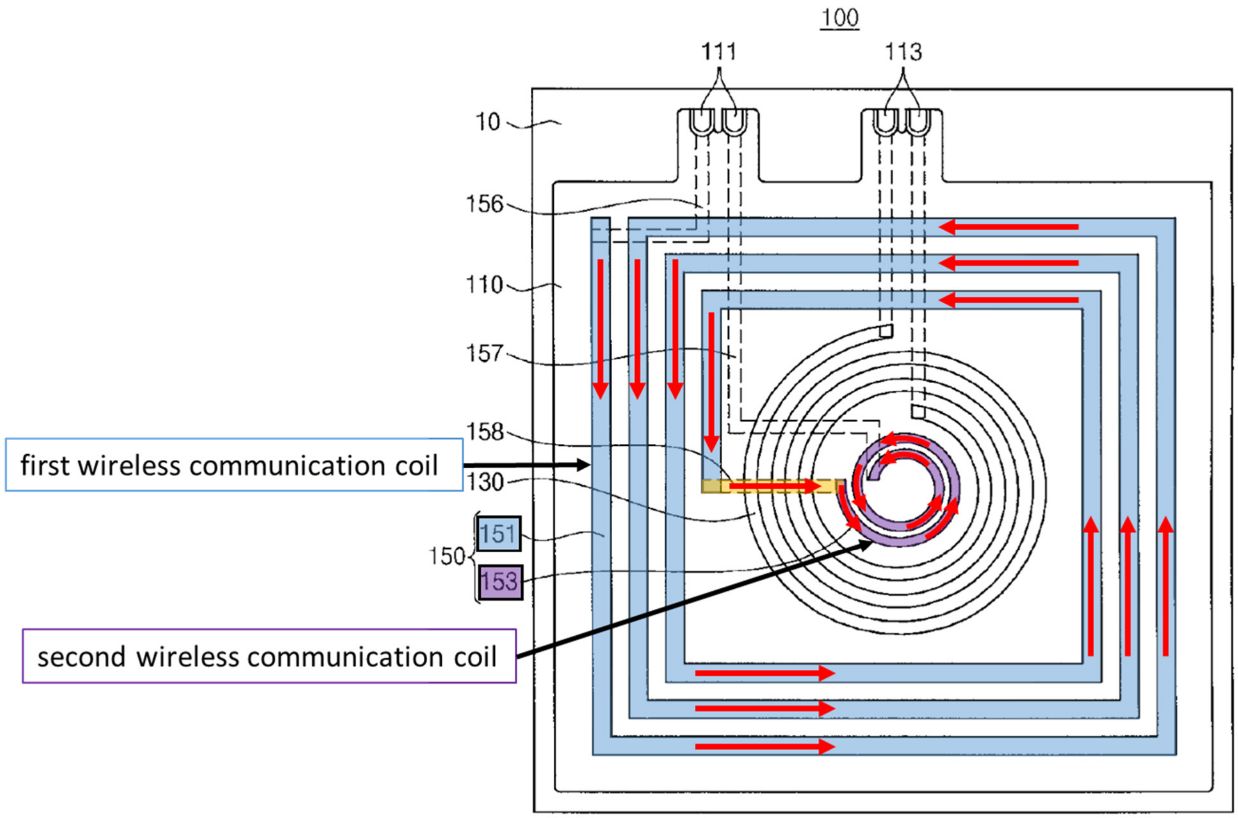


(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶61.)

Kim's figure 1 is annotated above to highlight the series connection formed by connection line 158 ("coil connection member") (orange) connecting the first loop antenna pattern 151 ("first wireless communication coil") and the second loop antenna pattern 153 ("second wireless communication coil "). (Ex-1002, ¶62.) A POSITA would have thus understood Kim discloses the first wireless communication coil (151) is connected in series with the second wireless communication coil (153). (*Id.*, ¶62.)

b) wherein the first wireless communication coil and the second wireless communication coil are wound to have a same current rotation direction.

Kim discloses this feature. (Ex-1002, ¶¶63-64.) 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; Ex-1002, ¶63), and the first and second wireless communication coils 151, 153 are connected in series (Section IX.A.3(a)). As such, current flowing through coils 151 and 153 would have the same current rotation direction. (Ex-1002, ¶63.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶63.)

Kim's figure 1 is annotated above, illustrating the direction of current flow in the first and second wireless communication coils 151, 153 with red arrows.[4] (Ex-1002, ¶64.)

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[4] Depending on the polarity, the current may flow in the opposite direction as the arrows, but it will always flow in the same direction in both coils. (Ex-1002, ¶64.)

4. Claim 7

a) 7[pre]: A wireless antenna comprising:

To the extent the preamble is limiting, Kim discloses this feature for the reasons discussed for claim element 1[pre]. (Ex-1002, ¶65; Section IX.A.1(a).)

b) 7[a]: a wireless communication antenna comprising: a first wireless communication coil and a second wireless communication coil; and

Kim discloses these features for the reasons discussed above for claim element 1[a]. (Ex-1002, ¶66; Section IX.A.1(b).)

c) 7[b]: a wireless charging antenna comprising: a wireless charging coil,

Kim discloses these features for the reasons discussed above for claim element 1[b]. (Ex-1002, ¶67; Section IX.A.1(c).)

d) 7[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, wherein the second wireless communication coil is disposed inside the wireless charging coil,

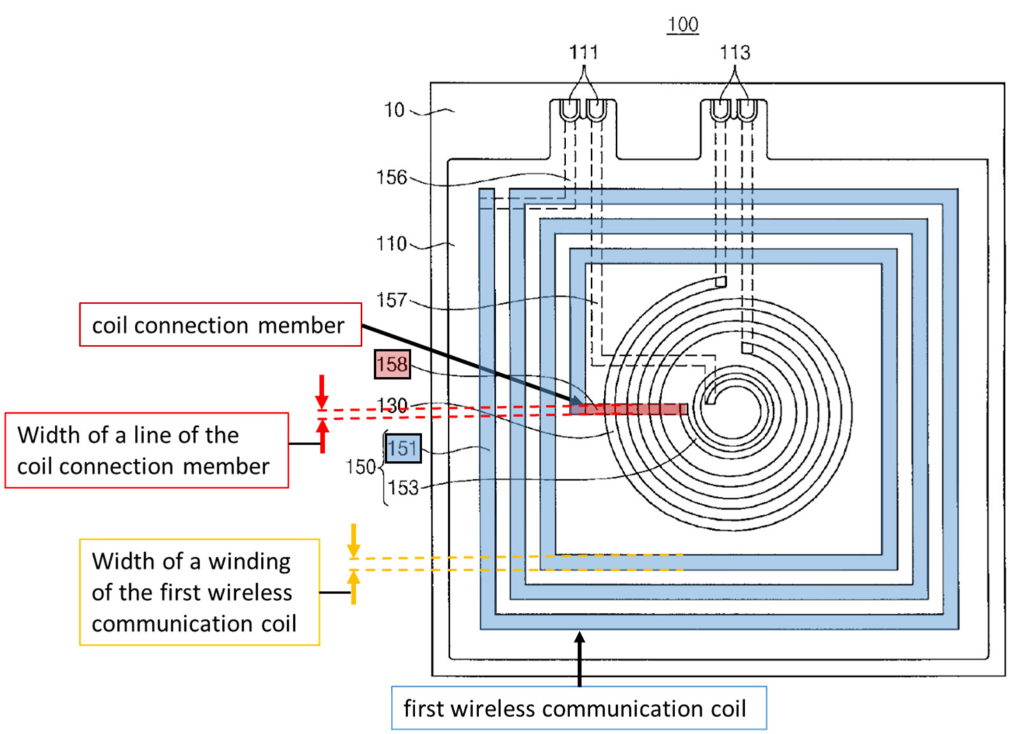
Kim discloses these features for the reasons discussed above for claim element 1[c]. (Ex-1002, ¶68; Section IX.A.1(d).)

e) 7[d]: wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil to interconnect the first wireless communication coil and the second wireless communication coil, and

Kim discloses these features for the reasons discussed above for claim element 1[d]. (Ex-1002, ¶69; Section IX.A.1(e).)

f) 7[e]: wherein a width of a line of the coil connection member is less than a width of a winding of the first communication coil.

Kim discloses this feature. (Ex-1002, ¶70.) For example, Kim discloses that a width of a second connection line 158 ("coil connection member") is less than a width of a winding of the first loop antenna pattern 151 ("first wireless communication coil"). (Ex-1005, FIG. 1.) As shown in Kim's annotated figure 1, below, the width of a line of the second connection line 158 ("coil connection member") is less than the width of the innermost turn of the first loop antenna pattern 151 ("first wireless communication coil").



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

5. Claim 8

a) The wireless antenna according to claim 7, wherein a number of windings of the second wireless communication coil is different from a number of windings of the first wireless communication coil.

Kim discloses these features for the reasons discussed above for claim 2. (Ex-1002, ¶71; Section IX.A.2(a).)

6. Claim 9

a) The wireless antenna according to claim 8, wherein the number of windings of the second wireless communication coil is less than the number of windings of the first wireless communication coil.

Kim discloses these features for the reasons discussed above for claim 2. (Ex-1002, ¶72; Section IX.A.2(a).) As discussed above, Kim discloses a second loop antenna pattern 153 ("the second wireless communication coil") with two windings, and a first loop antenna pattern 151 ("the first wireless communication coil") with three windings. (Ex-1005, FIG. 1; Ex-1002, ¶72.)

7. Claim 12

a) The wireless antenna according to claim 7, wherein the first wireless communication coil and the second wireless communication coil are connected to each other in series, and

Kim discloses these features for the reasons discussed above for claim element 5[a]. (Ex-1002, ¶73; Section IX.A.3(a).)

b) wherein the first wireless communication coil and the second wireless communication coil are wound to have a same current rotation direction.

Kim discloses these features for the reasons discussed above for claim element 5[b]. (Ex-1002, ¶74; Section IX.A.3(b).)

8. Claim 14

a) 14[pre]: A wireless antenna comprising:

To the extent the preamble is limiting, Kim discloses this feature for the reasons discussed for claim element 1[pre]. (Ex-1002, ¶75; Section IX.A.1(a).)

b) 14[a]: a wireless communication antenna comprising: a first wireless communication coil and a second wireless communication coil; and

Kim discloses these features for the reasons discussed above for claim element 1[a]. (Ex-1002, ¶76; Section IX.A.1(b).)

c) 14[b]: a wireless charging antenna comprising: a wireless charging coil,

Kim discloses these features for the reasons discussed above for claim element 1[b]. (Ex-1002, ¶77; Section IX.A.1(c).)

d) 14[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, wherein the second wireless communication coil is disposed inside the wireless charging coil,

Kim discloses these features for the reasons discussed above for claim element 1[c]. (Ex-1002, ¶78; Section IX.A.1(d).)

e) 14[d]: wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil to interconnect the first wireless communication coil and the second wireless communication coil,

Kim discloses these features for the reasons discussed above for claim element 1[d]. (Ex-1002, ¶79; Section IX.A.1(e).)

f) 14[e]: 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, and

Kim discloses these features for the reasons discussed above for claim element 1[e]. (Ex-1002, ¶80; Section IX.A.1(f).)

g) 14[f]: wherein a width of a line of the coil connection member is less than a width of a winding of the first communication coil.

Kim discloses these features for the reasons discussed above for claim element 7[e]. (Ex-1002, ¶81; Section IX.A.4(f).)

9. Claim 15

a) The wireless antenna according to claim 14, wherein a number of windings of the second wireless communication coil is different from a number of windings of the first wireless communication coil.

Kim discloses these features for the reasons discussed above for claim 2. (Ex-1002, ¶82; Section IX.A.2(a).)

10. Claim 16

a) The wireless antenna according to claim 15, wherein the number of windings of the second wireless communication coil is less than the number of windings of the first wireless communication coil.

Kim discloses these features for the reasons discussed above for claim 9. (Ex-1002, ¶83; Section IX.A.6(a).)

B. Ground 2 – Claims 3, 10, and 17 are Obvious over Kim in View of Kim '681

1. Claim 3

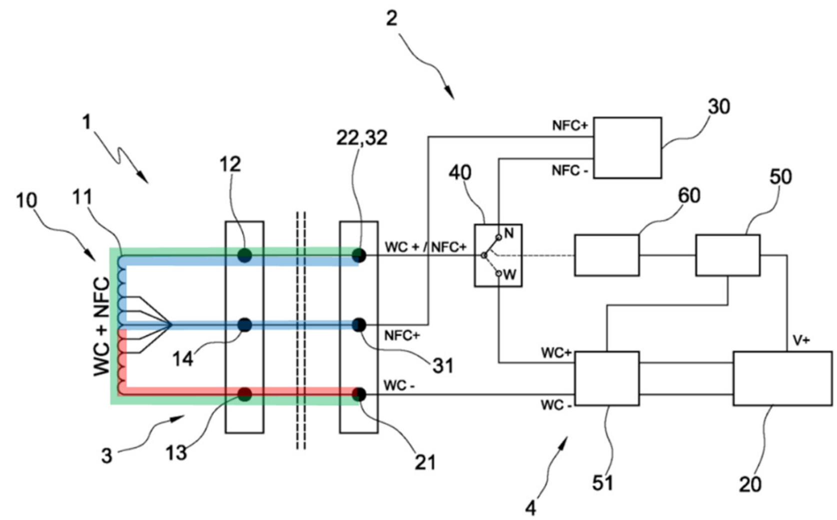
a) The wireless antenna according to claim 2, wherein a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil.

Kim in combination with Kim '681 discloses or suggests this feature. (Ex-1002, ¶¶84-92.) As discussed above in Sections IX.A.1(a)-(c), 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 non-contact power receiving coil unit 130 has a greater number of windings than loop antenna pattern 151, but Kim '681 discloses that a wireless charging coil may have more windings than a wireless communication coil. (Ex-1002, ¶84.) Thus, in view of Kim '681, a POSITA would have had good reason to implement Kim's antenna having a greater number of windings of the wireless charging coil than the number of windings of the first wireless communication coil. (Ex-1002, ¶84.)

Kim '681, like Kim, relates to an antenna for wireless charging and near field wireless communication. (Ex-1007, ¶[0001].) Therefore a POSITA implementing Kim's antenna would have had reason to look to Kim '681. (Ex-1002, ¶85.) 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 wireless 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 in figure 2 below) are used for wireless charging. (Ex-1007, ¶[0046] ("[T]he coil unit (11) between the first terminal (12) and the second terminal (13) is formed to have a characteristic of generating an induced electromotive force of a frequency (300 kHz) for relatively long **non-contact charging**") (emphasis added), ¶[0059].) However, only a subset of the coil windings (between terminal 12 and 14; path highlighted blue) are used for wireless communication. (*Id.* ("[T]he coil unit (11) between the first terminal (12) and the third terminal (14) generates an induced electromotive force of a relatively short frequency (13.56 MHz) for **NFC**.") (emphasis added), ¶[0060].)

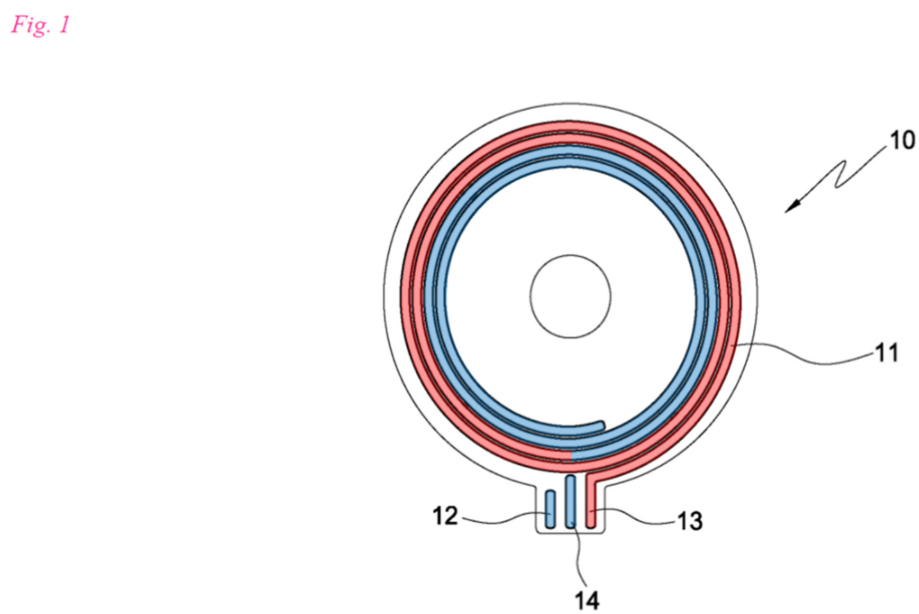
Fig. 2



(Ex-1007, FIG. 2 (annotated); Ex-1002, ¶86.)

Kim ’681’s coil antenna unit 10 is illustrated below in annotated Figure 1. As annotated, 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.[5] (Ex-1007, ¶¶[0044]-[0046]; Ex-1002, ¶87.)

[5] The highlighting in annotated Figure 1 is not intended to represent the precise division of the coil windings used for communication versus charging. Instead, it generally illustrates Kim ’681’s teaching that a portion of the coil is used for communication (blue), and the entire coil is used for wireless charging (blue and red together).



(Ex-1007, FIG. 1 (annotated); Ex-1002, ¶87.)

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, ¶88.) As taught by Kim '681, using a greater number of coil windings for wireless charging than for wireless communication ensures that the antenna functions properly (e.g., is able to generate an induced electromotive force) during both near field communication and wireless charging. (Ex-1007, ¶[0046].) Although Kim '681 concerns using different sections of the same coil, 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, ¶88.)

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, ¶89; *see, e.g.*, Ex-1025, ¶¶[0018], [0101], [102] ("For example, the number of windings of the inside first wireless communications coil 120 is larger than that of the outermost second [NFC] wireless communications coil 121, and the number of windings of the inside power receiving coil 110 is larger than that of the first wireless communications coil 120."), 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, in view of Kim '681, it would have been obvious, and a POSITA would have good reason, to select an appropriate number of windings for the first wireless communication coil and the wireless charging coil, where the wireless charging coil has more windings than the first wireless communication coil. (Ex-1002, ¶89.)

Moreover, Kim's first wireless communication coil 151 is part of its wireless communication antenna 150, which is for near field communication. (*See*, *e.g.*, Ex-1005, ¶[0030] ("loop antenna unit (150) enables near field communication").) In accordance with Kim '681's teachings discussed above, Kim's entire wireless communication antenna 150 (the "first wireless communication coil" 151 and the "second wireless communication coil" 153, combined) may have fewer windings than the wireless charging coil 130. (Ex-1002, ¶90.) Thus, a POSITA would have understood that the first wireless communication coil, itself a portion of the wireless communication antenna, may have fewer windings than the wireless charging coil. (*Id.*)

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, ¶91.) 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.*) 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.*, ¶92; *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, ¶92.)

2. Claim 10

a) The wireless antenna according to claim 8, 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 this feature for the reasons discussed above for claim 3. (Ex-1002, ¶93; Section IX.B.1(a).)

3. Claim 17

a) The wireless antenna according to claim 15, 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 this feature for the reasons discussed above for claim 3. (Ex-1002, ¶94; Section IX.B.1(a).)

C. Ground 3 – Claims 4, 6, 11, 13, 18, and 19 are Obvious over Kim in View of Shostak

1. Claim 4

a) The wireless antenna according to claim 2, 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, ¶¶95-103.) As discussed above, Kim discloses a second wireless communication coil. (*See, e.g.*, Sections IX.A.1(b); Ex-1005, ¶[0031].) Although

Kim's second wireless communication coil 153 has two windings (Section IX.A.3(a)) it would have been obvious to configure Kim's second wireless communication coil to have one winding in view of Shostak and the knowledge of a POSITA. (Ex-1002, ¶95.)

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). For instance, Shostak discloses that "[t]he portion 316 [of the wireless communication coil 504] forms a single loop as illustrated [in Figure 9]." (*Id.*, 10:4-12.)

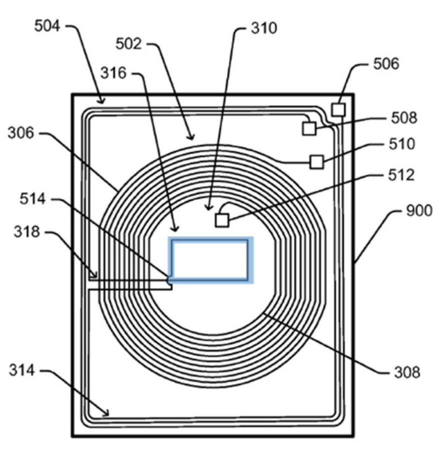


FIG. 9

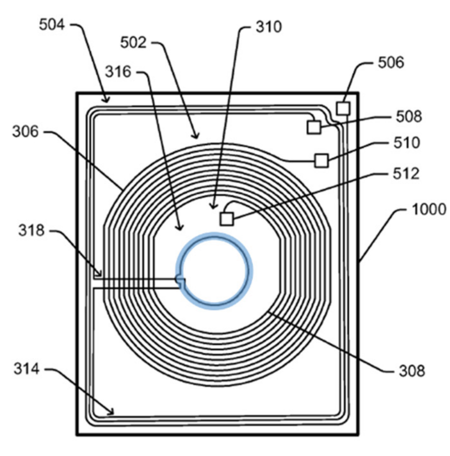


FIG. 10

(Ex-1006, FIGs. 9, 10 (annotated); Ex-1002, ¶96.)

A POSITA would have had reason to consider Shostak's teachings at least because the second communication coil in Kim and Shostak serve the same purpose: avoiding a dead zone in the center area of the antenna where the first (outer) communication antenna is unable to communicate with devices that are in the dead zone. (Ex-1005, ¶[0031]; Ex-1006, 10:41-52; Ex-1002, ¶97.) Thus, Shostak's teachings regarding the second communication coil are directly applicable to Kim, as they address the same known problem. (Ex-1002, ¶98.)

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, ¶99.) 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 1 winding to 2 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 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] ("The number of turns is related to the inductance of the antenna, and as the number of turns increases, the inductance of the antenna increases, but due to the exponentially increasing resistance value, it has an adverse effect on the maximum recognition distance of the [NFC] antenna."); Ex-1002, ¶100.) *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 '592 patent provides no evidence that the claimed range produces a new or unexpected result. Indeed, the '592 patent explains that routine optimization was conducted to identify the number of interior communication coil windings that would satisfy known wireless charging and communication standards, which led to a single winding in the second (interior) communication coil. (Ex-1001, 6:32-7:23.)

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, ¶101.) 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.

It would have also been obvious nonetheless 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, 8:10-22, 10:18-25.) 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, ¶102.) 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.C.2(a).)

A POSITA would have had a reasonable expectation of success in modifying the number of windings in Kim's communication coil 153 at least because 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. (*Id.*, ¶103; *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). Additionally, there is nothing particularly difficult about changing the number of coil windings in Kim's antenna. (Ex-1002, ¶103.)

2. Claim 6

a) The wireless antenna according to claim 1, 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.

Kim in combination with Shostak discloses or suggests this feature. (Ex-1002, ¶¶104-112.) As discussed above in Sections IX.A.1(b)-(c), 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, ¶104.)

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, ¶105.)

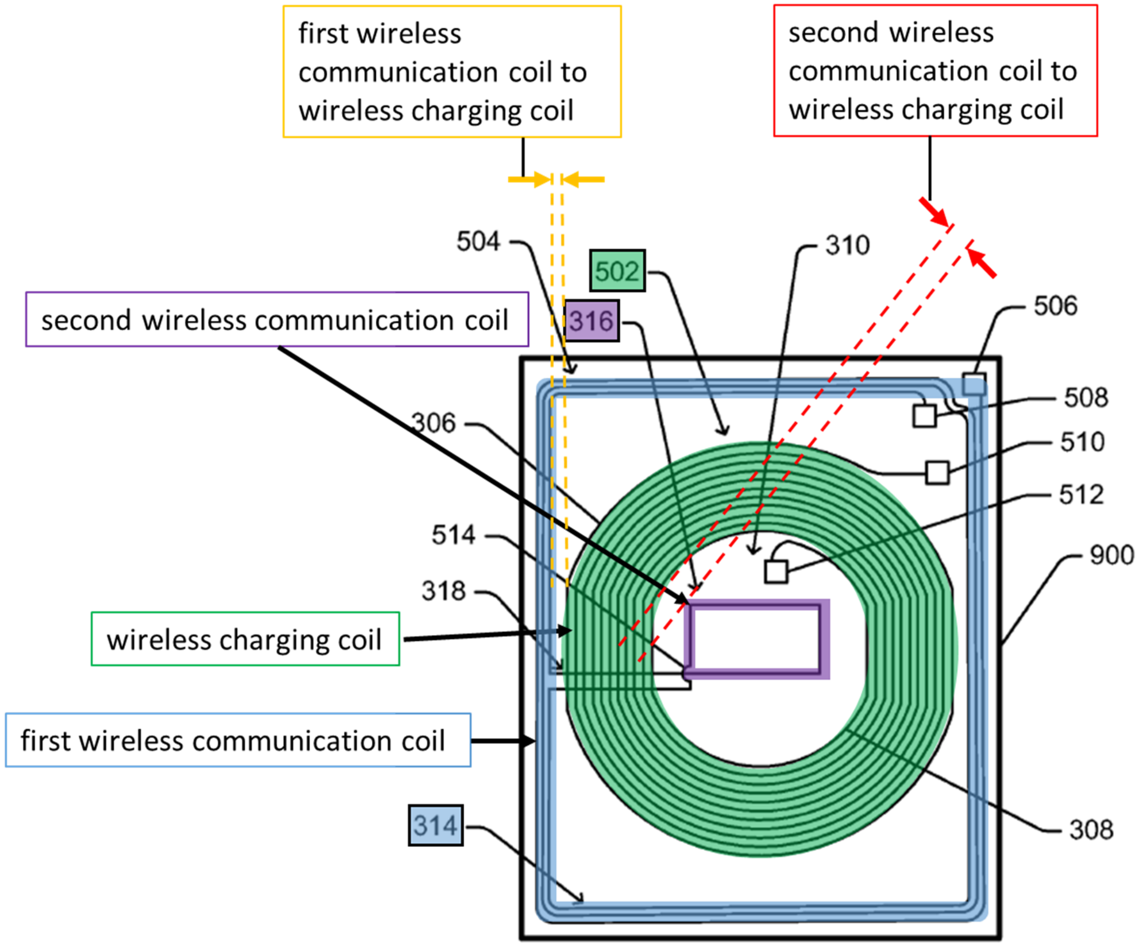


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶105.)

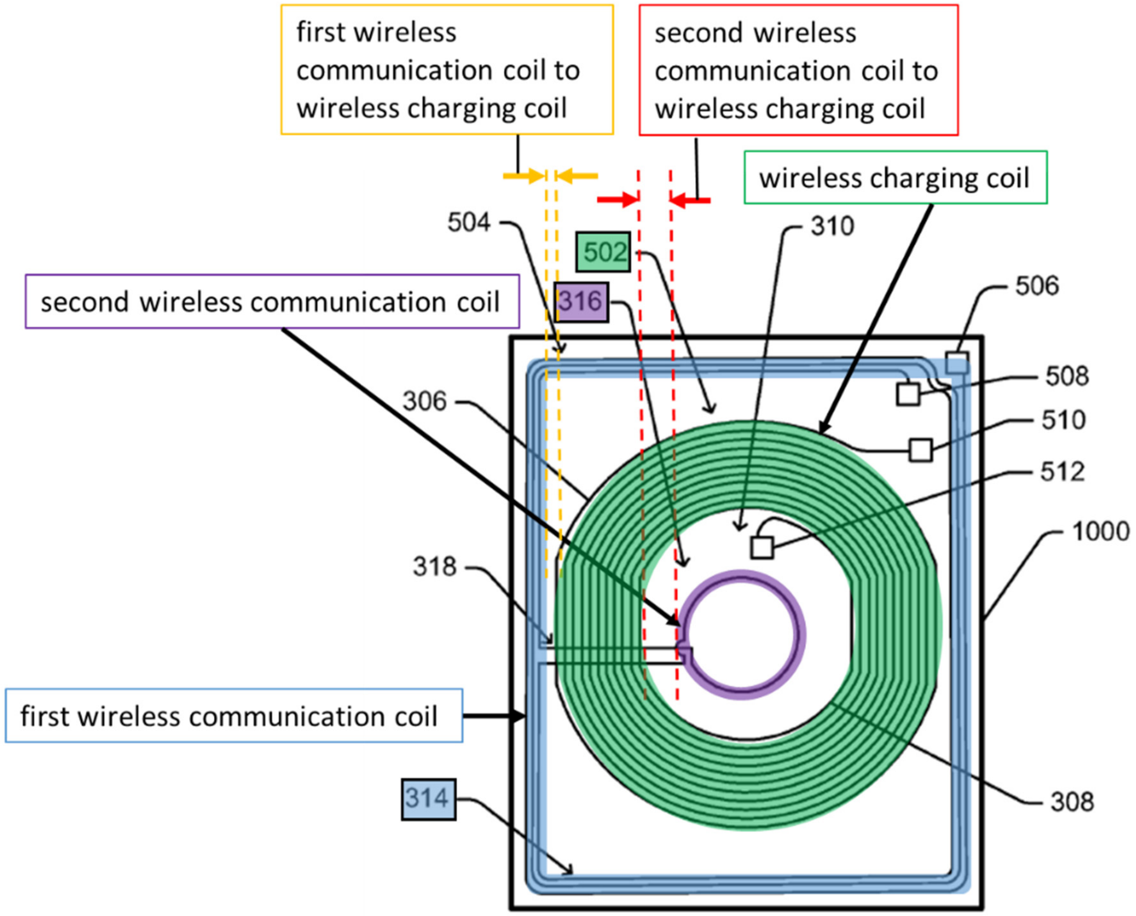


FIG. 10

(Ex-1006, FIG. 10[6] (annotated); Ex-1002, ¶105.)

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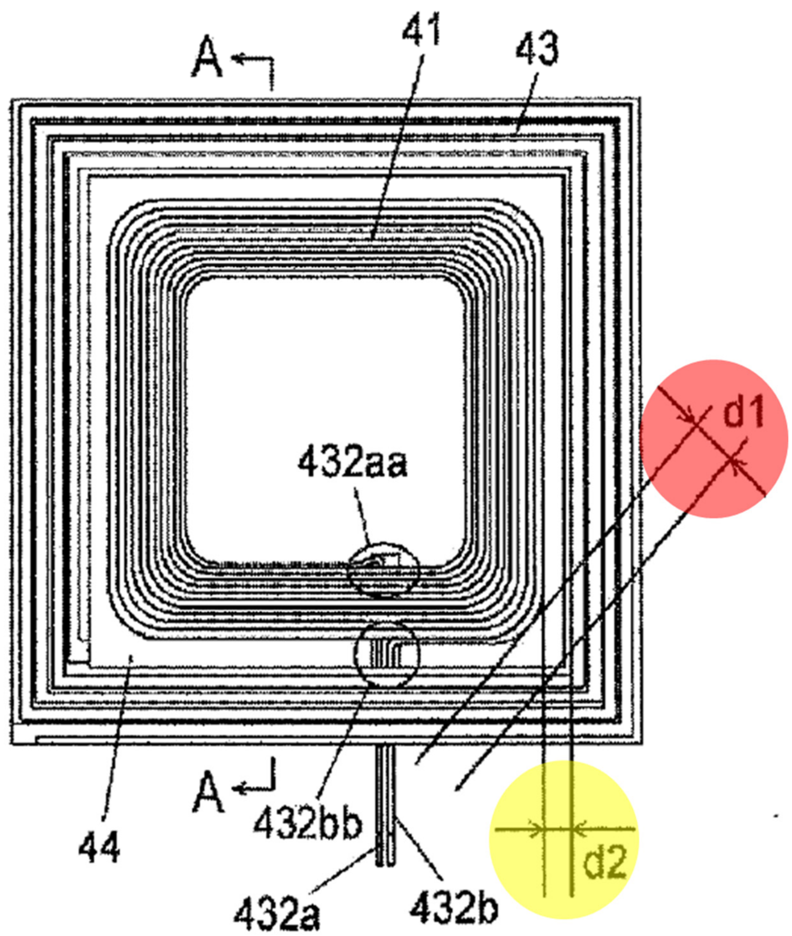
[6] Shostak explains that the figure 10 antenna is "analogous to" the figure 9 antenna, with the only difference being that figure 10 is used to illustrate that the antenna portion 316 in figure 9 "can form various other shapes" and is not limited to the rectangular loop illustrated in figure 9. (Ex-1006, 10:26-40.)

As discussed above in Section IX.B.1(a), Shostak discloses the same general antenna structure as Kim—a two-part communication antenna 314, 316 with a wireless charging antenna 502, placed in between the communication coils. (Ex-1006, 4:34-40, 4:55-58, 5:5-6, 7:29-50, FIGs. 3, 9, 10; Ex-1002, ¶106.) Shostak discloses that "a separation is maintained" between the second wireless communication coil 316 and the wireless charging coil 302 (502 in FIGs. 9, 10), and between the first wireless communication coil 314 and the wireless charging coil 302 (502 in FIGs. 9, 10). (Ex-1006, 5:33-41.) Shostak explains that the separation distances between the first and second communication coils and the wireless charging coil influences the mutual coupling between the wireless communication and wireless charging coils. (*Id.*) 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 discloses using different separation distances between each of the communication coils and the wireless charging coil, as noted above. (*Id.*, FIGs. 9, 10; Ex-1002, ¶106.)

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 would have had good reason to implement that feature in Kim. (Ex-1002, ¶107.) 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])—a POSITA would have understood that the magnetic fields are more concentrated in areas where the coil windings curve less gradually (e.g., in corners or where coil winding turns have a smaller diameter). (Ex-1010, 19:18-20:17, FIG. 8A; Ex-1002, ¶107.) Koyonagai teaches, for instance, that the separation distance between a charging coil 41 and an NFC coil 43 can be smaller along straight sides (d2) where the coil curves gradually (a large radius of the curve ("R")) than in the corners (d1) where R is small, because magnetic flux is concentrated where R is smaller. (Ex-1010, 10:26-27, 19:18-67; FIG. 8a.)

FIG. 8A



(Ex-1010, FIG. 8A; Ex-1002, ¶107.)

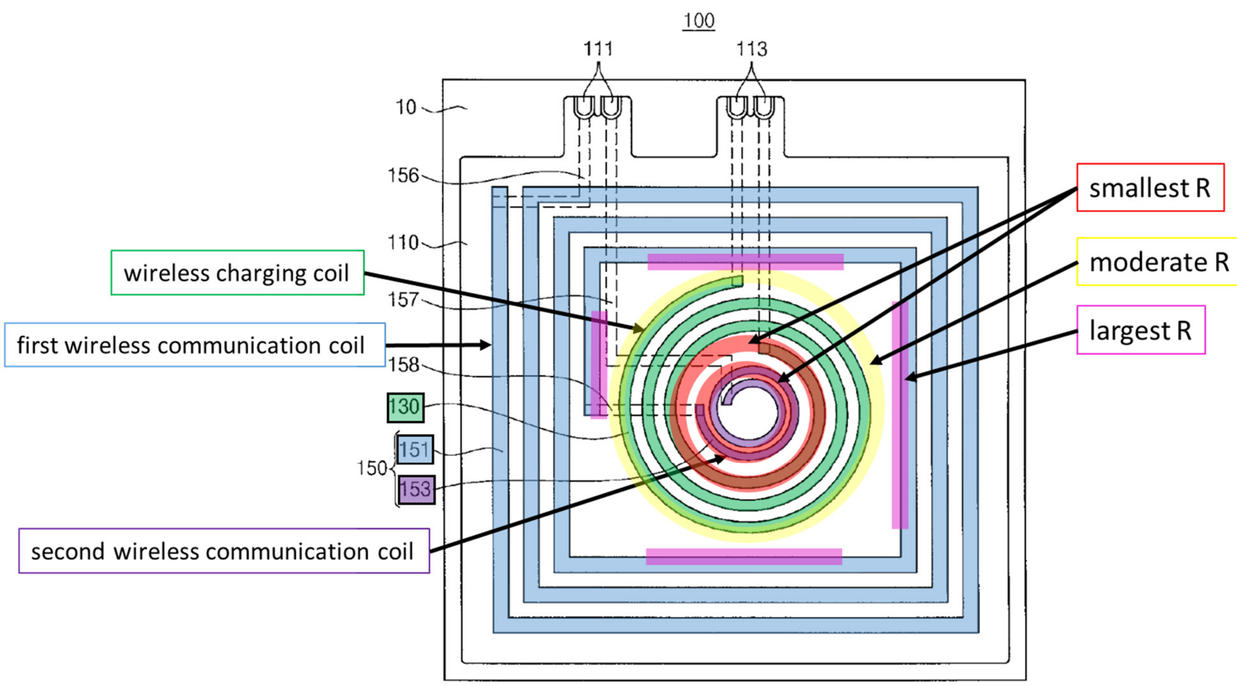
Koyanagi teaches that the antenna can be reduced in size by bringing the portions where flux is less concentrated close together (e.g., where R is large) (d2), but that the separation distance where R is small (d1) should be greater so that "a favorable balance can be achieved between a reduction in size, improvement of power transmission efficiency, and improvement of communication efficiency." (Ex-1010, 19:34-67; Ex-1002, ¶108.)

Shostak's disclosure that 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 is consistent with Koyanagi's teachings. (Ex-1002, ¶109.) For instance, in FIG. 9, Shostak's wireless charging coil 502 is spaced further from the four corners of the inner communication coil 316, where R is small and flux is concentrated, than it is from the straight sides of the outer communication coil 314, where R is large and flux is less concentrated. (Ex-1006, FIG. 9, 10; Ex-1002, ¶109.) Similarly, in FIG. 10, the round inner communication 316 has a smaller R than the outer turns of the wireless charging coil 502, and is accordingly spaced further apart from the wireless charging coil than the straight sides of outer communication coil 314 that have a large R. (Ex-1006, FIG. 9, 10; Ex-1002, ¶109.)

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, ¶110.) 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 R,[7] and therefore it should be spaced further from the wireless charging coil 130 than the first loop antenna pattern 151

[7] The relative R is depicted in annotated Figure 1, below. (*Id.*)

("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, ¶110.)



(Ex-1005, FIG. 1 (annotated to show the relative R where the coils are near each other: smallest R (red); moderate R (yellow), and the largest R (magenta).); Ex-1002, ¶110.)

Moreover, given that there are only three possible configurations—(1) the communication coils are equally spaced from the wireless charging coil, (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 regarding why a POSITA should select that configuration, a POSITA would have found it obvious to try the three options and select the best one for their application. (*Id.*, ¶111)

A POSITA would have had a reasonable expectation of success. (*Id.*, ¶112.) Such a person would have understood the impacts of adjusting the relative spacing between the coils, as discussed above. (*Id.*) And 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.*)

3. Claim 11

a) The wireless antenna according to claim 8, wherein the number of windings of the second wireless communication coil is one.

Kim in combination with Shostak discloses or suggests this feature for the reasons discussed above for claim 4. (Ex-1002, ¶113; Section IX.C.1(a).)

4. Claim 13

a) The wireless antenna according to claim 7, 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.

Kim in combination with Shostak discloses or suggests this feature for the reasons discussed above for claim 6. (Ex-1002, ¶114; Section IX.C.2(a).)

5. Claim 18

a) The wireless antenna according to claim 15, wherein the number of windings of the second wireless communication coil is one.

Kim in combination with Shostak discloses or suggests this feature for the reasons discussed above for claim 4. (Ex-1002, ¶115; Section IX.C.1(a).)

6. Claim 19

a) The wireless antenna according to claim 14, 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.

Kim in combination with Shostak discloses or suggests this feature for the reasons discussed above for claim 6. (Ex-1002, ¶116; Section IX.C.2(a).)

D. Ground 4 – Claims 1-19 are Obvious over Shostak in View of Kim

1. Claim 1

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

To the extent the preamble of claim 1 is limiting, Shostak discloses the features therein. (Ex-1002, ¶¶117-118.) 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.) Annotated figure 9 below shows the wireless antenna 900, wireless charging coil 502, and wireless communication coil 504.

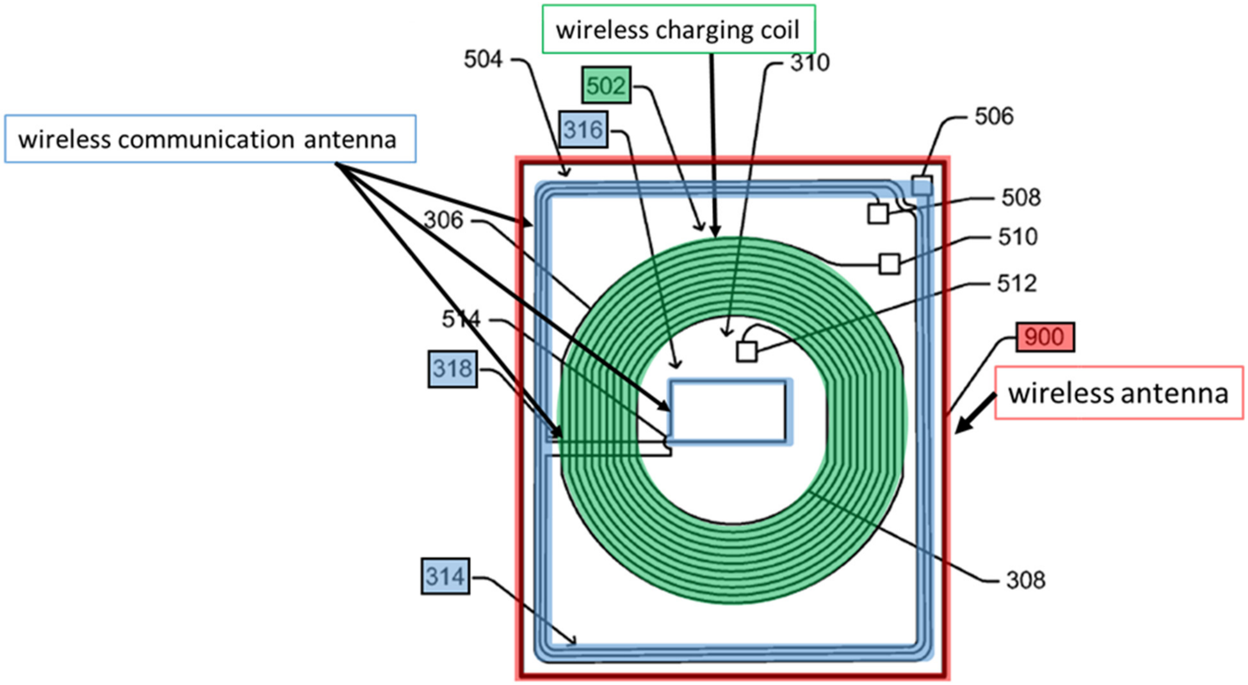


FIG. 9

(*Id.*, FIG. 9 (annotated); Ex-1002, ¶117.)

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

Shostak discloses this feature. (Ex-1002, ¶119.) 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"), and portion 318 which connects the outer and inner portions 314, 316. (*Id.*, 9:55-66.) Annotated figure 9 below shows outer coil portion 314 ("first wireless communication coil") positioned around a wireless charging antenna 502 and inner coil portion 316 ("second wireless communication coil") disposed inside of wireless charging antenna 502. (Ex-1002, ¶119.)

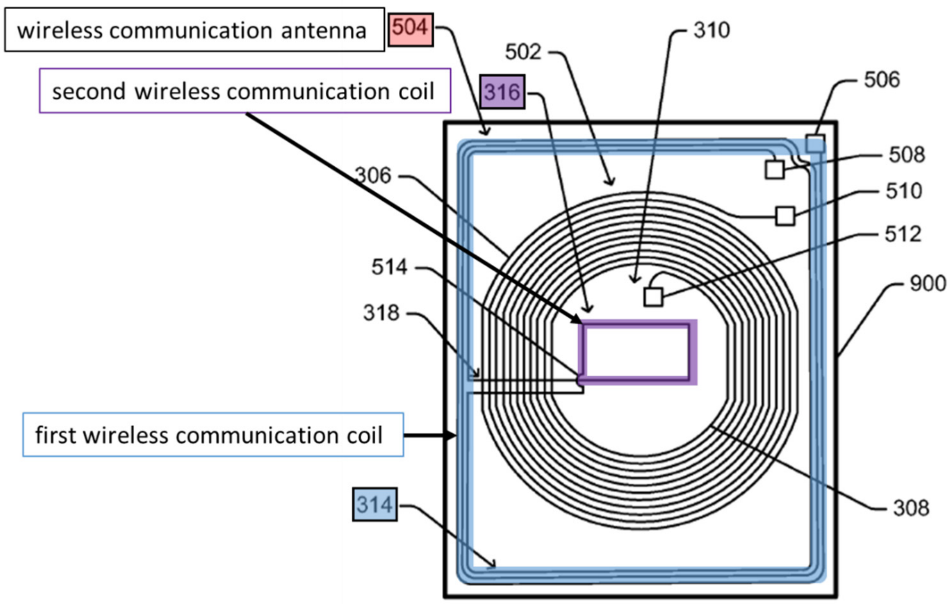


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶119.)

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

Shostak discloses this feature. (Ex-1002, ¶¶120-.) For instance, Shostak discloses "a wireless charging antenna that is the wireless charging coil 502." (Ex-1006, 9:58-60.) Annotated figure 9 below shows wireless charging coil 502. (Ex-1002, ¶120.)

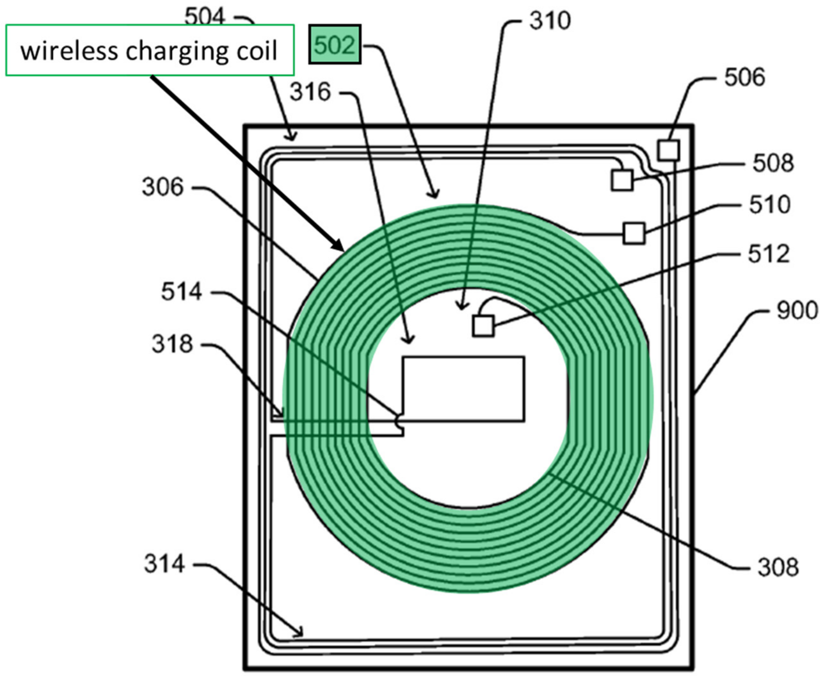


FIG. 9

(*Id.*, FIG. 9 (annotated); Ex-1002, ¶120.)

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

Shostak discloses these features. (Ex-1002, ¶121.) For instance, Shostak discloses "an example antenna apparatus 900 in which multiple antennas are co-located." (Ex-1006, 9:55-57, FIG. 9.) 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,[8] 9.) As shown in annotated figure 9 below, the wireless charging coil 502 is disposed inside the first wireless communication coil 314, and the second wireless communication coil 316 is disposed inside the wireless charging coil. (*Id.*, FIG. 9; Ex-1002, ¶121.)

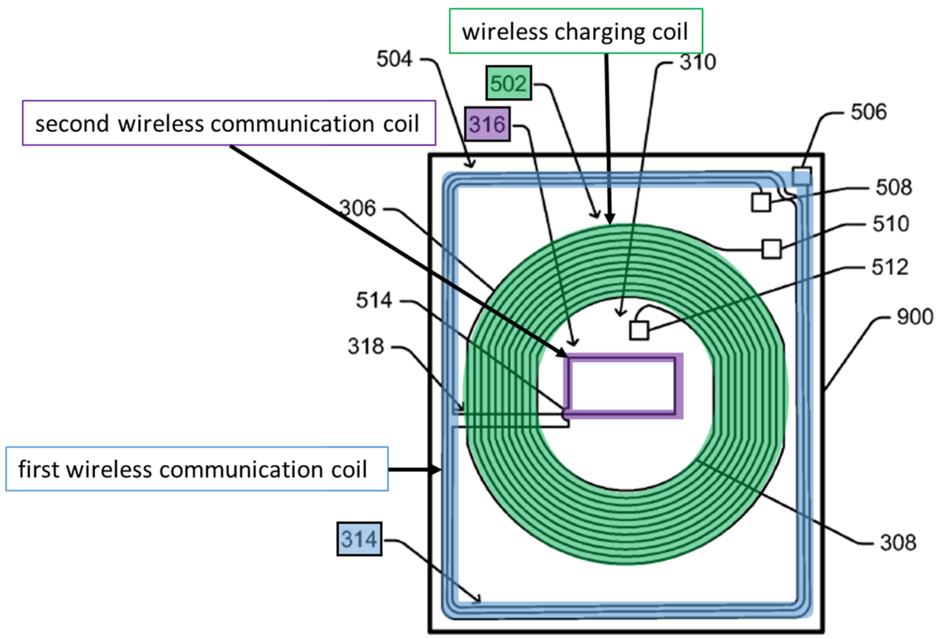


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶121.)

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[8] The example layout in Shostak's figures 3 and 4 provides the general structure of Shostak's antenna apparatus, illustrating each coil as a shaded area, whereas figures 5-10 illustrate specific coil patterns "each of which is an example of the antenna apparatus." (Ex-1006, 4:34-36, 6:21-25, 7:24-28, FIGs. 3-10.)

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

Shostak discloses or suggests this feature. (Ex-1002, ¶122-123.) For example, as discussed above for claim element 1[a], Section IX.D.1(b), Shostak discloses a wireless communication antenna 504 comprising a first wireless communication coil 314 and a second wireless communication coil 316. With respect to figures 3 and 9, Shostak further 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 ("The antenna apparatus 900 also includes a wireless communication antenna that is the wireless communication coil 504 (e.g., the antenna 304 of FIG. 3) including portions 314, 316, and 318."), FIG. 4.)

Annotated figure 9 below shows the wireless communication antenna 504 comprising coil connection member 318 interconnecting the first wireless communication coil 314 and second wireless communication coil 316 by traversing the wireless charging coil 502. (Ex-1002, ¶123.)

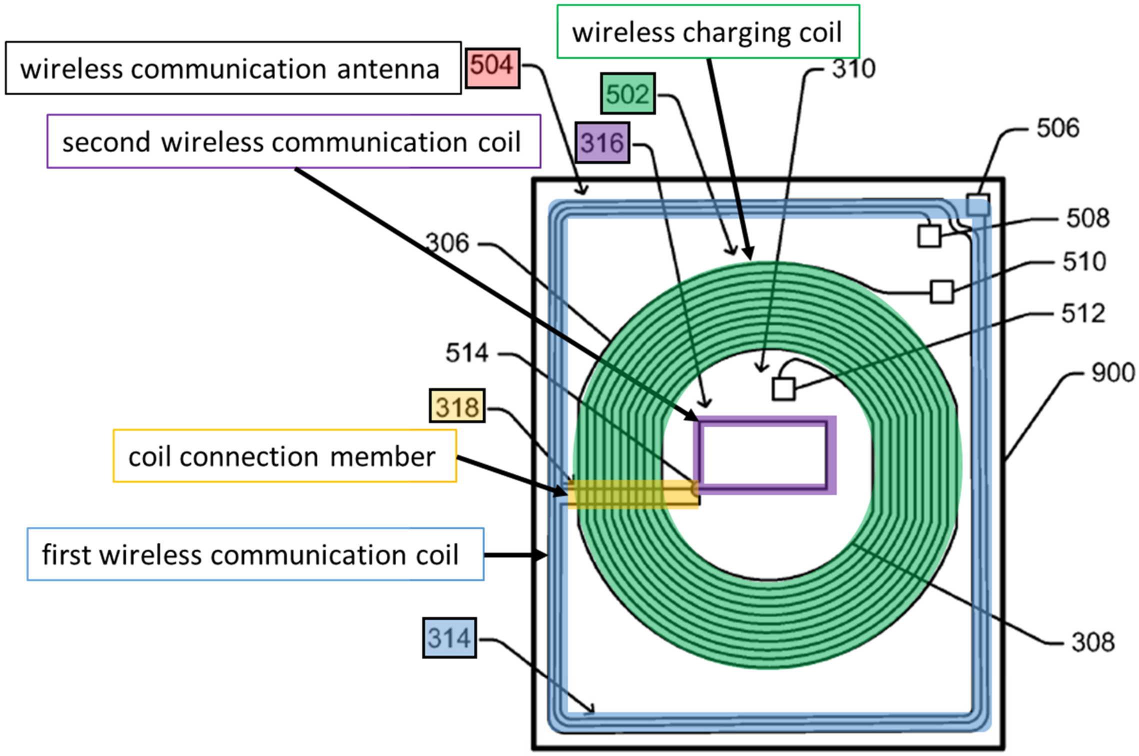


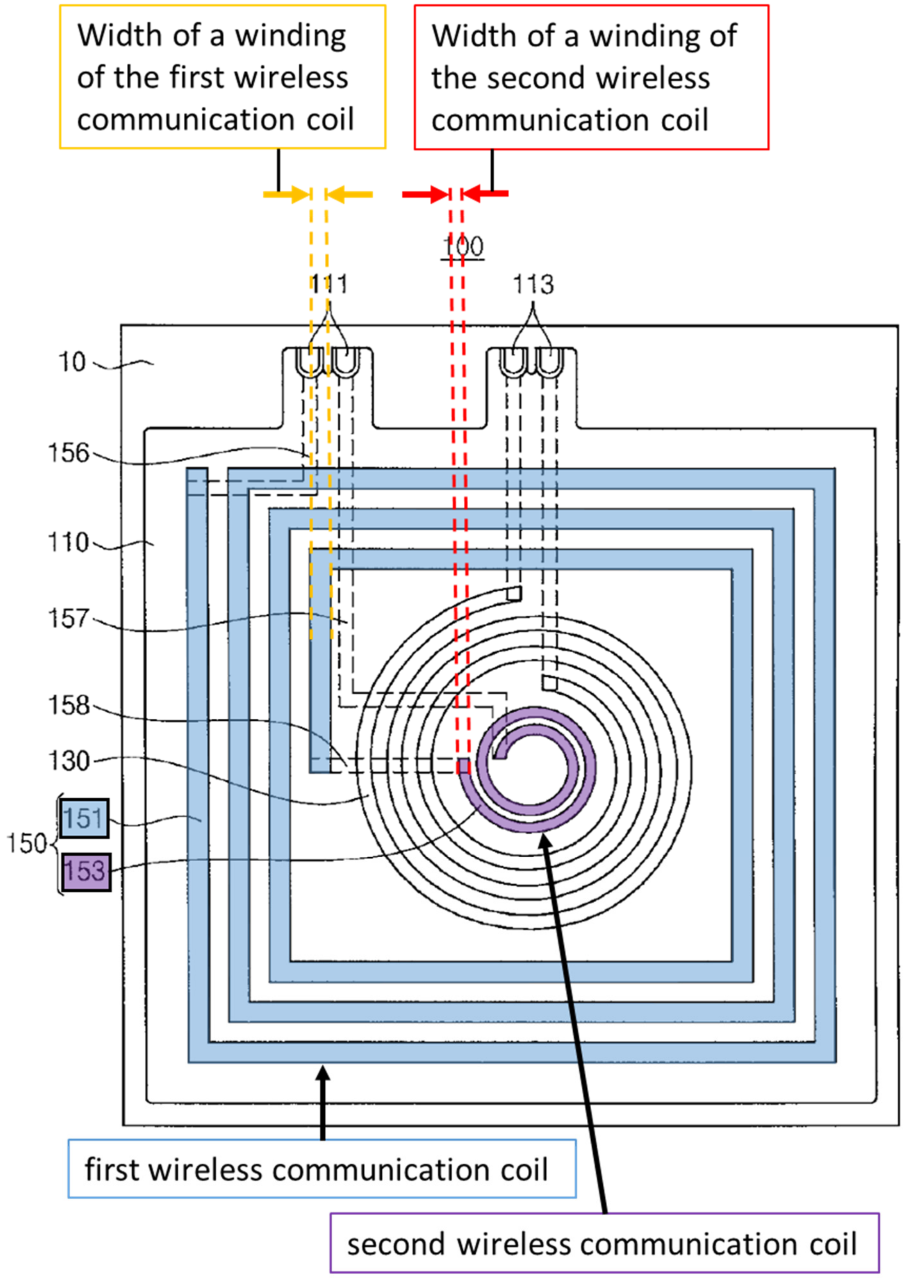
FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶123.)

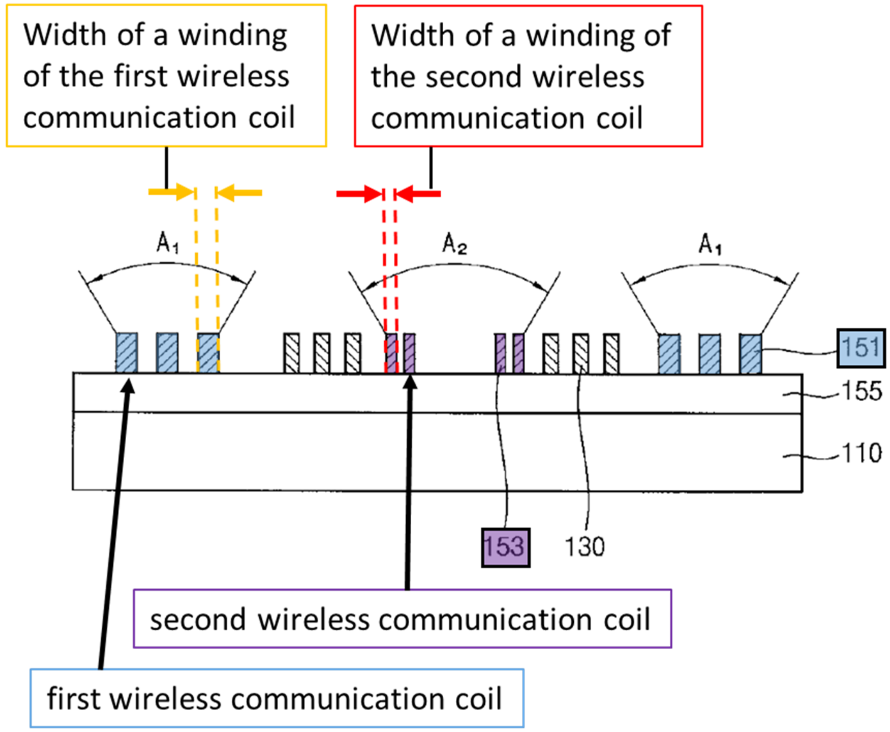
f) 1[e]: wherein a width of a winding of the second wireless communication coil is less than a width of a winding of the first communication coil.

Shostak in combination with Kim discloses or suggests this feature. (Ex-1002, ¶¶124-132.) As discussed for claim 1 in Ground 1, Kim discloses a wireless antenna design similar to that of Shostak, having first and second wireless communication coils with a wireless charging coil disposed between the communication coils. (Sections IX.A.1(a)-(f); Ex-1002, ¶124) Kim discloses, for example, 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(f); Ex-1002, ¶124.)

As discussed above in Section IX.A.1(f), Kim's figures consistently show the width of the windings of the second wireless communication coil as less than the width of the windings of the first wireless communication coil. (Section IX.A.1(f); Ex-1005, FIGs. 1, 2; Ex-1002, ¶125) And as shown in Kim's figures 1 and 2, annotated below, the width of the outermost turn of the second wireless communication coil (purple, width denoted in red) is less than the width of the innermost turn of the first wireless communication coil (blue, denoted in orange). (Ex-1002, ¶125.)



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



(Ex-1005, FIG. 2 (annotated); Ex-1002, ¶125.)

Shostak is silent on the relative widths of the first and second wireless communication coils. (Ex-1002, ¶126.) 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 as-filed parent application to the '592 patent did not describe this feature in its text, and thus did not provide any explanation or rationale as to why a width of a winding of one communication coil is greater than a width of a winding of another communication coil, let alone identify any criticality or importance associated with this feature. (Section IX.1(f).) 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, ¶127.) 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. (Ex-1002, ¶127.) Kim's disclosure of only one of these options—a winding of the first communication coil wider than a winding of the second 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 a POSITA would have been encouraged to try. (Ex-1002, ¶127.)

For example, A POSITA would have understood that a wider coil winding reduces the resistance of the coil, which is desirable in some applications. (Ex-1002, ¶128; 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 some applications a high quality factor (Q) coil is desirable, where having a wider coil results in a higher Q. (Ex-1002, ¶128; 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. (Ex-1002, ¶128.)

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, ¶129; Ex-1015, ¶[0046] ("The width and the length of each antenna coil and the film thickness or the coating thickness for each antenna coil are set in accordance with the desired communication performance."); Ex-1016, 1276, 1281 (disclosing that the inductive parameters of an inductive coil formed on a printed circuit board vary with outermost radius, number of turns, **conductor width,** lamination thickness, and conductor thickness), 1279 (showing that the inductance of the coil varies with width); Ex-1014, 871 ("[C]oil geometry is an important parameter in the design of the spiral configuration of the printed coils. Values for R_S for 5-turn circular PSC's with different W and S, measured at different resonating frequencies are shown in Fig. 6.") (where "W" refers to the width of the coil windings), 872 ("[A]s shown in Fig. 8, **a change in width of the coil** from 163 to 313 μm, **resulted the [sic] change in Q** by approximately 50% at 20 MHz.") (emphasis added), 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 when implementing 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 outermost and innermost windings for the wireless charging coil). (Ex-1002, ¶130.) It was known long before the alleged invention in the '592 patent that a coil inductor can be made 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 in small devices (such as the mobile devices Shostak's antenna is designed for), while maintaining substantially the same performance, including quality factor, inductance, and resistance as a coil where all traces are the width of the widest trace. (Ex-1002, ¶130; 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 the coils, width of the wireless charging coil windings, shape, etc.). (Ex-1002, ¶130.)

Therefore, in view of Kim and a POSITA's general understanding of the relationship between winding width and coil properties, and the advantages of a design where the inner coil winding(s) is narrower than the outermost winding(s), 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, ¶131.) *See Uber Techs.*, 957 F.3d at 1339; *In re Aller*, 220 F.2d at 456 ("[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.").

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, ¶132.)

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, and given these similarities, relative dimensions that work in Kim's antenna would also be expected to work in Shostak's antenna. (*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

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

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶133.) 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, ¶133.)

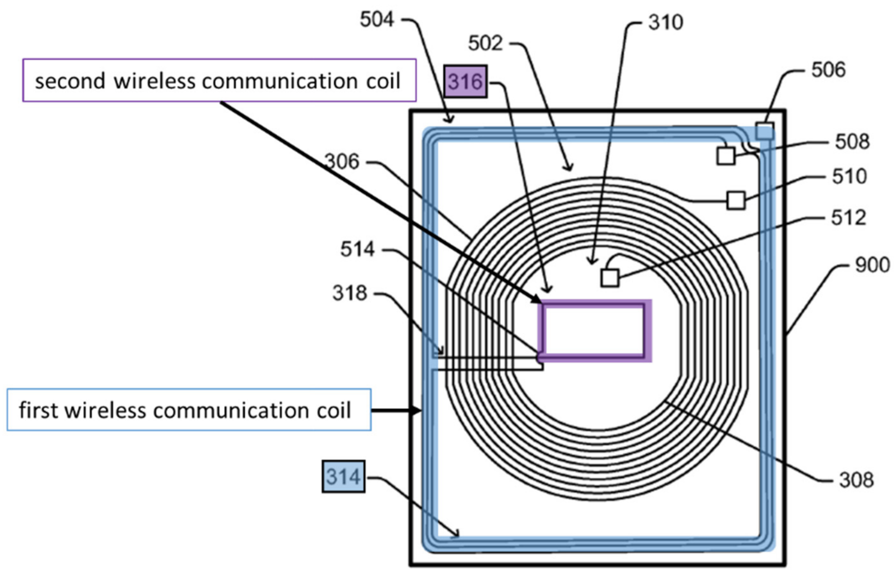


FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶133.)

3. Claim 3

a) The wireless antenna according to claim 2, wherein a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶134.) For example, as shown in Figure 9 of Shostak (annotated below) the wireless charging coil 502 has eleven windings and the first wireless communication coil 314 has three windings. (Ex-1006, FIG. 9; Ex-1002, ¶134.)

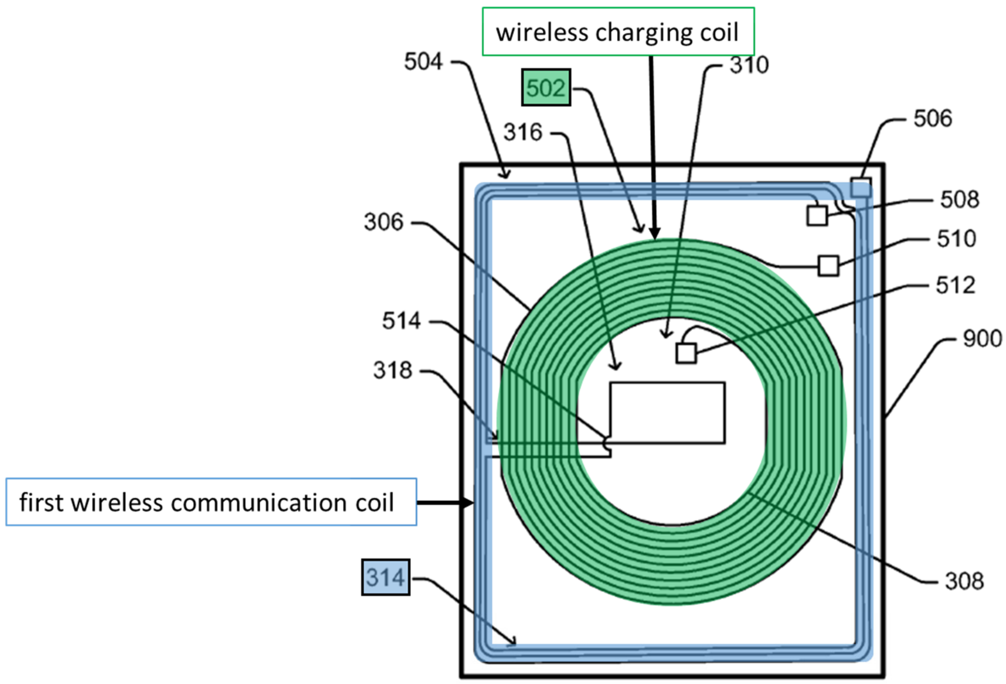


FIG. 9

(*Id.*, FIG. 9 (annotated); Ex-1002, ¶134.)

4. Claim 4

a) The wireless antenna according to claim 2, wherein the number of windings of the second wireless communication coil is one.

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶135.) For example, as discussed above in Section IX.C.1(a), Shostak discloses that the interior portion of the wireless communication antenna 316 ("second wireless communication coil") has only one winding. (Section IX.C.1(a).) For instance, Shostak discloses that "[t]he portion 316 [of the wireless communication coil 504] forms a single loop as illustrated [in Figure 9]." (*Id.*, 10:4-12; FIG. 9.)

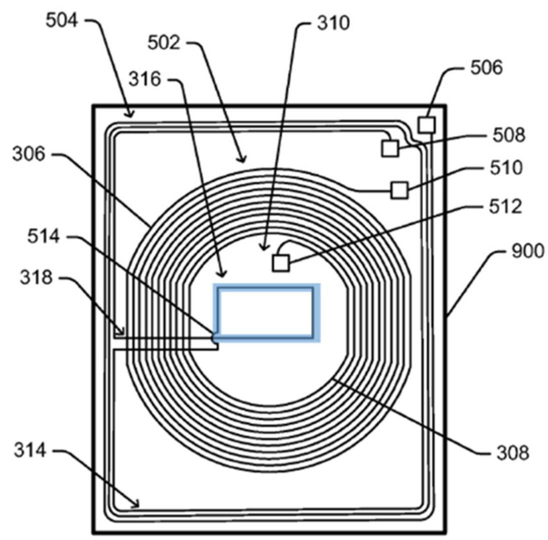


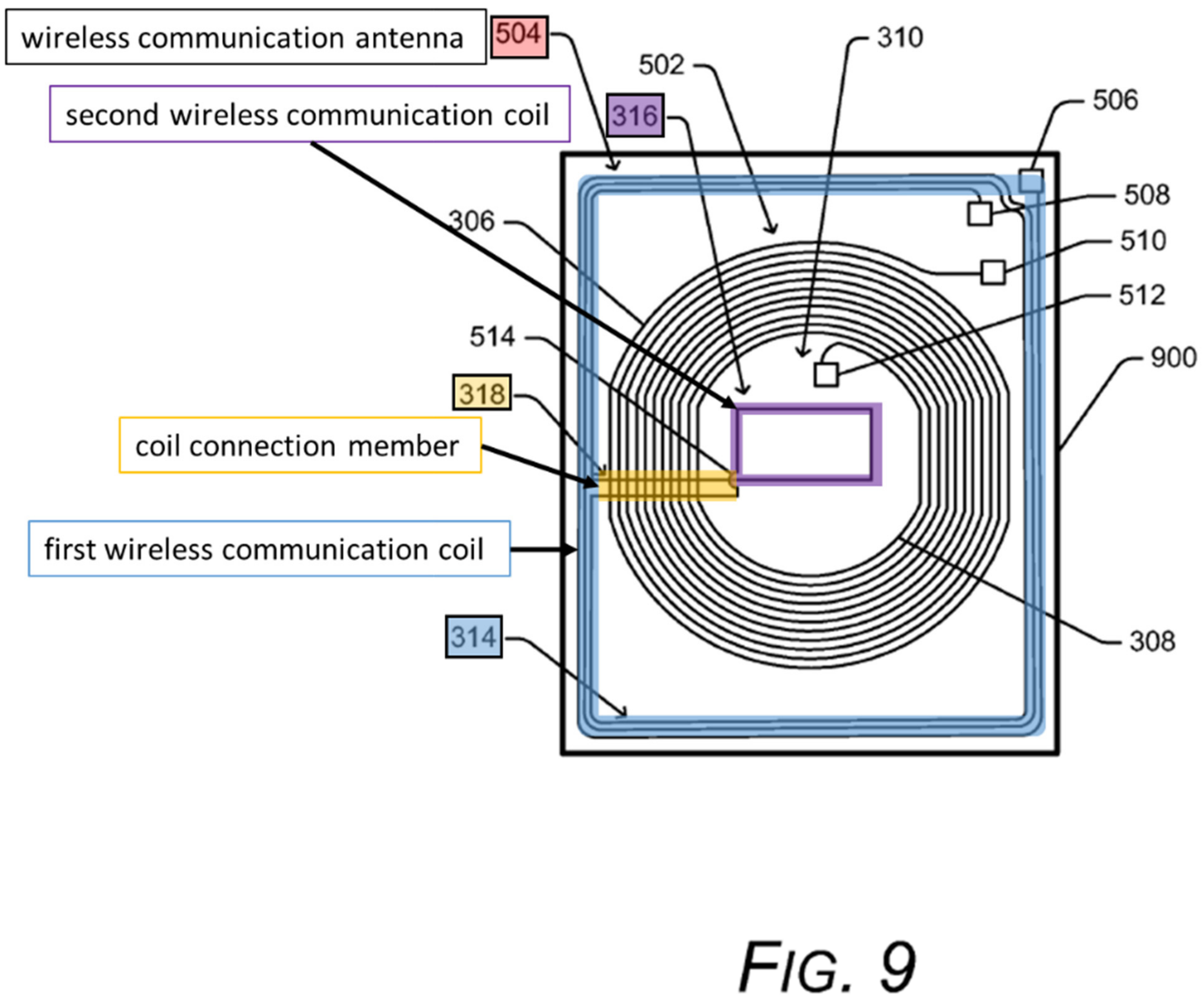
FIG. 9

(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶135.)

5. Claim 5

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

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶136.) For instance, as discussed above in Section IX.D.1(e) for claim element 1[d], 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.D.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 the second communication coil is connected to the innermost turn of the first wireless communication coil, with a single current path through the second communication coil. (Ex-1006, FIG. 9; Ex-1002, ¶__.) A POSITA would have thus understood Shostak discloses the first wireless communication coil (314) is connected in series with the second wireless communication coil (316). (Ex-1002, ¶136.)



(Ex-1006, FIG. 9 (annotated); Ex-1002, ¶136.)

b) wherein the first wireless communication coil and the second wireless communication coil are wound to have a same current rotation direction.

The Shostak-Kim combination discloses or suggests this feature. (Ex-1002, ¶137.) 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 in Section IX.D.5(a) such that current flowing through the coils would rotate in the same direction. (Section IX.D.5(a); Ex-1006, FIG. 9; Ex-1002, ¶137) Shostak further discloses that "the winding orientation (for example, clockwise or counterclockwise) of the portion 314 of the wireless communication coil 504 and the portion 316 of the wireless communication coil 504 is kept the same in the example of FIG.9," and "[k]eeping the winding orientation the same allows the magnetic field generated by each of the portions 314 and 316 to combine constructively in the center area 310 of the antenna apparatus 900 …." (Ex-1006, 10:18-25; *see also id*. 8:10-22.)

6. Claim 6

a) The wireless antenna according to claim 1, 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.

The Shostak-Kim combination discloses or suggests this feature as discussed above for claim 6 in Ground 3. (Ex-1002, ¶138; Section IX.C.2(a).)

7. Claim 7

a) 7[pre]: A wireless antenna comprising:

To the extent the preamble is limiting, Shostak discloses or suggests this feature for the reasons discussed for claim element 1[pre]. (Ex-1002, ¶139; Section IX.D.1(a).)

b) 7[a]: a wireless communication antenna comprising: a first wireless communication coil, and a second wireless communication coil; and

Shostak discloses or suggests these features for the reasons discussed above for claim element 1[a]. (Ex-1002, ¶140; Section IX.D.1(b).)

c) 7[b]: a wireless charging antenna comprising: a wireless charging coil,

Shostak discloses or suggest this feature for the reasons discussed above for claim element 1[b]. (Ex-1002, ¶141; Section IX.D.1(c).)

d) 7[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, wherein the second wireless communication coil is disposed inside the wireless charging coil,

Shostak discloses or suggests these features for the reasons discussed above for claim element 1[c]. (Ex-1002, ¶142; Section IX.D.1(d).)

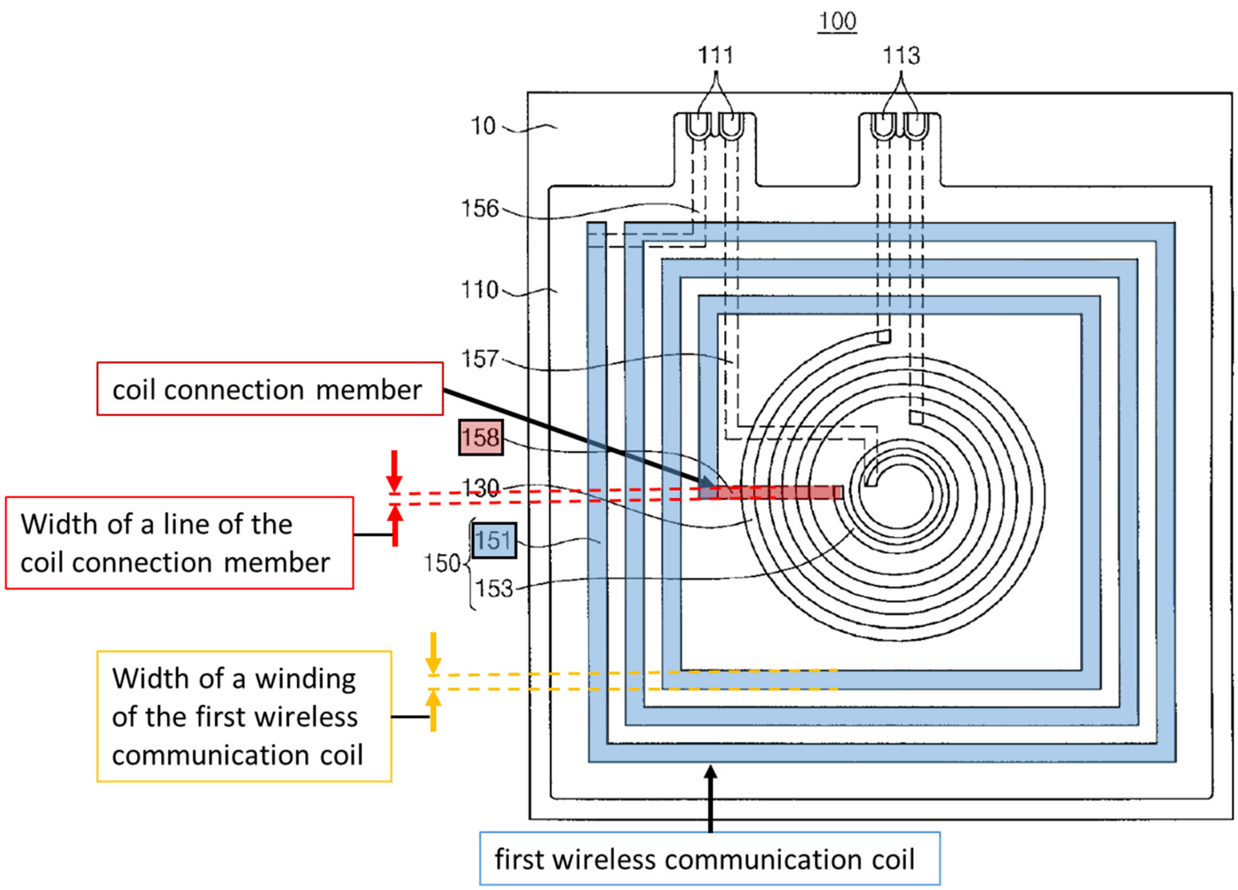
e) 7[d]: wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil to interconnect the first wireless communication coil and the second wireless communication coil, and

Shostak discloses these features for the reasons discussed above for claim element 1[d]. (Ex-1002, ¶143; Section IX.D.1(e).)

f) 7[e]: wherein a width of a line of the coil connection member is less than a width of a winding of the first communication coil.

Shostak in combination with Kim discloses or suggests this feature. (Ex-1002, ¶¶144-147.) As discussed above for claim element 1[d] in Section IX.D.1(e), Shostak discloses a wireless communication antenna 504 comprising a first wireless communication coil 314 and a second wireless communication coil 316, where "portion 318" ("coil connection member") "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 ("The antenna apparatus 900 also includes a wireless communication antenna that is the wireless communication coil 504 (e.g., the antenna 304 of FIG. 3) including portions 314, 316, and 318."), FIG. 4.)

Shostak is silent on the relative widths of the coil connection member and the first communication coil. (Ex-1002, ¶145.) 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 a width of a line of the connection member is less than a width of a winding of the first communication coil (Section IX.A.4(f)), and, in view of Kim, a POSITA implementing Shostak's antenna would have had good reason to use those same relative widths. (Ex-1002, ¶145.)



(Ex-1005, FIG. 1 (annotated); Ex-1002, ¶145.)

A POSITA would have understood that the width of a conductor, such as Kim and Shostak's coil patterns and connection lines are nothing more than a design choice, ordinarily considered when designing a coil antenna. (Ex-1002, ¶146.) For instance, a POSITA would have understood that a conductor such as Kim and

Shsotak's coil connection members carry current, and would have known to select an appropriate width based on ordinary design considerations such as material costs and resistance. (Ex-1002, ¶146.) For instance, Shostak's coil patterns are made from expensive conductive material (copper or silver (Ex-1006, 7:38-39)) that also adds weight to a wireless antenna. (Ex-1002, ¶146.) Therefore, a POSITA would have been motivated to minimize the amount of material used in the connection member to save cost and weight. (*Id.*) There would have been no need make the coil connection member wider than the second wireless communication coil because current flowing through the connection member would already be limited by the width of the second wireless communication coil. (*Id.*) Indeed, a POSITA would have known to size the second wireless communication coil at a size sufficient to accommodate the current flowing without significant resistive losses. (*Id.*) Using the same width connection member as the first wireless communication coil would have added negligible additional resistance, and would have had the desirable benefits of saving cost and weight, with no added complexity to Shostak's antenna. (*Id.*) In view of these various design considerations, selecting a width for the connection member that is narrower than the first communication coil would have been obvious. (*Id.*)

Notably, this claim feature is not described anywhere in the text of the '592 patent and is therefore certainly not critical to the alleged invention, nor does the feature purport to solve any recognized problem. (*See generally*, Ex-1001.) Therefore, a POSITA would have found it obvious to select a coil connection member having a width that is less than a width of a winding of the first communication coil (i.e., the same width as the second communication coil as disclosed by Kim) amongst the finite number of predictable options (same width, greater width, lesser width). (Ex-1002, ¶147.) Such a person would have had a reasonable expectation of success because they would have known how to size a connection member appropriately, and changing the connection member's width is not particularly difficult or complex.

8. Claim 8

a) The wireless antenna according to claim 7, wherein a number of windings of the second wireless communication coil is different from a number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests these features for the reasons discussed above for claim 2. (Ex-1002, ¶148; Section IX.D.2(a).)

9. Claim 9

a) The wireless antenna according to claim 8, wherein the number of windings of the second wireless communication coil is less than the number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests these features for the reasons discussed above for claim 2. (Ex-1002, ¶149; Section IX.D.2(a).) As discussed above, Shostak discloses inner coil portion 316 ("second wireless communication coil") with one windings, and outer coil portion 314 ("first wireless communication coil") with three windings. (Ex-1005, FIG. 1.)

10. Claim 10

a) The wireless antenna according to claim 8, wherein a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim 3. (Ex-1002, ¶150; Section IX.D.3(a).)

11. Claim 11

a) The wireless antenna according to claim 8, wherein the number of windings of the second wireless communication coil is one.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim 4. (Ex-1002, ¶151; Section IX.D.4(a).)

12. Claim 12

a) The wireless antenna according to claim 7, wherein the first wireless communication coil and the second wireless communication coil are connected to each other in series, and

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim element 5[a]. (Ex-1002, ¶152; Section IX.D.5(a).)

b) wherein the first wireless communication coil and the second wireless communication coil are wound to have a same current rotation direction.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim element 5[b]. (Ex-1002, ¶153; Section IX.D.5(b).)

13. Claim 13

a) The wireless antenna according to claim 7, 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.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim 6. (Ex-1002, ¶154; Section IX.D.6(a).)

14. Claim 14

a) 14[pre]: A wireless antenna comprising:

To the extent the preamble is limiting, Shostak discloses or suggests this feature for the reasons discussed for claim element 1[pre]. (Ex-1002, ¶155; Section IX.D.1(a).)

b) 14[a]: a wireless communication antenna comprising: a first wireless communication coil, and a second wireless communication coil; and

Shostak discloses or suggests this feature for the reasons discussed for claim element 1[a]. (Ex-1002, ¶156; Section IX.D.1(b).)

c) 14[b]: a wireless charging antenna comprising: a wireless charging coil,

Shostak discloses or suggests this feature for the reasons discussed for claim element 1[b]. (Ex-1002, ¶157; Section IX.D.1(c).)

d) 14[c]: wherein the wireless charging coil is disposed inside the first wireless communication coil, wherein the second wireless communication coil is disposed inside the wireless charging coil,

Shostak discloses or suggests this feature for the reasons discussed for claim element 1[c]. (Ex-1002, ¶158; Section IX.D.1(d).)

e) 14[d]: wherein the wireless communication antenna further comprises a coil connection member traversing the wireless charging coil to interconnect the first wireless communication coil and the second wireless communication coil,

Shostak discloses or suggests this feature for the reasons discussed for claim element 1[d]. (Ex-1002, ¶159; Section IX.D.1(e).)

f) 14[e]: 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, and

Shostak in combination with Kim discloses or suggests this feature for the reasons discussed for claim element 1[e]. (Ex-1002, ¶160; Section IX.D.1(e).)

g) 14[f]: wherein a width of a line of the coil connection member is less than a width of a winding of the first communication coil.

Shostak in combination with Kim discloses or suggests this feature for the reasons discussed for claim element 7[e]. (Ex-1002, ¶161; Section IX.D.7(f).)

15. Claim 15

a) The wireless antenna according to claim 14, wherein a number of windings of the second wireless communication coil is different from a number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 2. (Ex-1002, ¶162; Section IX.D.2(a).)

16. Claim 16

a) The wireless antenna according to claim 15, wherein the number of windings of the second wireless communication coil is less than the number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 9. (Ex-1002, ¶163; Section IX.D.9(a).)

17. Claim 17

a) The wireless antenna according to claim 15, wherein a number of windings of the wireless charging coil is greater than the number of windings of the first wireless communication coil.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed above for claim 3. (Ex-1002, ¶164; Section IX.D.3(a).)

18. Claim 18

a) The wireless antenna according to claim 15, wherein the number of windings of the second wireless communication coil is one.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 4. (Ex-1002, ¶165; Section IX.D.4(a).)

19. Claim 19

a) The wireless antenna according to claim 14, 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.

The Shostak-Kim combination discloses or suggests this feature for the reasons discussed for claim 6. (Ex-1002, ¶166; Section IX.D.6(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)

As explained below, 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 parallel 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 dates) 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 (Feb. 19, 2019) (recognizing that, even if a trial will come before a final decision, 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"); *cf. Unilioc USA, Inc. v. RingCentral, Inc.*, No. 2-17-cv-00354-JRG (E.D. Tex. Feb. 12, 2018), at *1 (observing that staying the case pending IPR will "streamline the scope of th[e] case to an appreciable extent" regardless of the IPR outcome).

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 complaint in the Eastern District of Texas 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 only four months after PO's Complaint and 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) (Finding it was reasonable for Petitioner to wait to file the Petition until shortly after receiving infringement contentions.).

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 (Dec. 2, 2019) (where the district court has not issued a claim construction ruling, fact discovery and expert discovery are not closed, and dispositive motion briefing has not yet occurred, that weighs against finding that case is 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 '592 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) to deny institution of Samsung's Petition in view of the disclosures of the new prior art and combinations presented herein.

Petitioner only relies on only one prior art reference presented to the Office during prosecution, Shostak (Ex-1006), which was cited by the Examiner against the '592 patent's parent applications. (*See e.g.*, Ex-1023, 354-57.) The Examiner concluded that the prior art did not disclose the combination of claim elements 1[d] and 1[e] (Ex-1004, 12; *see also* Ex-1023, 304), but the Examiner failed to consider on the record whether that combination of limitations would have been obvious. Moreover, the Examiner was not presented with Kim, which discloses both claim elements 1[d] and 1[e], as described above.

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 1-19 of the ’592 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. 10,727,592 contains, as measured by the word-processing system used to prepare this paper, 13,143 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. 10,727,592 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on PAIR:

BIRCH STEWART KOLASCH & BIRCH, LLP
8110 Gatehouse Road, Suite 100 East
Falls Church, VA 22042

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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