

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

SCRAMOGE TECHNOLOGY LTD.,
Patent Owner.

IPR2022-00350
Patent 9,806,565 B2

Before JAMESON LEE, KARL D. EASTHOM, and MICHELLE N.
WORMMEESTER, *Administrative Patent Judges*.

WORMMEESTER, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining Some Challenged Claims Unpatentable
Denying Patent Owner's Revised Motion to Amend
35 U.S.C. § 318(a)

Dismissing Petitioner's Motion to Strike
37 C.F.R. § 42.5

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–20 of U.S. Patent No. 9,806,565 B2 (Ex. 1001, “the ’565 patent”). Scramoge Technology Ltd. (“Patent Owner”) filed a Preliminary Response (Paper 6). With our authorization (*see* Paper 7), Petitioner filed a preliminary Reply (Paper 8) to Patent Owner’s Preliminary Response, and Patent Owner filed a preliminary Sur-reply (Paper 9) to Petitioner’s preliminary Reply. Pursuant to 35 U.S.C. § 314, we instituted *inter partes* review. Paper 10 (“Inst. Dec.”).

Following institution, Patent Owner filed a Response (Paper 19, “PO Resp.”) to the Petition, Petitioner filed a Reply (Paper 22, “Pet. Reply”) to Patent Owner’s Response, and Patent Owner filed a Sur-reply (Paper 24, “PO Sur-reply”) to Petitioner’s Reply.

Patent Owner also filed an initial Contingent Motion to Amend (Paper 18), and Petitioner filed an Opposition (Paper 21) to the Motion to Amend. We issued preliminary guidance on Patent Owner’s Motion to Amend. Paper 23. Thereafter, Patent Owner filed a Contingent Revised Motion to Amend (Paper 25, “RMTA”), replacing the initial Motion to Amend. Petitioner filed an Opposition (Paper 30, “Pet. RMTA Opp.”) to the Revised Motion to Amend, Patent Owner filed a Reply (Paper 32, “PO RMTA Reply”) to Petitioner’s Opposition, and Petitioner filed a Sur-reply (Paper 38, “Pet. RMTA Sur-reply”) to Patent Owner’s Reply.

Lastly, Petitioner filed a Motion to Strike (Paper 28), and Patent Owner filed an Opposition (Paper 31) to Petitioner’s Motion to Strike. We authorized the filing of these papers in an e-mail dated March 14, 2023. Ex. 3002.

On June 2, 2023, we conducted an oral hearing. A copy of the transcript (Paper 43, “Tr.”) is in the record.

We have jurisdiction under 35 U.S.C. § 6(b). For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–12 and 14–20 of the ’565 patent are unpatentable. We also determine that Petitioner has not shown by a preponderance of the evidence that claim 13 is unpatentable. We further determine that Petitioner has demonstrated unpatentability of proposed substitute claims 21–23 by a preponderance of the evidence, and, therefore, we deny Patent Owner’s Revised Motion to Amend. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a).

II. BACKGROUND

A. Related Proceedings

The parties identify one federal district court case, *Scramoge Technology Limited v. Apple Inc.*, No. 5:22-cv-03041 (N.D. Cal.). Paper 13, 2–3 (Patent Owner’s Amended Mandatory Notices); Paper 41, 2 (Petitioner’s Updated Mandatory Notices). Patent Owner also identifies several *inter partes* review proceedings. Paper 13, 2.

B. The ’565 Patent

The ’565 patent describes wireless power receivers. Ex. 1001, 1:14–15. In one embodiment, “[a] connecting unit is disposed in [a] receiving space of [a] magnetic substrate so that the thickness of the wireless power receiver can be remarkably reduced as much as the thickness of the connecting unit.” *Id.* at 2:45–49.

To illustrate, Figure 26 of the '565 patent is reproduced below.

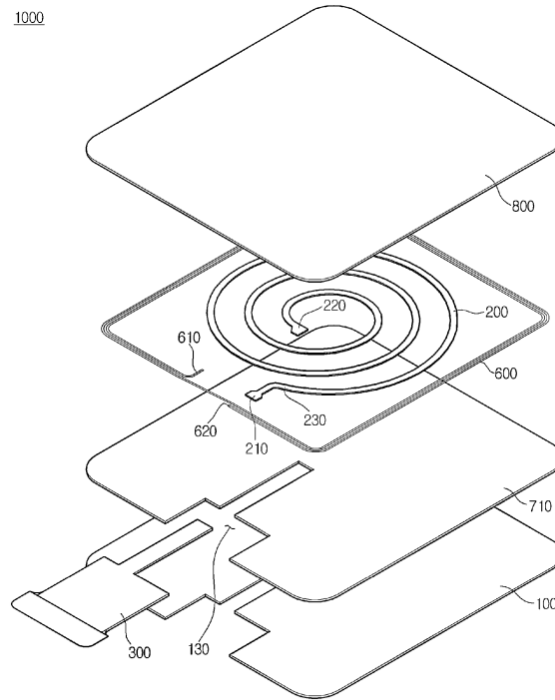


FIG. 26

Figure 26 is an exploded view of wireless power receiver 1000, which includes magnetic substrate 100, coil unit 200, connecting unit 300, short-range communication antenna 600, adhesive layer 710, and protective film 800. Ex. 1001, 14:46–47, 14:59–64.

Magnetic substrate 100 includes receiving space 130 with a shape corresponding to the shape of connecting unit 300. Ex. 1001, 15:27–28, 16:4–6. Connecting unit 300 is disposed in receiving space 130 and connected to coil unit 200, which includes coil 230. *Id.* at 15:27–31, 15:34–36. Coil unit 200 may be disposed on magnetic substrate 100 and may have a spiral shape. *Id.* at 16:62–63. Short-range communication antenna 600 may be disposed along the perimeter of magnetic substrate 100 such that it surrounds coil unit 200 and may have a rectangular shape. *Id.* at 16:38–42. To further illustrate, Figure 27 of the '565 patent is reproduced below.

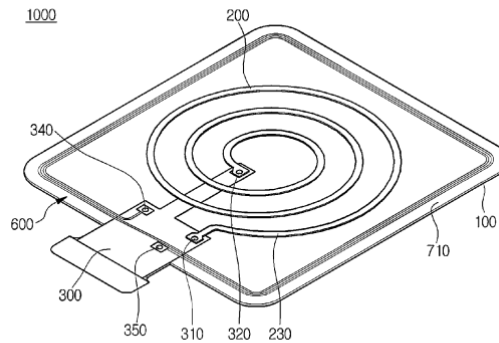


FIG. 27

Figure 27 illustrates wireless power receiver 1000 in its assembled state. *Id.* at 14:52–55. Connection terminal 310 of connecting unit 300 is connected to connection terminal 210 of coil unit 200, connection terminal 320 of connecting unit 300 is connected to connection terminal 220 of coil unit 200, connection terminal 340 of connecting unit 300 is connected to connection terminal 610 of antenna 600, and connection terminal 350 of connecting unit 300 is connected to connection terminal 620 of antenna 600. *Id.* at 15:60–16:3. As depicted above in Figure 27, after assembly, connecting unit 300 extends out of receiving space 130 (*see* Fig. 26).

In operation, coil unit 200 receives power from a transmission side through “electromagnetic induction or resonance.” Ex. 1001, 15:32–34. Connecting unit 300 connects a receiver circuit with coil unit 200 to transfer the power received from coil unit 200 to a load through the receiver circuit. *Id.* at 15:38–41. Short-range communication antenna 600 transceives information in cooperation with a reader. *Id.* at 16:26–28. The receiver circuit transfers the signal received from short-range communication antenna 600 to a short-range communication signal processing unit. *Id.* at 15:49–52.

The '565 patent explains that, “[s]ince the connecting unit 300 is disposed in the receiving space 130 of the magnetic substrate 100, the thickness of the wireless power receiver 1000 can be remarkably reduced as much as the thickness of the connecting unit 300,” and, “[t]hus, the thickness of the electronic device, such as a portable terminal, equipped with the wireless power receiver 1000 can be remarkably reduced.” Ex. 1001, 16:6–13.

C. Illustrative Claim

Petitioner challenges claims 1–20 of the '565 patent, where claims 1 and 12 are independent. Claim 1, reproduced below, is illustrative of the claims under challenge.

1. A wireless power receiver comprising:
 - a substrate comprising a receiving space of a predetermined shape formed therein for a connecting unit configured to connect to a wireless power receiving circuit;
 - a coil unit disposed on the substrate, the coil unit comprising a first connection terminal, a second connection terminal, and a coil; and
 - a short-range communication antenna disposed on the substrate and surrounding the coil;wherein the coil is configured to wirelessly receive power, wherein the coil is formed as a conductive pattern on or within the substrate,
- wherein the conductive pattern comprises a conductive line wound at least two times and conductive pattern has a spiral shape, wherein the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil, wherein the coil unit overlaps the receiving space in a first direction perpendicular to an upper surface the substrate,

wherein the connecting unit is disposed in the receiving space and connected to the coil unit,

wherein the connecting unit overlaps the receiving space in a second direction parallel to the upper surface of the substrate, and

wherein the connecting unit comprises:

- a third connection terminal connected to the first connection terminal of the coil unit; and
- a fourth connection terminal connected to the second connection terminal of the coil unit.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–20 of the ’565 patent on the following three grounds. Pet. 17–73. We instituted *inter partes* review. Inst. Dec. 39.

Claims Challenged	35 U.S.C. § ¹	References/Basis
1–8, 11–18	103	Hong, ² Park ³
9, 19	103	Hong, Park, Hasegawa ⁴
10, 20	103	Hong, Park, Sung ⁵

In support of its arguments, Petitioner relies on a Declaration of Joshua Phinney, Ph.D. (Ex. 1003). The transcript of the deposition of Dr. Phinney is entered in the record as Exhibit 2017.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the ’565 patent issued was filed before this date, the pre-AIA version of § 103 applies.

² Hong, U.S. Patent No. 8,941,352 B2, issued Jan. 27, 2015 (Ex. 1005).

³ Park, U.S. Patent No. 8,922,162 B2, issued Dec. 30, 2014 (Ex. 1006).

⁴ Hasegawa, U.S. Publ’n No. 2009/0021212 A1, published Jan. 22, 2009 (Ex. 1007).

⁵ Sung, U.S. Publ’n No. 2012/0274148 A1, published Nov. 1, 2012 (Ex. 1008).

III. ANALYSIS

Because Patent Owner’s Revised Motion to Amend is contingent on a conclusion of unpatentability of the challenged patent claims, we first address Petitioner’s challenge of claims 1–20 of the ’565 patent, and then we address Patent Owner’s proposed substitute claims 21–23 in the Revised Motion to Amend.

A. Claim Construction

In an *inter partes* review proceeding, we construe a claim of a patent “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” *See* 37 C.F.R. § 42.100(b) (2019). Applying that standard, we construe a claim in accordance with its ordinary and customary meaning as would have been understood by one of ordinary skill in the art, taking into account the specification and the prosecution history pertaining to the patent. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

Patent Owner requests that we “construe independent claims 1 and 12 to require two separate and distinct components for the ‘substrate comprising a receiving space’ and ‘connecting unit.’” PO Resp. 8–19. Petitioner responds that it “relies on separate and distinct elements to satisfy the claimed ‘*substrate comprising a receiving space*’ and ‘*connecting unit*,’ and no actual claim construction dispute exists.” Pet. Reply 5. For purposes of this Decision, we conclude that no claim term requires express interpretation to resolve any controversy in this proceeding. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

B. Obviousness over Hong and Park

Petitioner asserts that claims 1–8 and 11–18 of the ’565 patent would have been obvious over Hong and Park. Pet. 18–60. Patent Owner disputes certain aspects of Petitioner’s analysis regarding independent claims 1 and 12 as well as dependent claim 13. PO Resp. 19–32. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–8, 11, 12, and 14–18 would have been obvious over Hong and Park. Petitioner has not, however, demonstrated by a preponderance of the evidence that claim 13 would have been obvious over Hong and Park.

1. Overview of Asserted Prior Art

We start with an overview of the asserted prior art, Hong and Park.

a. Hong

Hong describes “a contactless charging apparatus for a portable terminal.” Ex. 1005, 1:16–17. To illustrate, Figure 3 of Hong is reproduced below.

FIG. 3

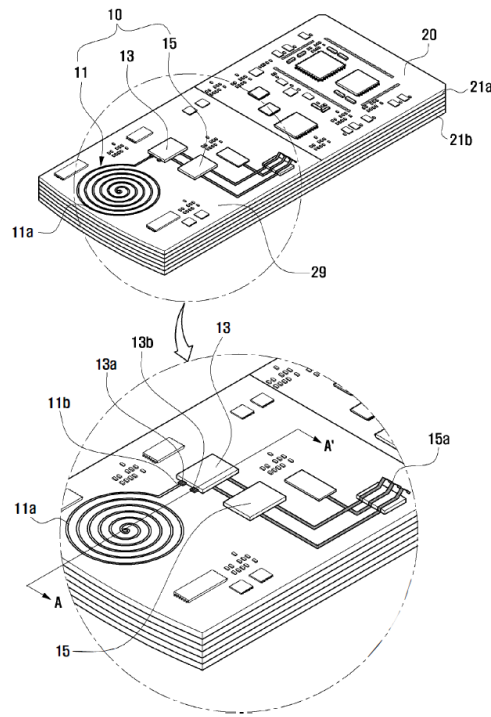


Figure 3 shows contactless charging apparatus 10 mounted on main circuit board 20 of a portable terminal. *Id.* at 2:44–47, 3:36–38, 4:16–19.

Contactless charging apparatus 10 includes secondary coil 11, rectifying unit 13, and charging unit 15. Secondary coil 11 includes coil layer 11a and may have a circular shape. *Id.* at 4:22–27.

Secondary coil unit 11 and rectifying unit 13 are connected through via holes 25a, 25b, and 25c as well as wiring layer 27. *Ex.* 1005, 5:7–10. Specifically, end 11b of coil layer 11a is electrically connected to connecting terminal 13a of rectifying unit 13 at layer 21a of main circuit board 20. *Id.* at 5:11–15. End 11c of coil layer 11a, which is formed at a center of coil layer 11a, is electrically connected to connecting terminal 13b of rectifying unit 13. *Id.* at 5:16–18. This connection is made through wiring layer 27, which is formed in via holes 25a, 25b, and 25c on inner layers 23 of main circuit board 20. *Id.* at 5:19–22.

When contactless charging apparatus 10 is engaged with a contactless charger, secondary coil unit 11 generates an electromotive force that is induced by a primary coil in the contactless charger to charge a battery located in the portable terminal. Ex. 1005, code (57), 3:36–38, 5:31–47.

b. Park

Park relates to “a portable terminal having a secondary coil for wireless charging, as well as a plurality of antenna elements.” Ex. 1006, 1:16–19. To illustrate, Figure 4 of Park is reproduced below.

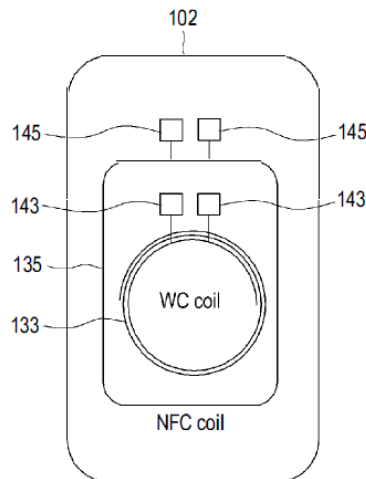


FIG.4

Figure 4 shows an example configuration of a portable terminal that implements a wireless charging function and a Near Field Communication (NFC) function using a coil module comprising shielding member 131 (not shown) and coils 133 and 135, where coil 133 serves as a secondary coil used for wireless charging and coil 135 serves as an antenna element for NFC. *Id.* at 3:9–11, 4:60–65. Coil 135 surrounds coil 133. *Id.* at 3:61–64.

Coils 133 and 135 are attached to shielding member 131. Ex. 1006, 3:4–8. To illustrate, Figure 3 of Park is reproduced below.

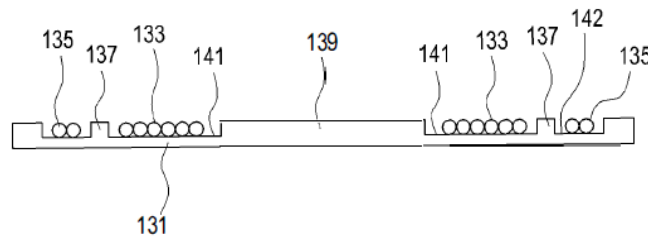


FIG.3

Figure 3 is a sectional view of the coil module. *Id.* at 2:43. Shielding member 131 includes accommodation grooves 141 and 142. *Id.* at 3:35–37. Accommodation groove 142 surrounds accommodation groove 141. *Id.* at 3:37–42. Coil 133 is accommodated in accommodation groove 141, whereas coil 135 is accommodated in accommodation groove 142. *Id.* at 3:56–59. Shielding wall 137, which shields interference of electronic waves between coils 133 and 135, is interposed between accommodation grooves 141 and 142. *Id.* at 3:42–44, 3:66–4:1.

2. Analysis of Claims 1–8 and 11–18

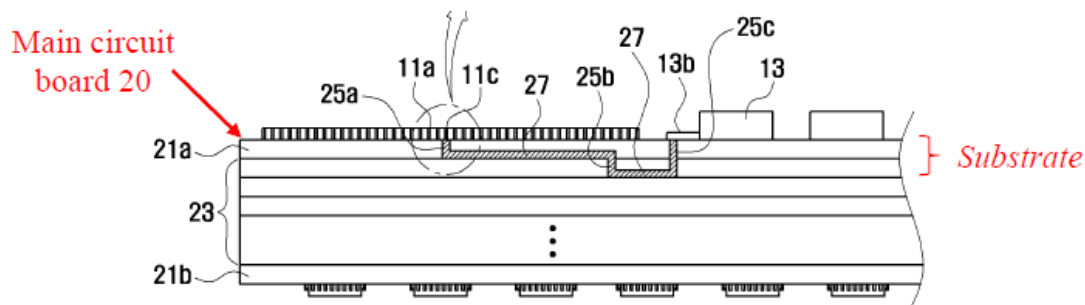
We turn now to our discussion of the claims.

a. Independent Claim 1

Claim 1 is directed to a “wireless power receiver” that comprises a “substrate,” a “coil unit” including a “coil,” a “short-range communication antenna,” and a “connecting unit.” Claim 1 recites various limitations designated by Petitioner as limitations 1.1 through 1.10. We address these limitations in turn and then consider the parties’ disputes.

i. Limitation 1.1: “substrate”

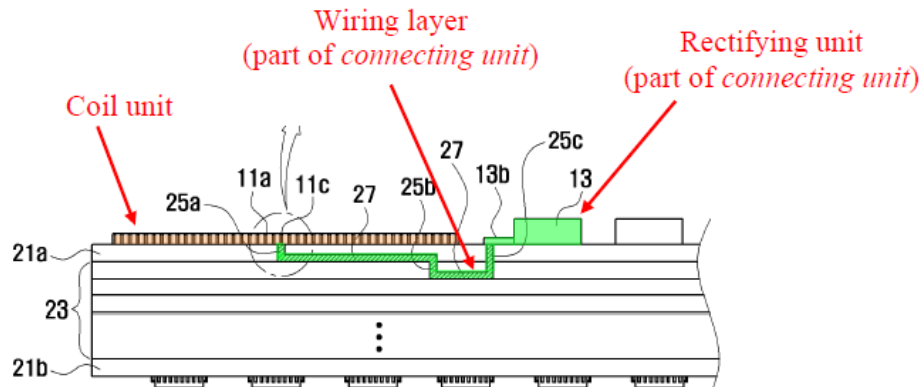
Claim 1 recites “a substrate comprising a receiving space of a predetermined shape formed therein for a connecting unit configured to connect to a wireless power receiving circuit.” For this limitation, which Petitioner designates as limitation 1.1, Petitioner directs us to where Hong teaches that “[t]he secondary coil unit 11 is **formed at one surface of the main circuit board 20,**” and that “[t]he end 11c of the coil layer 11a makes contact to the connecting terminal 13b through **the wiring layer 27 formed in via holes 25a, 25b, and 25c, which are formed on inner layers 23 of the main circuit board 20.**” Pet. 29 (quoting Ex. 1005, 3:50–51, 5:19–22 (emphases added by Petitioner)). Petitioner identifies “the upper portion of the main circuit board [20]” in Hong, specifically “the layers of Hong’s main circuit board [20] upon which and through which these elements are formed,” as a “substrate.” *Id.* at 29–30 (citing Ex. 1005, 3:53–64, 4:33–36, Fig. 4). To illustrate, Petitioner provides a cropped and annotated version of Figure 4 of Hong, which is reproduced below. *Id.* at 30.



Petitioner’s version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6.

Petitioner further identifies Hong’s rectifying unit 13 and wiring layer 27 together as a “connecting unit.” Pet. 30–32. As support, Petitioner

provides another cropped and annotated version of Figure 4 of Hong, reproduced below. *Id.* at 31.



This version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Petitioner contends that Hong’s via holes 25a, 25b, and 25c as well as the space extending between them correspond to the recited receiving space formed in the substrate. Pet. 32. To support its position, Petitioner directs us to where Hong teaches that “the wiring layer 27 [is] formed in via holes 25a, 25b, and 25c, which are formed on inner layers 23 of the main circuit board 20,” where the wiring layer 27 corresponds to the recited connecting unit. Ex. 1005, 5:19–22 (quoted by Pet. 32). Petitioner further points to Hong’s teaching that “[a] via hole and a wiring layer may be formed . . . according to a designed condition,” (Ex. 1005, 5:22–24 (quoted by Pet. 32)), which, according to Petitioner, means “the *receiving space* in the main circuit board is a designed space of a predetermined shape that extends through the layers from the end 11c of the coil layer 11a to the connecting terminal 13b of the rectifying unit,” (Pet. 33).

Petitioner additionally provides a cropped and annotated version of Figure 3 of Hong, which is reproduced below. Pet. 31.

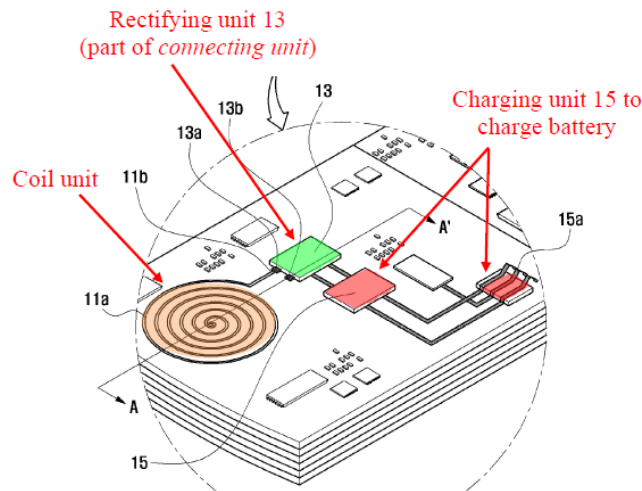


Figure 3 of Hong, as provided by Petitioner, shows contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 2:44–47. As shown in the annotated figure, Petitioner identifies Hong’s charging unit 15 as a “wireless power receiving circuit.” Pet. 30. Hong teaches that “the rectifying unit 13 connects with the charging unit 15 which includes a battery charging terminal 15a for contact with a battery,” where rectifying unit 13 corresponds to the recited connecting unit. *See* Ex. 1005, 4:59–62 (cited by Pet. 30).

Patent Owner disputes Petitioner’s analysis for limitation 1.1. *See* PO Resp. 19–31. We address the parties’ dispute in further detail below.

ii. Limitations 1.2, 1.6, and 1.7: “coil unit”

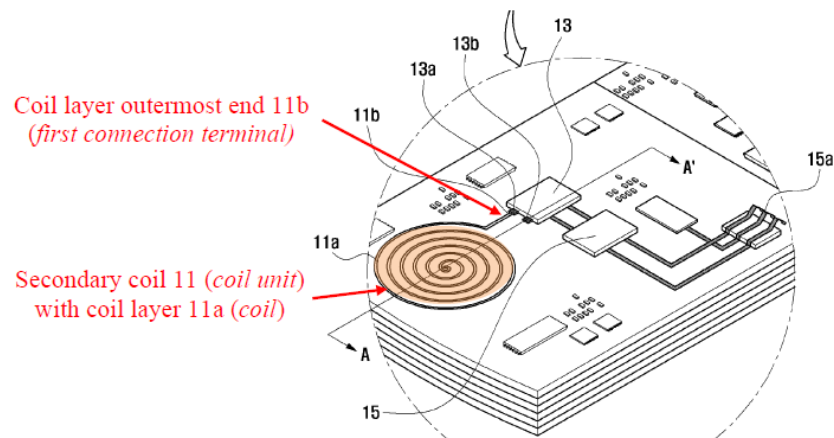
Claim 1 further recites “a coil unit disposed on the substrate, the coil unit comprising a first connection terminal, a second connection terminal, and a coil.” Petitioner designates this limitation as limitation 1.2. Pet. 34. Claim 1 requires that “the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil.” Petitioner designates this limitation as limitation 1.6. *Id.* at 40.

Additionally, claim 1 requires that “the coil unit overlaps the receiving space in a first direction perpendicular to an upper surface of the substrate.”

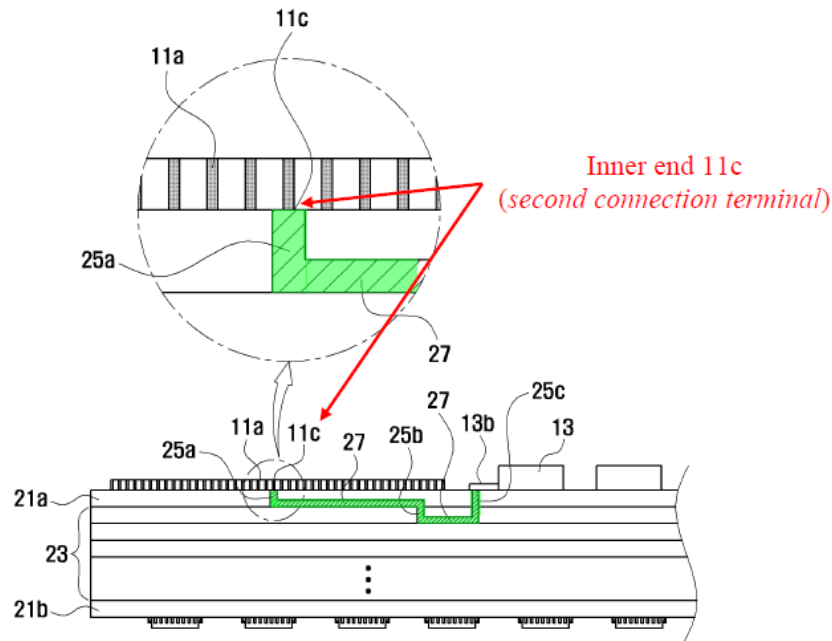
Petitioner designates this limitation as limitation 1.7. *Id.* at 41. We discuss these limitations in turn.

With respect to limitation 1.2 (which recites “a coil unit disposed on the substrate, the coil unit comprising a first connection terminal, a second connection terminal, and a coil”), Petitioner identifies Hong’s secondary coil 11 as a “coil unit.” Pet. 34. As support, Petitioner directs us to where Hong teaches that “a secondary coil 11 [is] formed on a main circuit board 20” and “includes a coil layer 11a.” Ex. 1005, 4:16–23 (cited by Pet. 34). Hong teaches that “an outermost end 11b of the coil layer 11a is electrically connected to connecting terminal 13a of the rectifying unit 13,” and that “[a]nother end 11c, formed at a center of the coil layer 11a, is electrically connected to connecting terminal 13b of the rectifying unit 13.” *Id.* at 5:11–19, Fig. 4 (cited by Pet. 34–35). Petitioner identifies Hong’s coil layer 11a as a “coil,” Hong’s end 11b as a “first connection terminal,” and Hong’s end 11c as a “second connection terminal.” Pet. 34–35.

To illustrate, Petitioner provides a cropped and annotated version of Figure 3 of Hong, which is reproduced below. Pet. 35.



Petitioner's version of Figure 3 of Hong shows contactless charging apparatus 10, which includes secondary coil 11, mounted on main circuit board 20. *See* Ex. 1005, 2:44–47, 4:16–19. Petitioner also provides an annotated version of Figure 4 of Hong, reproduced below. Pet. 36.



This version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. In the annotated figures, Petitioner labels the components in Hong corresponding to the recited first connection terminal, the recited second connection terminal, and the recited coil. Pet. 35–36.

With respect to limitation 1.6 (which recites “the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil”), Petitioner cross-references its analysis for limitation 1.2. Pet. 40. Petitioner directs us again to Hong’s teaching of “an outermost end 11b of the coil layer 11a” and “[a]nother end 11c, formed at a center of the coil layer 11a.” Ex. 1005, 5:11–19, Figs. 3, 4 (cited by Pet. 40–41). Petitioner characterizes end 11c as an

“inner” end. Pet. 40. We note that end 11b faces away from main circuit board 20, whereas end 11c faces toward main circuit board 20. *See* Ex. 1005, Figs. 3, 4. As discussed above, Hong’s end 11b corresponds to the recited first connection terminal, and Hong’s end 11c corresponds to the recited second connection terminal.

With respect to limitation 1.7 (which recites “the coil unit overlaps the receiving space in a first direction perpendicular to an upper surface of the substrate”), Petitioner provides another version of Figure 4 of Hong, which is reproduced below. Pet. 42.

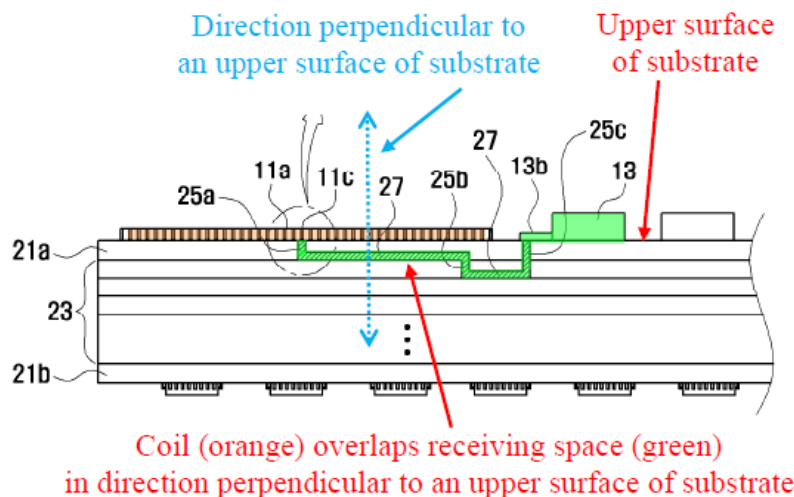


Figure 4 of Hong, as cropped and annotated by Petitioner, is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Pointing to the annotations in this version of Figure 4, Petitioner contends that “Hong teaches and illustrates in Fig. 4 that its coil layer 11a overlaps the *receiving space* (in which the wiring layer is disposed) in a first direction perpendicular to an upper surface of the main circuit board (*substrate*).” Pet. 41.

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited coil unit of limitations 1.2, 1.6, and 1.7. Patent

Owner does not dispute Petitioner's analysis for any of these limitations.

See generally PO Resp.

iii. Limitation 1.3: "short-range communication antenna"

Claim 1 further recites "a short-range communication antenna disposed on the substrate and surrounding the coil." For this limitation, which Petitioner designates as limitation 1.3, Petitioner relies additionally on Park. Pet. 36–38. Specifically, Petitioner directs us to where Park describes a portable terminal implementing "both a wireless charging function and an NFC function" with "[a] first coil 133 as a secondary coil used for wireless charging and [a] second coil 135 as an antenna element for NFC." Ex. 1006, 4:60–65 (quoted by Pet. 37). Park teaches that "the first and second coils 133 and 135 are accommodated in the first and second accommodation grooves 141 and 142 [of shielding member 131], respectively, and the second coil 135 surrounds the first coil 133." *Id.* at 3:61–64, Figs. 3, 4 (cited by Pet. 37).

Petitioner contends that an ordinarily skilled artisan "would have been motivated to combine the teachings of Park with those of Hong." Pet. 22–23; *see also id.* at 22–27. As support, Petitioner asserts that Hong's "contactless power apparatus may be implemented in the context of a portable terminal," (Pet. 23 (citing Ex. 1005, Fig. 1)), and points to Park's teaching that, "[a]s portable terminals have become a daily commodity, they are equipped with the NFC function," (Ex. 1006, 1:29–33 (cited by Pet. 23)). Park further teaches that "a portable terminal is provided with an additional antenna for performing the NFC function." Ex. 1006, 1:31–33 (quoted by Pet. 23). In light of these teachings, Petitioner asserts that, "as a baseline, it

was well known and obvious for a portable terminal, such as Hong's, to include an NFC antenna coil as well as a wireless charging coil." Pet. 23. Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1003 ¶¶ 49–51).

Petitioner adds that an ordinarily skilled artisan "would have been specifically motivated to implement Hong's device with an NFC coil because as of the earliest alleged priority date of the '565 patent, NFC was a standardized data transmission protocol with a multitude of commercial applications and advantages over other short-range wireless communication protocols." Pet. 24. Petitioner states that "NFC technology provides an advantage of fast communication setup between communication devices," (*id.* (quoting Ex. 1006, 1:33–36)), and "the intuitive operation of NFC protocol systems makes the technology particularly easy for consumers to use," (*id.* (quoting Ex. 1010, 4:2–5)). According to Petitioner, combining the teachings of Hong and Park "would allow Hong's mobile device to be easily used for transactions in a variety of commercial applications." *Id.* Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1003 ¶ 52).

Based on Petitioner's argument and evidence, we are persuaded that Petitioner's proposed combination of Hong and Park teaches the recited short-range communication antenna of limitation 1.3. We also are persuaded that Petitioner's proffered reasoning for modifying Hong's device to include Park's NFC antenna coil is sufficient to support the legal conclusion of obviousness. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.").

Patent Owner does not dispute Petitioner's analysis for this limitation.
See generally PO Resp.

iv. Limitations 1.4 and 1.5: “coil”

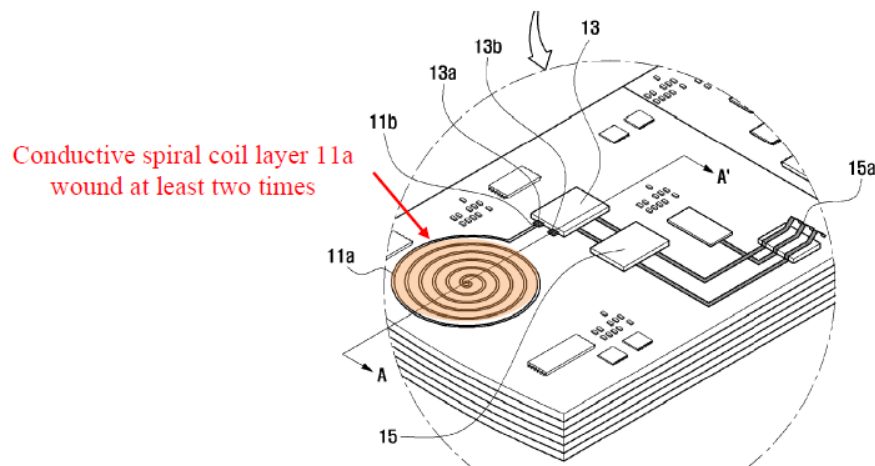
As discussed above, Petitioner identifies Hong's coil layer 11a as the recited coil. Pet. 34. Claim 1 requires that “the coil is configured to wirelessly receive power, wherein the coil is formed as a conductive pattern on or within the substrate.” Petitioner designates this limitation as limitation 1.4. *Id.* at 38. Claim 1 additionally requires that “the conductive pattern comprises a conductive line wound at least two times and conductive pattern has a spiral shape.” Petitioner designates this limitation as limitation 1.5. *Id.* at 39. We discuss these limitations in turn.

With respect to limitation 1.4 (which recites “the coil is configured to wirelessly receive power, wherein the coil is formed as a conductive pattern on or within the substrate”), Petitioner directs us to where Hong teaches that its “coil layer . . . generates an electromotive force induced by a magnetic induction field created by a contactless charger.” Ex. 1005, code (57) (cited by Pet. 38). More specifically, an “induced electromotive force is generated in the secondary coil unit 11 of the portable terminal 1 by the magnetic induction field formed in the primary coil unit 511 of the power transmitter 510.” *Id.* at 5:44–47 (cited by Pet. 38).

Petitioner also directs us to where Hong teaches that its “secondary coil unit 11 is formed at one surface of the main circuit board 20,” and the “coil layer [is] spirally formed in a circular form on a plane.” Ex. 1005, 3:50–52 (cited by Pet. 38). Petitioner points to Hong's further teaching that “a material of the secondary coil unit 11 on the main circuit board 20 may be

the same as that of a conductive wiring and may be a conductive material to generate an induced electromotive force.” *Id.* at 4:28–32 (cited by Pet. 38).

With respect to limitation 1.5 (which recites “the conductive pattern comprises a conductive line wound at least two times and conductive pattern has a spiral shape”), Petitioner points again to Hong’s teaching that its coil layer 11a is shaped like a spiral and made of a conductive material. Pet. 39 (citing Ex. 1005, 3:50–52, 4:27–32). Petitioner further relies on Figure 3 of Hong, which, according to Petitioner, shows coil layer 11a wound at least two times. *Id.* To illustrate, Petitioner provides a cropped and annotated version of Figure 3 of Hong, reproduced below. *Id.*



Petitioner’s version of Figure 3 of Hong shows contactless charging apparatus 10, which includes secondary coil 11, mounted on main circuit board 20. *See* Ex. 1005, 2:44–47, 4:16–19. Coil layer 11a is shown with orange shading.

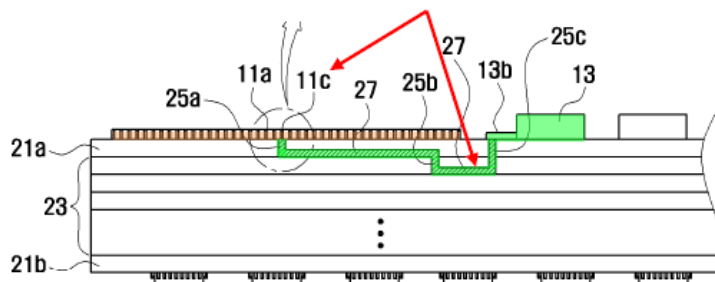
Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited coil of limitations 1.4 and 1.5. Patent Owner does not dispute Petitioner’s analysis for either limitation. *See generally* PO Resp.

v. Limitations 1.8, 1.9, and 1.10: “connecting unit”

As discussed above, Petitioner identifies Hong’s rectifying unit 13 and wiring layer 27 together as a “connecting unit.” Pet. 30. Claim 1 requires that “the connecting unit is disposed in the receiving space and connected to the coil unit.” Petitioner designates this limitation as limitation 1.8. *Id.* at 42. Claim 1 further requires that “the connecting unit overlaps the receiving space in a second direction parallel to the upper surface of the substrate.” Petitioner designates this limitation as limitation 1.9. *Id.* at 43. Lastly, claim 1 requires that “the connecting unit comprises[] a third connection terminal connected to the first connection terminal of the coil unit[] and a fourth connection terminal connected to the second connection terminal of the coil unit.” Petitioner designates this limitation as limitation 1.10. *Id.* at 44. We discuss these limitations in turn.

With respect to limitation 1.8 (which recites “the connecting unit is disposed in the receiving space and connected to the coil unit”), Petitioner provides a cropped and annotated version of Figure 4 of Hong, reproduced below. Pet. 43.

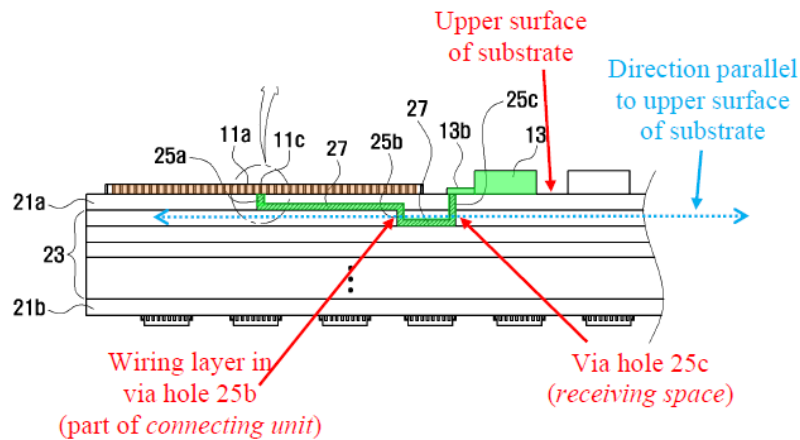
Wiring layer 27 (part of *connecting unit*) disposed in *receiving space* of circuit board and connected to end 11c of coil



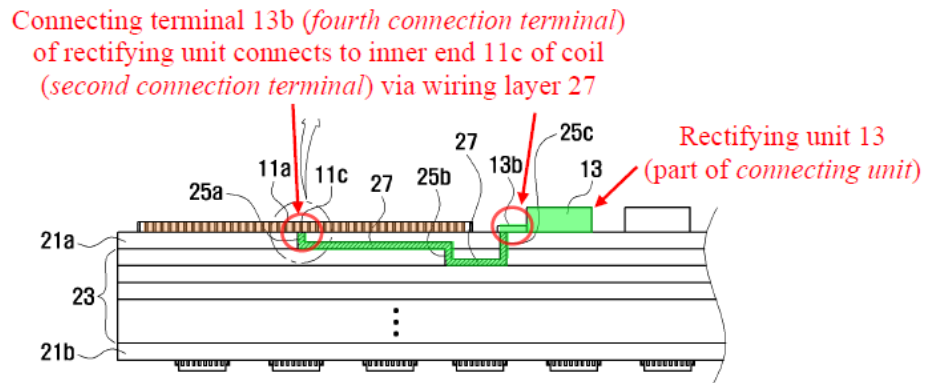
Petitioner’s version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Petitioner contends that “Hong teaches and

illustrates in Fig. 4 that the wiring layer 27 (part of the *connecting unit*) is disposed within the receiving space (via holes 25a, 25b, and 25c and empty spaces within layers 21a and 23) and connected to the inner end of 11c of coil layer [11a].” Pet. 42.

With respect to limitation 1.9 (which recites “the connecting unit overlaps the receiving space in a second direction parallel to the upper surface of the substrate”), Petitioner provides another version of Figure 4 of Hong, reproduced below. Pet. 44.



This version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Petitioner contends that “Hong illustrates in Fig. 4 . . . that wiring layer 27 of the *connecting unit* overlaps the *receiving space* in a second direction parallel to the upper surface of the main circuit board (*substrate*) in two different ways.” Pet. 43. As to the first way, Petitioner asserts that “the wiring layer is disposed within the receiving space—i.e., the wiring layer occupies the same space as the receiving space and thus **overlaps the receiving space in every direction**, including the second direction parallel to the upper surface of the main circuit board.” *Id.* As to the second way, Petitioner asserts that “the portion of the wiring layer in via



This version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. As shown in the annotated figures, Petitioner identifies Hong’s connecting terminal 13a as a “third connection terminal” and Hong’s connecting terminal 13b as a “fourth connection terminal.” Pet. 44–46. Petitioner further directs us to where Hong teaches that connecting terminal 13a is connected to end 11b of coil layer 11a, and that connecting terminal 13b is connected to end 11c of coil layer 11a. *Id.* at 44–45 (citing Ex. 1005, 5:11–22). As discussed above, end 11b corresponds to the recited first connection terminal, and end 11c corresponds to the recited second connection terminal. *Id.* at 34–35.

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited connecting unit of limitations 1.9 and 1.10. Patent Owner does not dispute Petitioner’s analysis for either of these limitations. *See generally* PO Resp. Patent Owner does, however, dispute Petitioner’s analysis for limitation 1.8. *See id.* at 19–31. We address the parties’ dispute in further detail below.

vi. The Parties' Disputes

Patent Owner makes several arguments, focusing on the recited substrate of limitation 1.1 and the recited connecting unit of limitation 1.8. *See* PO Resp. 19–31. For example, Patent Owner argues that “Hong does not disclose or render obvious . . . a ‘substrate comprising a receiving space of a predetermined shape formed therein for a connecting unit’ as separate and distinct from a ‘connecting unit [that] is disposed in the receiving space.’” *Id.* at 20. According to Patent Owner, “Petitioner relies on the same structural elements to satisfy claim limitations that are required to be separate and distinct.” *Id.*; *see also* PO Sur-reply 8–11. As an example, Patent Owner asserts,

Petitioner and its expert, Dr. Phinney, rely on Hong’s disclosure of a rectifying unit 13 and “through via holes 25a, 25b, and 25c and a wiring layer 27 formed on the main circuit board 20” to satisfy the “connecting unit” limitation. With respect to the “substrate comprising a receiving space” limitation, Petitioner and Dr. Phinney also rely on the “through via holes 25a, 25b, and 25c and a wiring layer 27 formed on the main circuit board 20.”

PO Resp. 20; *see also id.* at 29 (“According to Petitioner and Dr. Phinney, the wiring layer 27 . . . is simultaneously the ‘connecting unit’ and the ‘receiving space’ formed in the substrate.”); PO Sur-reply 2 (“[T]he Petition identifies Hong’s wiring layer 27 as being part [of] the ‘connecting unit.’ Further, there can be no reasonable dispute that what the Petition purports to identify as a ‘receiving space’ in Hong is also, in fact, Hong’s wiring layer 27.”).

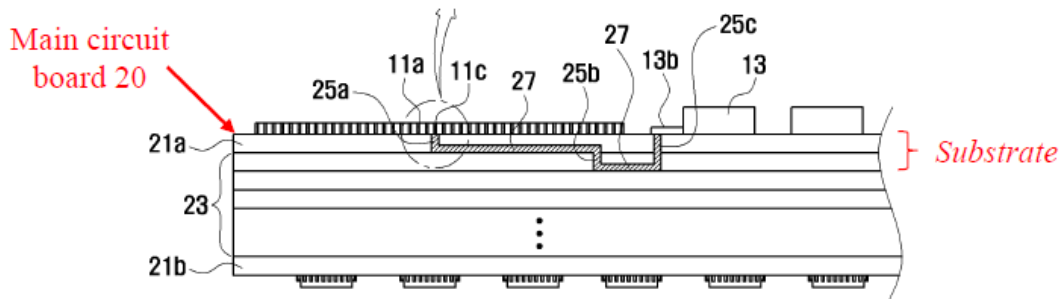
In its Reply, Petitioner asserts that “neither the Petition nor Dr. Phinney’s declaration ever relies on the via holes 25a, 25b, and 25c as a structural element to establish that Hong teaches the ‘*connecting unit*,’

instead relying on Hong's wiring layer 27 and rectifying unit 13." Pet. Reply 7 (citing Pet. 30). Petitioner further asserts that "neither the Petition nor Dr. Phinney's declaration rel[ies] on the wiring layer 27 as a structural element to establish that Hong teaches a '*substrate comprising a receiving space*.'" *Id.* at 8. Petitioner reiterates its position in the Petition that "the via holes 25a, 25b, and 25c formed in Hong's main circuit board 20 and the space extending between these via holes teach the claimed '*receiving space*.'" *Id.* at 9 (citing Pet. 28–29, 32–33).

Patent Owner counters that "[t]he wiring of the inner layers in Hong is created on each individual layer, as part of a well-known patterning process, before the layers are pressed together, meaning there is no space extending between the via holes that the wiring layer is disposed in." PO Sur-reply 8. Patent Owner asserts that "[t]he conductive wiring extends between the via holes at manufacture of the circuit board." *Id.*

Patent Owner's argument that "Petitioner relies on the same structural elements to satisfy claim limitations that are required to be separate and distinct" is unavailing. *See* PO Resp. 20. With respect to the recited "substrate comprising a receiving space," Petitioner directs us to where Hong teaches that its "secondary coil unit 11 is *formed at one surface of the main circuit board 20*," and that "[t]he end 11c of the coil layer 11a makes contact to the connecting terminal 13b through the wiring layer 27 formed in via holes 25a, 25b, and 25c, which are *formed on inner layers 23 of the main circuit board 20*." Ex. 1005, 3:50–51, 5:19–22 (emphases added) (cited by Pet. 29). Petitioner asserts that "the layers of Hong's main circuit board upon which and through which these elements are formed are a substrate," and that "[t]he *receiving space* is formed by via holes 25a, 25b, and 25c and

the space extending between them.” Pet. 29, 32 (emphases with underlining added). To illustrate, Petitioner provides a cropped and annotated version of Figure 4 of Hong, reproduced below. *Id.* at 30.



This version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. As Petitioner’s version of the figure shows, Petitioner identifies the upper two *layers* of Hong’s main circuit board 20 as the recited substrate. Those upper two layers include first outermost layer 21a and the topmost inner layer 23. Ex. 1005, 5:7–24 (cited by Ex. 1003 ¶ 65); *see also* Pet. 42. Petitioner does not point to wiring layer 27 as part of the substrate comprising a receiving space. *Compare* PO Resp. 20 (“With respect to the ‘substrate comprising a receiving space’ limitation, Petitioner and Dr. Phinney also rely on the ‘through via holes 25a, 25b, and 25c and a wiring layer 27 formed on the main circuit board 20.’”), *with* Pet. 29 (“[T]he layers of Hong’s main circuit board upon which and through which these elements are formed are a *substrate*.”).

With respect to the recited “connecting unit [that] is disposed in the receiving space,” Petitioner identifies Hong’s rectifying unit 13 and wiring layer 27 together as the connecting unit. Pet. 30. Petitioner does not rely on Hong’s via holes 25a, 25b, and 25c as disclosing any part of the connecting unit. *Compare* PO Resp. 20 (“Petitioner and its expert, Dr. Phinney, rely on

Hong's disclosure of a rectifying unit 13 and 'through via holes 25a, 25b, and 25c and a wiring layer 27 formed on the main circuit board 20' to satisfy the 'connecting unit' limitation."), *with* Pet. 30 ("[W]ith respect to the recited *connecting unit*, Hong teaches that its contactless charging apparatus includes several elements that connect the power-receiving coil to the battery charging unit 15 (*wireless power receiving circuit*), including a 'rectifying unit 13' and a 'wiring layer 27' (together the *connecting unit*).").

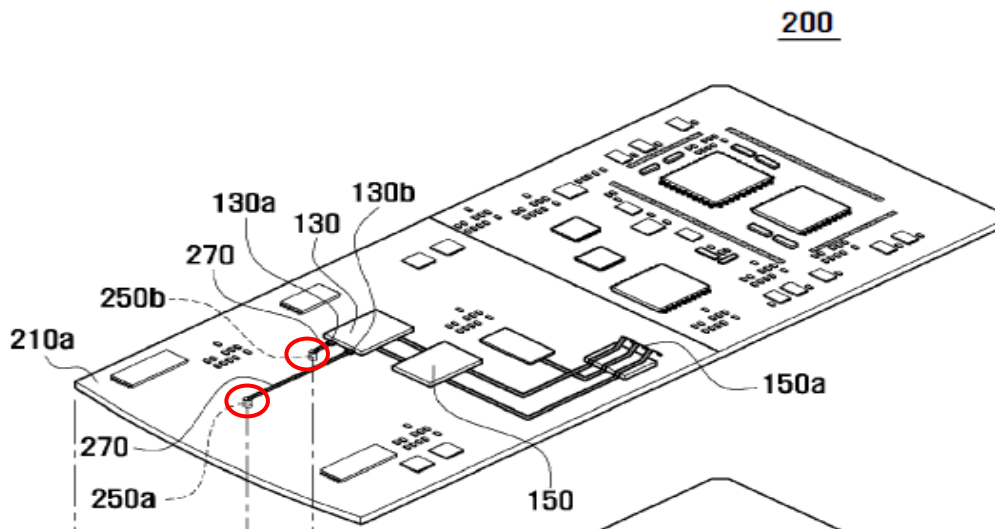
Petitioner therefore does not rely on the same structural elements to satisfy the recited substrate comprising a receiving space and the recited connecting unit that is disposed in the receiving space, contrary to Patent Owner's position. *See* PO Resp. 20. Petitioner asserts that Hong's "wiring layer 27 (part of the *connecting unit*) is disposed within the receiving space (via holes 25a, 25b, and 25c and empty spaces within layers 21a and 23)." Pet. 42. That does not mean that Petitioner relies on wiring layer 27 as disclosing a substrate comprising a receiving space, or that Petitioner relies on via holes 25a, 25b, and 25c as disclosing a connecting unit that is disposed in the receiving space. Petitioner's assertion means simply that wiring layer 27 is disposed in via holes 25a, 25b, and 25c and the spaces extending between them, as claim 1 requires. Patent Owner's argument does not undermine Petitioner's showing for the claimed substrate and connecting unit.

Even if we were to agree with Patent Owner that there is no space extending between Hong's via holes 25a, 25b, and 25c, we find that at least the via holes teach the recited receiving space. *See* PO Sur-reply 8. As discussed above and further below, and as Petitioner argues, Figure 27 of the '565 patent shows that connecting unit 300 is only partially inside receiving

space 130, where the distal outside end of connecting unit 300 (i.e., the end opposite connection terminal 320) is not in receiving space 130. *See* Ex. 1001, Figs. 26, 27; Pet. Reply 16 n.1 (“This aligns with the language of claims 1 and 12, which does not require that the entirety of the ‘connecting unit is disposed in the receiving space’ and is consistent with the figures in the ’565 Patent that show a portion of the connecting unit 300 being disposed *outside* of the receiving space 130.” (citing Ex. 1001, Figs. 12, 27)); *supra* Part II.B (describing same). It follows that at least one of Hong’s via holes satisfies a receiving space as claimed.

Hong explicitly describes its “wiring layer 27 *formed in* via holes 25a, 25b, and 25c.” Ex. 1005, 5:19–22. Patent Owner’s assertion that “[t]here are no voids or empty space in Hong’s inner layers through which the conductive wiring runs nor does Hong teach anything to that effect” is inconsistent with this description in Hong. *See* PO Sur-reply 10. Moreover, Figure 6 of Hong, which Patent Owner cites, shows via holes as voids or spaces. *See* Ex. 1005, Fig. 6 (cited by PO Sur-reply 4). To illustrate, a cropped and annotated version of Figure 6 of Hong is reproduced below.

FIG. 6



This version of Figure 6 of Hong shows outermost layer 210a of main circuit board 200. *See* Ex. 1005, 6:3–7. Outermost layer 210a includes via holes 250a and 250b (encircled in red), which are illustrated as three-dimensional voids or spaces in the substrate. *See id.* at Fig. 6.

Patent Owner further argues that Hong “makes clear that the disclosed wiring layer is part of the *substrate* and not a feature of a separate and distinct ‘connecting unit,’” and that “[t]he inner layer wiring/traces are part of the circuit board, and thus part of the substrate.” PO Resp. 29; *see also* PO Sur-reply 7 (“Hong teaches that the wirings and wiring layers exist within the inner layers of the circuit board and are not part of a separate and distinct ‘connecting unit’, which is ‘disposed in’ a separate and distinct ‘receiving space of a predetermined shape formed’ in a ‘substrate.’”). As support, Patent Owner directs us to where Hong describes “a wiring layer 27 formed on the main circuit board 20,” and to where Hong teaches that “a wiring layer may be formed via another inner layer [of main circuit board 20] according to a designed condition of the inner layers 23.” Ex. 1005, 5:9–10,⁶ 5:23–24 (cited by PO Resp. 29). Patent Owner adds that Hong’s “wiring layer 27 [] consist[s] *inter alia* of the circuit board wiring and the via holes between [the] inner end of the coil and the rectifying circuit.” PO Resp. 29.

Petitioner counters that “Patent Owner’s argument is based on the fallacy that the wiring layer somehow consists of the via holes.” Pet. Reply 11. According to Petitioner, “Hong is unequivocal that the wiring layer is separate and distinct from the receiving space in which it is formed.”

⁶ Patent Owner incorrectly cites “Ex. 1005, 9–10.” The cited language appears at Exhibit 1005, 5:9–10.

Id.; *see also id.* at 9 (“Hong explicitly distinguishes that the wiring layer is a separate and distinct element that is ‘formed in’ its receiving space.”). As support, Petitioner points to where Hong describes a “wiring layer 27 **formed in** via holes 25a, 25b, and 25c, which are formed on inner layers 23 of the main circuit board 20.” *Id.* at 9, 11 (quoting Ex. 1005, 5:19–22⁷ (emphasis added by Petitioner)). Petitioner contends that “[t]he via holes 25a, 25b, and 25c, which are used to form Hong’s receiving space, necessarily exist prior to the wiring layer 2[7] being ‘formed in’ these via holes.” *Id.* at 9–10. According to Petitioner, “[t]he wiring layer being ‘formed in’ the via holes does not change that the wiring layer itself is separate and distinct from the via holes,” which “do not cease to exist.” *Id.* at 10.

We agree with Petitioner. Hong does not describe wiring layer 27 as a part of the substrate, as Patent Owner contends. *See* PO Resp. 29 (“Hong, however, makes clear that the disclosed wiring layer is part of the *substrate* and not a feature of a separate and distinct ‘connecting unit.’”). Instead, Hong describes a “wiring layer 27 formed in *via holes 25a, 25b, and 25c, which are formed on inner layers 23* of the main circuit board 20.” Ex. 1005, 5:19–22 (emphasis added) (cited by Pet. 29). This description in Hong is consistent with Petitioner’s position that wiring layer 27 is separate and distinct from the substrate comprising a receiving space (i.e., via holes 25a, 25b, and 25c). Petitioner explains persuasively that “the space within Hong’s substrate that is filled with its wiring layer (and thus not the substrate material) teaches a ‘*receiving space*’ within a substrate.” Pet. Reply 6.

⁷ Petitioner cites “Ex. 1005, 7:24,” but the quoted language appears at Exhibit 1005, 5:19–22.

Patent Owner further argues that “[b]ecause the inner layer wiring/traces are formed when the substrate is formed, they cannot simultaneously be part of the ‘connecting unit’ and be the ‘receiving space.’” PO Resp. 29.

Petitioner responds that “Patent Owner cannot read method of manufacturing limitations into the challenged apparatus claims.” Pet. Reply 12. According to Petitioner, “Hong’s wiring layer is simply ‘*disposed in the receiving space*.’” *Id.* (citing Ex. 1005, 7:24, Fig. 4). Petitioner contends that the fact “[t]hat the wiring layer becomes ‘disposed in’ Hong’s receiving space by being ‘formed in’ Hong’s receiving space is irrelevant to the obviousness analysis for this structural limitation.” *Id.*; *see also id.* at 11 (“Patent Owner further ignores that the challenged claims are broad **apparatus** claims that recite structural elements that are unconcerned with any manufacturing or assembly steps that may have been used to arrive at these structure elements.”).

In response, Patent Owner asserts that “[t]he use of ‘disposed in[]’ . . . in claims to describe the inter-relationship of the physical structures . . . means that those structures were previously separate.” PO Sur-reply 12; *see also id.* at 11–13.

Claim 1 is an apparatus claim that recites “the connecting unit is disposed in the receiving space.” Counsel for Patent Owner acknowledged during oral argument that “the claim language is directed to the structural components, not the methods, if you will, of how you go about putting the pieces together.” Tr. 66:8–10. Thus, Hong’s teaching that its wiring layer 27 is *formed in* via holes 25a, 25b, and 25c (thereby occupying the space within the via holes) and on main circuit board 20 (thereby occupying the

space between the via holes) satisfies the claim's requirement that the connecting unit is disposed in the receiving space. *See* Ex. 1006, Fig. 4. Moreover, Hong's teaching that its wiring layer is formed in the via holes implies that the wiring layer is separate from the via holes. Patent Owner's argument does not undermine Petitioner's showing in this regard.

Patent Owner further argues that "[t]here is no 'receiving space' formed in Hong's substrate (circuit board 20) and, consequently, there is no 'receiving space' in which the 'connecting unit is disposed.'" PO Resp. 29–30; *see also* PO Sur-reply 10 ("There are no voids or empty space in Hong's inner layers through which the conductive wiring runs nor does Hong teach anything to that effect.").

In response, Petitioner reiterates its position that "Hong's receiving space in its substrate comprises via **holes** 25a, 25b, and 25c and the space between them that necessarily does not include substrate material because the wiring layer 27 is 'formed' therein." Pet. Reply 12 (citing Ex. 1005, 5:17–24; Pet. 32–33). Petitioner asserts that "Patent Owner blatantly ignores Hong's explicit showing that the 'wiring layer 27 [is] formed in via holes 25a, 25b, and 25c, which are formed on inner layers 23 of the main circuit board 20.'" *Id.* at 13 (quoting Ex. 1005, 5:17–24). Petitioner explains that Hong's "via holes 25a, 25b, and 25c, which are used to form Hong's receiving space, are 'formed on inner layers 23 of the main circuit board 20' and necessarily exist such that the wiring layer 27 can be 'formed in' these via holes." *Id.* According to Petitioner, "[t]he via holes do not cease to exist once the wiring layer is formed, they are simply filled." *Id.* Petitioner adds that, "[t]o the extent Patent Owner is attempting to read in a limitation about *how* the receiving space is formed, the claims do not require this." *Id.* at 12.

We agree with Petitioner. As Petitioner points out, Hong describes a “wiring layer 27 formed in via holes 25a, 25b, and 25c, which are formed on inner layers 23 of the main circuit board 20.” Ex. 1005, 5:19–22. This description in Hong is consistent with Petitioner’s position that Hong’s via holes 25a, 25b, and 25c satisfy the recited receiving space. Contrary to Patent Owner’s argument, Hong’s via holes 25a, 25b, and 25c are formed in main circuit board 20, and wiring layer 27 is disposed in the via holes. *See* PO Resp. 29–30 (“There is no ‘receiving space’ formed in Hong’s substrate (circuit board 20) and, consequently, there is no ‘receiving space’ in which the ‘connecting unit is disposed.’”). As discussed above, Petitioner explains persuasively that “the space within Hong’s substrate that is filled with its wiring layer (and thus not the substrate material) teaches a ‘*receiving space*’ within a substrate.” Pet. Reply 6. Accordingly, Patent Owner’s argument is unavailing, and we remain persuaded that Hong’s via holes 25a, 25b, and 25c and the space between them teach the recited receiving space.

We note Patent Owner’s contention that “Petitioner conjures ‘the space extending between’ the via holes out of thin air,” and that “Hong only refers to the ‘wirings’ . . . or ‘wiring layers’ . . . as existing between the via holes on the inner layers” of main circuit board 20. PO Sur-reply 6–7; *see also id.* at 8–11. Even if we were to agree with Patent Owner on this point, however, we are still persuaded that Hong’s via holes 25a, 25b, and 25c teach the recited receiving space, as discussed above.

Patent Owner further argues that “[i]f Petitioner’s arguments were correct, the ‘receiving space’ limitation would be rendered superfluous” because “[a]ny structure would necessarily occupy the ‘receiving space’ in which it is formed.” PO Resp. 30.

Petitioner counters that “Hong’s receiving space in which the wiring layer is disposed is no more superfluous than the ‘*receiving space*’ of the challenged apparatus claims in which the ‘*connecting unit*’ is disposed.” Pet. Reply 13. Additionally, relying on the declaration testimony of Dr. Phinney, Petitioner asserts that “[i]t was well known to [persons of ordinary skill in the art] in the electrical arts that when manufacturing printed circuit boards that will contain embedded components, ‘recesses’ or ‘openings’ (receiving spaces) are formed in the layers of the circuit board to accommodate the embedded components.” *Id.* at 13–14 (citing Ex. 1003 ¶ 68; Pet. 33).

We are persuaded by Petitioner in this regard. Although the claim encompasses forming a structure in a receiving space, the claim is not limited to this or any manner of disposing the structure in the receiving space. *See* Ex. 1001, claim 1 (reciting “the connecting unit is disposed in the receiving space”). Further, the limitation does not recite “disposed in a receiving space,” but “disposed in the receiving space,” and that receiving space is within the substrate. Thus, that a unit necessarily occupies the space in which it is formed is not enough to meet the limitation. That receiving space has to be within the substrate. Accordingly, the receiving space limitation is not superfluous, as Patent Owner argues. *See* PO Resp. 30.

Lastly, Patent Owner argues that “[t]he Petition asserts that Hong alone discloses the ‘substrate comprising a receiving space,’ ‘coil unit’ and ‘connecting unit’ limitations,” and “does not propose any combination of references” or “propose or articulate any modifications to Hong for a single reference obviousness theory based on Hong.” PO Resp. 21. According to Patent Owner, “the Board must consider only what Hong actually

discloses—regardless of whether the Petition uses the conclusory language that ‘Hong renders obvious’ the various limitations.” *Id.*

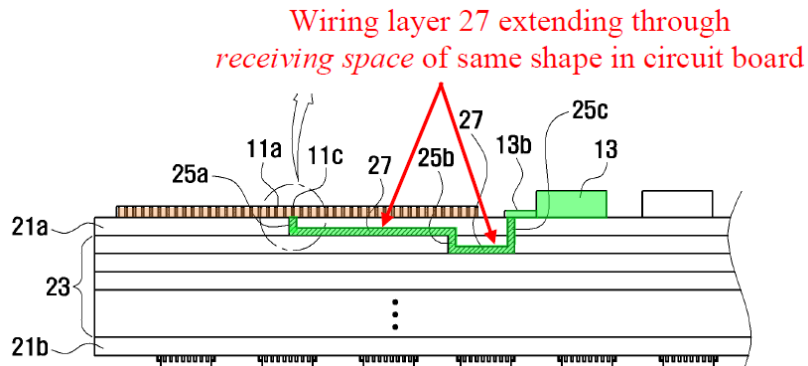
Patent Owner’s argument does not sufficiently undermine Petitioner’s showing that Hong teaches the recited substrate comprising a receiving space and the recited connecting unit that is disposed in the receiving space. As Patent Owner correctly observes, Petitioner relies solely on Hong for teaching these claim limitations. Therefore, Petitioner need not articulate any obviousness theory with respect to these limitations. Additionally, as discussed above, we consider “what Hong actually discloses” in the portions of Hong cited by the parties. *See* PO Resp. 21.

We noted above that Patent Owner does not present separate arguments for other limitations of claim 1. *See generally* PO Resp. Accordingly, we are persuaded that Petitioner’s proposed combination of Hong and Park teaches all the recited limitations of claim 1, and that Petitioner’s proffered reasoning for combining Hong and Park provides sufficient articulated reasoning with rational underpinnings to support the legal conclusion of obviousness.

b. Dependent Claim 2

Claim 2 depends from claim 1 and recites “the shape of the receiving space corresponds to a shape of the connecting unit.” As discussed above with respect to claim 1, Hong’s via holes 25a, 25b, and 25c correspond to the recited receiving space and Hong’s wiring layer 27 corresponds to the recited connecting unit. Petitioner asserts that Hong “teaches that the wiring layer 27 is formed within the main circuit board ‘according to a designed condition’ of the via holes and layers of the main circuit board.” Pet. 47

(citing Ex. 1005, 5:7–24). Petitioner contends that Hong’s receiving space therefore “is ‘designed’ to accommodate the wiring layer.” *Id.* (citing Ex. 1005, Fig. 4). To illustrate, Petitioner provides a cropped and annotated version of Figure 4 of Hong, reproduced below. *Id.*



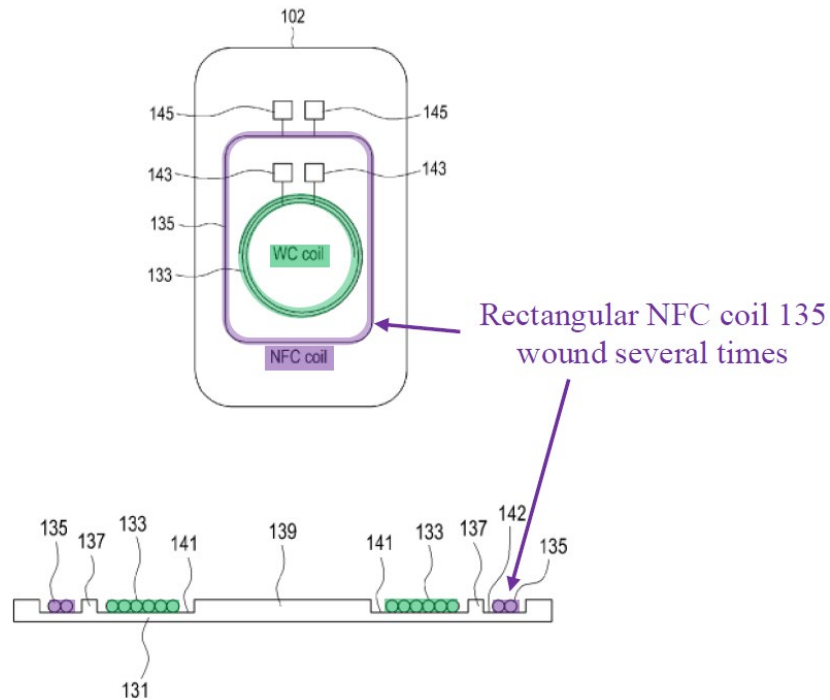
Petitioner’s version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6.

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited limitation of claim 2. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

c. Dependent Claim 3

Claim 3 depends from claim 1 and recites “the short-range communication antenna has a rectangular configuration formed by winding one conductive line several times.” As discussed above with respect to claim 1, Petitioner’s proposed combination of Hong and Park “add[s] an NFC antenna coil to Hong’s main circuit board in the manner taught by Park,” where Park’s NFC antenna (coil 135) corresponds to the recited short-range communication antenna. Pet. 48. Petitioner provides an

annotated figure combining Figures 3 and 4 of Park, which is reproduced below. *Id.*



Petitioner's figure combines Figures 3 and 4 of Park, where Figure 3 of Park is a sectional view of a coil module, and Figure 4 of Park shows a portable terminal with coil 133 serving as a secondary coil for wireless charging and coil 135 serving as an antenna for NFC. *See* Ex. 1006, 2:43, 3:9–11, 4:60–65. Referring to its figure, Petitioner asserts that Park “illustrates that it was known for an NFC antenna to be ‘formed by spirally winding enamel-insulated conductor wires’ several times in a rectangular configuration.” Pet. 48 (quoting Ex. 1006, 3:56–64). According to Petitioner, “Hong’s wireless charging coil disposed on the main circuit board of a portable terminal, in view of Park’s NFC antenna coil that has a rectangular configuration formed by winding one conductive line several times, renders obvious [the recited limitation of claim 3].” *Id.* at 48–49.

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner’s proposed combination of Hong and Park teaches the recited limitation of claim 3. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

d. Dependent Claim 4

Claim 4 depends from claim 1 and recites “the connecting unit is connected to the short-range communication antenna.” As discussed above with respect to claim 1, Petitioner’s proposed combination of Hong and Park “add[s] an NFC antenna coil to Hong’s main circuit board in the manner taught by Park,” where Hong’s “rectifying unit [13] is part of the [recited] *connecting unit* because it is one of the elements that connects the power-receiving coil to the battery charging unit.” Pet. 49. Petitioner asserts that “Park similarly teaches that a ‘rectifier’ connects its NFC antenna coil 135 and wireless charging coil 133 to the ‘circuits of the portable terminal 100.’” *Id.* (quoting Ex. 1006, 5:47–52). According to Petitioner, “when adding Park’s NFC antenna coil to Hong’s main circuit board, a [person of ordinary skill in the art] would have found it obvious to connect the NFC antenna coil to Hong’s rectifier (part of the *connecting unit*) in the manner taught by Park.” *Id.* at 49–50. In Petitioner’s proposed combination of Hong and Park, “both Hong’s wireless charging coil and NFC antenna coil would be connected to the rectifying unit 13 so as to connect them to the other circuits in the portable device, in the same predictable manner as taught in Park.” *Id.* at 50. Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1003 ¶¶ 96–99).

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner’s proposed combination of Hong and Park teaches the recited limitation of claim 4. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

e. Dependent Claim 5

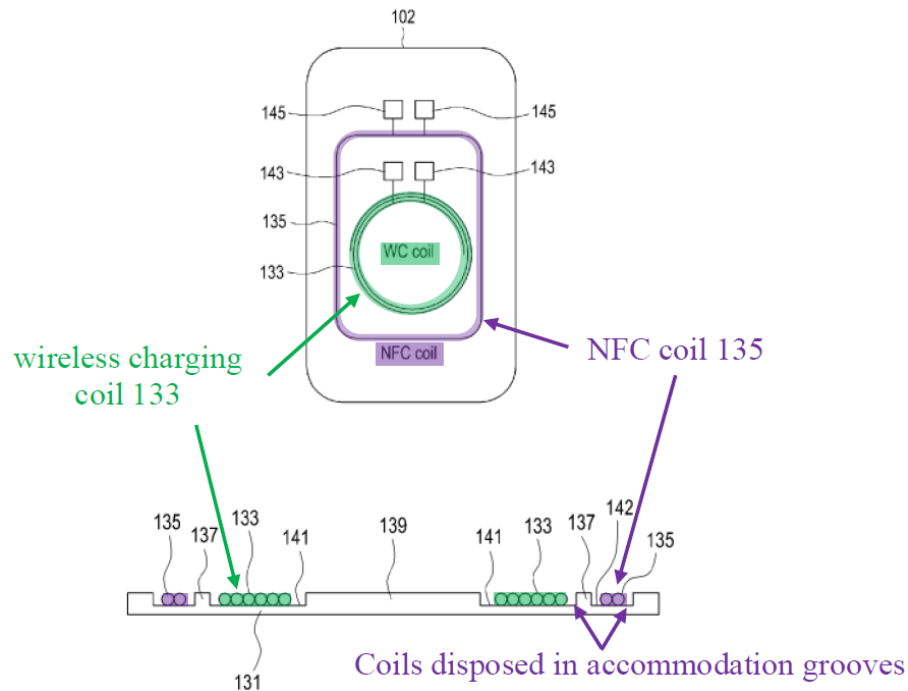
Claim 5 depends from claim 1 and recites “the conductive pattern is a conductive layer.” As discussed above with respect to claim 1, Hong’s coil layer 11a corresponds to the recited coil, which is formed as a conductive pattern on or within the substrate. Petitioner cross-references its analysis for limitation 1.5 and asserts that “Hong teaches that its power-receiving coil is a ‘coil **layer**’ and is made of ‘a **conductive** material’ (i.e., a *conductive layer*).” Pet. 50 (citing Ex. 1005, 3:50–52, 4:27–32). Petitioner additionally asserts that “Hong also teaches that the coil layer may be formed by a ‘deposition process [that] forms an oxide layer (**deposition layer**) on a semiconductor substrate.” *Id.* (quoting Ex. 1005, 3:59–64).

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited limitation of claim 5. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

f. Dependent Claim 6

Claim 6 depends from claim 1 and recites “the substrate comprises a pattern groove for receiving a part of the coil and wherein the part of the coil is disposed in the pattern groove.” As discussed above with respect to claim 1, Petitioner’s proposed combination of Hong and Park “add[s] an NFC antenna coil to Hong’s main circuit board in the manner taught by Park.”

Pet. 51. Petitioner provides an annotated figure combining Figures 3 and 4 of Park, which is reproduced below. *Id.* at 52.



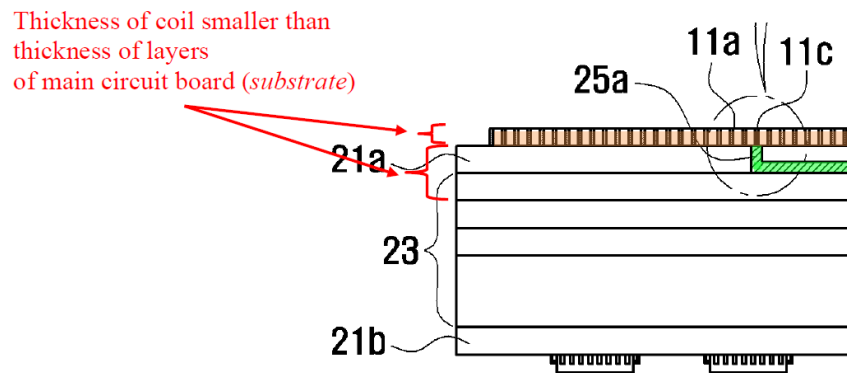
Petitioner’s figure combines Figures 3 and 4 of Park, where Figure 3 of Park is a sectional view of a coil module, and Figure 4 of Park shows a portable terminal with coil 133 serving as a secondary coil for wireless charging and coil 135 serving as an antenna for NFC. *See* Ex. 1006, 2:43, 3:9–11, 4:60–65. Petitioner asserts that “Park teaches that it was known to dispose both the NFC antenna coil and wireless charging coil in ‘first and second accommodation gro[o]ves’ that are ‘recessed into one surface’ of the substrate, as illustrated in Figs. 3 and 4” of Park. Pet. 51 (citing Ex. 1006, 3:35–44, 3:61–4:1). Petitioner also asserts that “Park further explains that ‘[a] shielding wall 137 is interposed between the first and second accommodation grooves 141 and 142,’ where the ‘shielding wall 137 shields interference of electronic waves between the first and second coils 133 and 135.’” *Id.* at 52 (quoting Ex. 1006, 3:35–44, 3:61–4:1). Referring to its

analysis for claim 1, Petitioner repeats its contention that an ordinarily skilled artisan “would have been motivated to apply Park’s teaching of disposing concentric coils in accommodation grooves to Hong’s device to achieve the same advantages.” *Id.* According to Petitioner, “Hong’s wireless charging coil, in view of Park’s teaching of disposing concentric wireless charging and NFC antenna coils in respective accommodation grooves recessed into a substrate, renders obvious [the limitation of claim 6].” *Id.* at 52–53. Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* at 51–53 (citing Ex. 1003 ¶¶ 102–104).

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner’s proposed combination of Hong and Park teaches the recited limitation of claim 6. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

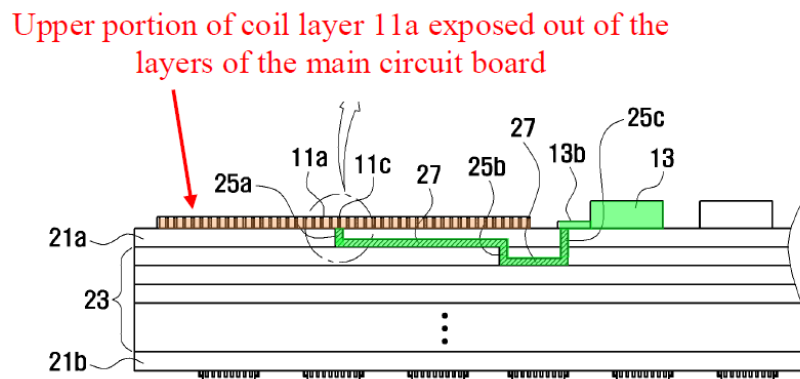
g. Dependent Claim 7

Claim 7 depends from claim 1 and recites “the coil has a thickness smaller than a thickness of the substrate and wherein an upper portion of the coil is exposed out of the substrate.” As discussed above with respect to claim 1, Hong’s coil layer 11a corresponds to the recited coil, and Hong’s outermost layer 21a and topmost inner layer 23 together correspond to the recited substrate. Petitioner provides a cropped and annotated version of Figure 4 of Hong, reproduced below. Pet. 53.



Petitioner's version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Referring to its version of Figure 4 of Hong, Petitioner asserts that “Hong teaches that its coil layer 11a has a thickness smaller than the thickness of layers of the main circuit board upon which and through which various elements are formed (*substrate*).” Pet. 53.

Petitioner also provides another version of Figure 4, reproduced below. Pet. 54.



This version of Figure 4 of Hong is a partial sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Petitioner asserts that “Hong teaches that an upper portion of the coil layer 11a is exposed out of the layers of the main circuit board 20 (*substrate*).” Pet. 53.

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited limitation of claim 7. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

h. Dependent Claim 8

Claim 8 depends from claim 1 and recites “[a] wireless portable terminal, comprising the wireless power receiver of claim 1.” Petitioner cross-references its analysis for limitation 1.1 and asserts that “Hong teaches that its contactless charging apparatus (*wireless power receiver*) is disposed within a ‘portable terminal.’” Pet. 54. As support, Petitioner directs us to where Hong describes its invention as “[a] contactless charging apparatus of a portable terminal.” Ex. 1005, code (57) (cited by Pet. 54); *see also id.* at 4:16–22, Fig. 2 (cited by Pet. 54–55).

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited limitation of claim 8. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

i. Dependent Claim 11

Claim 11 depends from claim 1 and recites “the one end of the coil is at an outside portion of the conductive pattern and the other end of the coil is at an inside portion of the conductive pattern.” For this limitation, Petitioner cross-references its analysis for limitation 1.2 and asserts that “Hong teaches that the conductive coil layer 11a includes ‘outermost end 11b’ at the outside portion of the spiral coil layer and ‘end 11c’ that is ‘formed at a center of the coil layer 11a.’” Pet. 55 (citing Ex. 1005, 5:11–22, 4:53–56, Figs. 3, 4).

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited limitation of claim 11. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

j. Independent Claim 12

Claim 12 is directed to a “wireless power receiver” and recites similar limitations as claim 1, including “a substrate comprising a receiving space of a predetermined shape formed therein for a connecting unit configured to connect to a wireless power receiving circuit.” With respect to those similarly recited limitations, Petitioner relies on its discussion of claim 1 for its analysis of claim 12. Pet. 56–57. Patent Owner’s arguments disputing claim 1 apply to claim 12. PO Resp. 19–20. Likewise, our analysis of claim 1 applies to claim 12.

We note that claim 12 recites an additional limitation, which requires that “the coil unit is disposed on the substrate and the connecting unit.” For this limitation, Petitioner provides an annotated version of Figure 4 of Hong, which is reproduced below. Pet. 58.

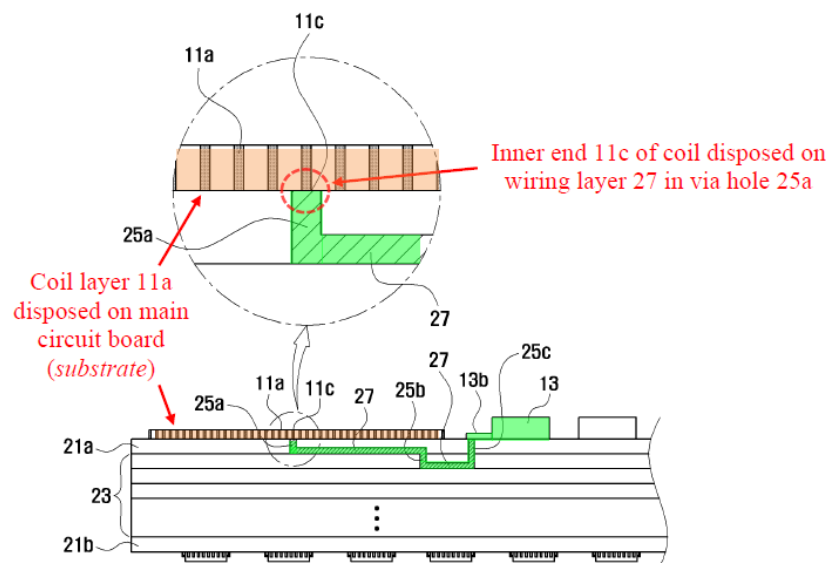


Figure 4, as annotated by Petitioner, is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Petitioner contends that Figure 4 shows that Hong’s “secondary coil 11’ (*coil unit*) is formed on the top layers of main circuit board 20 (*substrate*).” Pet. 57. Petitioner also contends that Figure 4 shows that “the ‘end 11c’ of the coil is disposed on the wiring layer 27 (part of the *connecting unit*) where they connect at via hole 25a.” *Id.* (citing Ex. 1005, 5:11–22).

Based on Petitioner’s argument and evidence, we are persuaded that Hong teaches the recited coil unit. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

In summary, we are persuaded that Petitioner’s proposed combination of Hong and Park teaches all the recited limitations of claim 12, and that Petitioner’s proffered reasoning for combining Hong and Park provides sufficient articulated reasoning with rational underpinnings to support the legal conclusion of obviousness.

k. Dependent Claim 13

Claim 13 depends from claim 12 and recites “the connecting unit is configured such that it is separable from the receiving space.” As discussed above, Hong’s rectifying unit 13 and wiring layer 27 together correspond to the recited connecting unit, and Hong’s via holes 25a, 25b, and 25c as well as the space extending between them correspond to the recited receiving space. Pet. 30–32. Petitioner asserts that Hong satisfies the limitation recited in claim 13 because Hong’s “rectifying unit (part of the *connecting unit*) is connected to the surface of the circuit board 20 (through via hole

connections) and may be disposed in different locations on the circuit board (e.g., on the top or on the bottom).” *Id.* at 58–59 (citing Ex. 1005, 4:16–19, 5:7–10, 5:25–30).

Petitioner further points to Dr. Phinney’s declaration testimony that the ’565 patent teaches that connecting unit 300 is secured within receiving space 130 by soldering the connection terminals of the connecting unit to the connection terminals of the coil unit 200. Pet. 59 (citing Ex. 1003 ¶ 122; Ex. 1001, 8:27–9:6, Figs. 11–13). Dr. Phinney provides an annotated version of Figure 12 of the ’565 patent, which is reproduced below. Ex. 1003 ¶ 122.

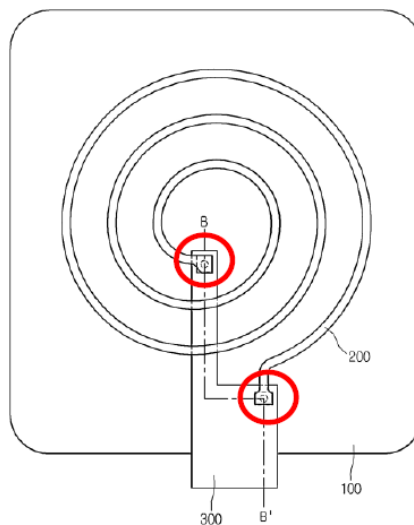


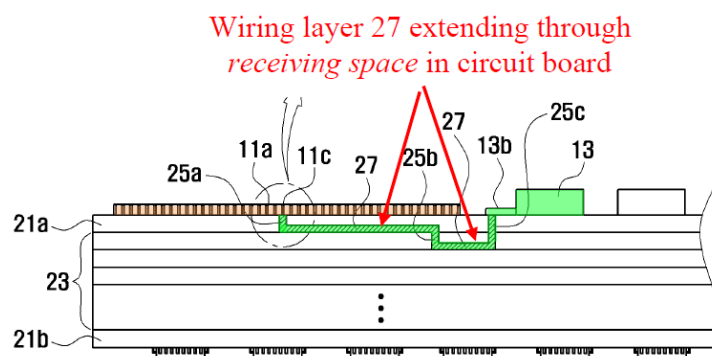
Figure 12 of the ’565 patent, as annotated by Dr. Phinney, is a plan view of a wireless power receiver. *See* Ex. 1001, 3:25–26. Dr. Phinney states that “the connecting unit 300 is disposed within the receiving space 130 and interconnected with the coil unit with solder.” Ex. 1003 ¶ 122. Relying on Dr. Phinney’s declaration testimony, Petitioner contends that “the claimed ‘separable’ connecting unit encompasses a connecting unit that is secured by solder,” and that “Hong’s rectifying unit (part of the *connecting unit*) that is connected to the surface of the circuit board 20 with via hole connections

therefore renders obvious [the limitation of claim 13].” Pet. 59 (citing Ex. 1003 ¶ 122).

Patent Owner counters that, “[w]hile the rectifying unit may be separable from the circuit board 20, the remainder of the alleged ‘connecting unit,’ including the wiring layer 27 that Dr. Phinney and the Petition rely on as supposedly ‘disposed in the receiving space,’ is not separable from the circuit board 20 (the ‘substrate’).” PO Resp. 31. Patent Owner adds that “neither Dr. Phinney nor the Petition allege[s] that the rectifying unit is disposed in the supposed ‘receiving space.’” *Id.* at 31–32. According to Patent Owner, Hong’s “rectifying unit can’t be separable from that supposed ‘receiving space.’” *Id.* at 32.

In response, Petitioner contends that “[c]laim 13 does not require that the entire ‘*connecting unit*’ be separable from the receiving space,” or “that the portion of the connecting unit that is ‘*disposed in the receiving space*’ be separable from the receiving space.” Pet. Reply 15–16. According to Petitioner, “[c]laim 13 is sufficiently broad to encompass any portion of the connecting unit being separable from the receiving space,” and, therefore, “regardless of whether or not the wiring layer is separable from the receiving space, claim 13’s limitation is met by Hong’s rectifying unit, which is separable from the receiving space.” *Id.* Petitioner does not provide persuasive support based on the ’565 patent for this interpretation or construction of claim 13. *See id.* at 16–17.

Rather, Petitioner provides an annotated version of Figure 4 of Hong, reproduced below. Pet. Reply 18.



Petitioner’s version of Figure 4 of Hong is a sectional side view of contactless charging apparatus 10 mounted on main circuit board 20. *See* Ex. 1005, 4:12–19, 5:4–6. Referring to its version of Figure 4 of Hong, Petitioner asserts that “Hong’s rectifying unit 13, which forms a portion of its connecting unit, **is in direct contact with via hole 25c**, which forms a part of Hong’s receiving space.” Pet. Reply 17. Petitioner further asserts that “Hong explains that the ‘connection between the secondary coil unit 11 and the rectifying unit 13 may be achieved through via holes 25a, 25b, and 25c and a wiring layer 27 formed on the main circuit board 20.’” *Id.* (quoting Ex. 1005, 5:7–10). Additionally, Petitioner asserts that “[t]he connecting terminal 13b of the rectifying unit 13 maintains contact with the wiring layer 27 in via hole 25c and thereby, with via hole 25c, to maintain its electrical connection with the coil that is connected to the wiring layer 27.” *Id.* (citing Ex. 1005, 5:17–24, Fig. 4). Petitioner concludes that “[s]imply removing the rectifying unit such that it is no longer in direct contact with the via hole 25c (*receiving space*) is one example way in which the rectifying unit 13 is *separable* from Hong’s receiving space.” *Id.* at 18.

In its Sur-reply, Patent Owner asserts that “[c]laim 13 requires that the ‘connecting unit’ is ‘disposed in the receiving space’ and is ‘configured [such] that it is separable from the receiving space.’” PO Sur-reply 13.

Patent Owner contends that Hong’s “rectifying unit is not disposed in the ‘receiving space,’ nor does Petitioner contend so.” *Id.* Patent Owner further points out that “[n]othing that is disposed in Hong’s ‘receiving space,’ i.e., wiring layer 27 . . . , is separable from that ‘receiving space.’” *Id.*

According to Patent Owner, “Petitioner’s reliance on the rectifying unit as separable does not satisfy the clear requirements of the claim.” *Id.* at 13–14.

We agree with Patent Owner. Through its dependency from claim 12, claim 13 requires that “the connecting unit is disposed in the receiving space.” As outlined above and further below, this only requires that a part of the connecting unit is in the receiving space. Claim 13 further requires that “the connecting unit is configured such that it is separable from the receiving space.” Read together, these limitations tend to support Patent Owner’s position (i.e., that the portion of the connecting unit that is disposed in the receiving space is configured to be separable from the receiving space) more than Petitioner’s position (i.e., that the portion of the connecting unit that is *not* disposed in the receiving space is configured to be separable from the receiving space).

Also, the ’565 patent specification is consistent with Patent Owner’s reading of the claim. To illustrate, Figure 11 of the ’565 patent, which Petitioner cites (*see* Pet. 59), is reproduced below.

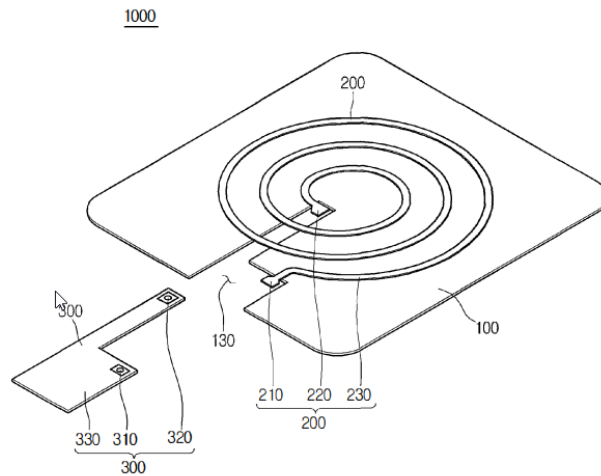


FIG. 11

Figure 11 is a perspective view of a wireless power receiver. Ex. 1001, 3:23–24. Figure 12 of the '565 patent, which Petitioner also cites (*see* Pet. 59), is reproduced below as well.

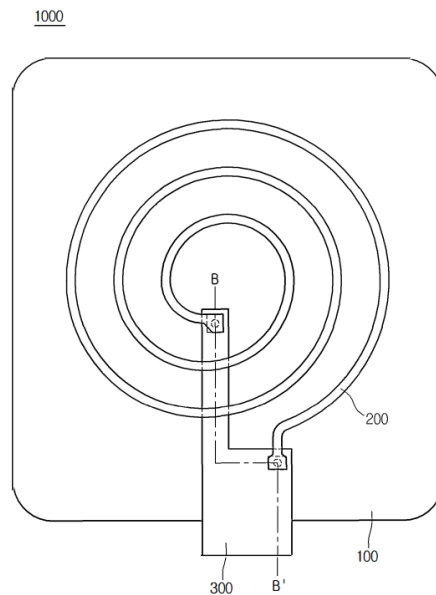


FIG. 12

Figure 12 is a plan view of the wireless power receiver in Figure 11. Ex. 1001, 3:25–26. Figures 11 and 12 together show that the portion of connecting unit 300 that is separable from receiving space 130 is the portion

of connecting unit 300 that is disposed in the receiving space 130. *See id.* at Figs. 11, 12.

Under Petitioner's reading of the claim, the portion of connecting unit 300 that is not within receiving space 130 is separable from receiving space 130. Petitioner does not, however, explain sufficiently how something that is not within a space can be separable from that space. Also, Petitioner does not point to any support in the specification of the '565 patent showing how only a portion of connecting unit 300 outside of receiving space 130 is separable without also separating the remaining portion that is inside the receiving space. The limitation at issue requires the connecting unit to be separable, not just a portion of the connecting unit to be separable. We do not see how the connecting unit can be separated while a portion of it stays unseparated, and Petitioner has not provided adequate explanation.

Petitioner does not argue that a connecting unit in contact with a hole is the same as a connecting unit within the hole (the receiving space). Petitioner's version of Figure 4 of Hong, reproduced above, shows that rectifying unit 13 is located above via hole 25c, occupying the space outside via hole 25c. *See* Pet. Reply 18. Relocating rectifying unit 13 would separate rectifying unit 13 from the space outside via hole 25c, not via hole 25c itself. For the reasons outlined above, we are not persuaded that Petitioner has shown that Hong teaches the limitation recited in claim 13.

We note that Petitioner does not rely on Park for this limitation. *See* Pet. 58–59.

1. Dependent Claims 14–18

Claims 14–18 depend from independent claim 12 and recite similar limitations as claims 2–4, 6, and 8, which depend from claim 1. Petitioner relies on its discussion of claims 2–4, 6, and 8 for its analysis of claims 14–18, respectively. Pet. 60. Patent Owner does not present separate arguments for any of claims 14–18. *See generally* PO Resp. Accordingly, our analysis of claims 2–4, 6, and 8 applies to claims 14–18. For the reasons given above, we are persuaded that Petitioner’s proposed combination of Hong and Park teaches all the recited limitations of claims 14–18.

3. Summary

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–8, 11, 12, and 14–18 would have been obvious over Hong and Park. Petitioner has not, however, demonstrated by a preponderance of the evidence that claim 13 would have been obvious over Hong and Park.

C. Obviousness over Hong, Park, and Hasegawa

Petitioner asserts that claims 9 and 19 of the ’565 patent would have been obvious over Hong, Park, and Hasegawa. Pet. 60–68. Patent Owner does not separately dispute Petitioner’s analysis regarding these claims. *See generally* PO Resp. For the reasons explained below, we determine that Petitioner has shown by a preponderance of the evidence that claims 9 and 19 would have been obvious over Hong, Park, and Hasegawa.

We provided an overview of Hong and Park above. *See supra* Part III.B.1. Before addressing Petitioner’s analysis, we additionally provide an overview of Hasegawa.

1. Overview of Hasegawa

Hasegawa relates to “a coil unit utilized for non-contact power transmission using a coil, an electronic instrument, and the like.” Ex. 1007 ¶ 2. The coil unit may be implemented in a primary-side electronic instrument (for example, a charger) as well as a secondary-side electronic instrument (for example, a portable telephone), where the charger charges the portable telephone using electromagnetic induction between a coil of the coil unit in the charger and a coil of the coil unit in the portable telephone. *Id.* ¶ 62, Fig. 1.

The coil unit includes a coil and a magnetic sheet. Ex. 1007 ¶¶ 66–67. The coil has a transmission side and a non-transmission side, where the magnetic sheet is provided over the non-transmission side of the coil. *Id.* ¶ 67. The magnetic sheet receives a magnetic flux from the coil to increase the inductance of the coil. *Id.* ¶ 69. Additionally, heat generated by the coil is dissipated through the magnetic sheet. *Id.* ¶ 71. Hasegawa explains that “[a] soft magnetic material is preferably used as the material for the magnetic sheet.” *Id.* ¶ 69.

2. Analysis of Claims 9 and 19

Claim 9 depends from claim 1 and requires that “the substrate comprises magnetic material.” Claim 19 depends from claim 12 and recites

the same limitation. Petitioner relies on the same discussion for claims 9 and 19. Pet. 68. We discuss both claims together.

For this limitation (“the substrate comprises magnetic material”), Petitioner provides an annotated version of Figure 2 of Hasegawa, which is reproduced below. Pet. 67.

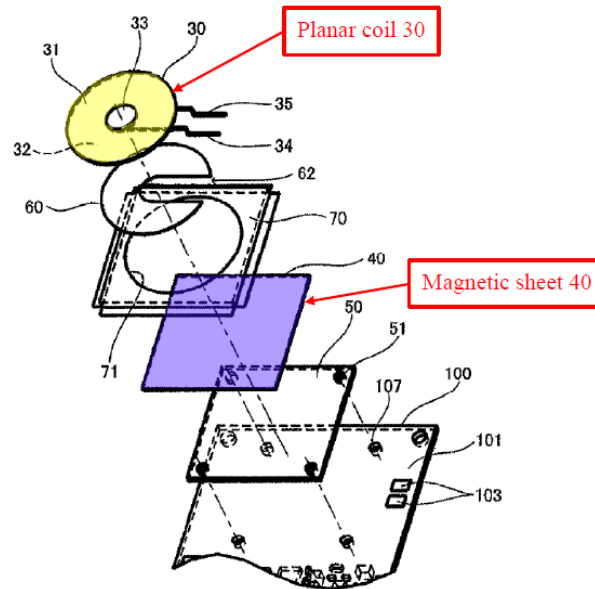


Figure 2, as annotated by Petitioner, is an exploded view of a coil unit, which includes coil 30 (shown with yellow shading) and magnetic sheet 40 (shown with purple shading). See Ex. 1007 ¶¶ 66–67. Petitioner directs us to where Hasegawa teaches that magnetic sheet 40 is disposed on the non-transmission side of coil 30 and is made of a magnetic material so that it can receive a magnetic flux from coil 30 to increase the inductance of coil 30. Pet. 66 (citing Ex. 1007 ¶ 69).

According to Petitioner, it would have been obvious “for Hong’s apparatus to include a magnetic layer beneath the coil, as taught by Hasegawa.” Pet. 63–66. Petitioner asserts that “Hong chooses to omit implementation details that were known to [persons of ordinary skill in the art]—for example, details related to the materials used to form the layers of

the main circuit board beneath the power-receiving coil,” and that “when considering the general description in Hong, a [person of ordinary skill in the art] would have naturally considered Hasegawa, as it more fully describes known material layers intended for use beneath a power-receiving coil.” *Id.* at 63–64. Petitioner adds that “[o]ne of ordinary skill in the art would have been specifically motivated to utilize a magnetic layer in association with Hong’s main circuit board because . . . using a magnetic layer as taught by Hasegawa would improve Hong’s apparatus by increasing power transfer efficiency and reducing heat.” *Id.* at 64–65 (citing Ex. 1007 ¶¶ 69, 71). As support, Petitioner asserts that “Hasegawa explains that when a magnetic layer is disposed below a power-receiving coil, the layer receives a magnetic flux from the coil ‘to increase the inductance’ of the coil.” *Id.* at 64 (quoting Ex. 1007 ¶ 69). Petitioner also asserts that “a magnetic layer beneath such a coil dissipates heat generated from current flowing through the coil.” *Id.* at 64–65 (citing Ex. 1007 ¶ 71). Petitioner relies on the declaration testimony of Dr. Phinney as support. *Id.* at 63–65 (citing Ex. 1003 ¶¶ 133–134).

Based on Petitioner’s argument and evidence, we are persuaded that the proposed combination of Hong, Park, and Hasegawa teaches the recited substrate of claims 9 and 19. We also are persuaded that Petitioner’s proffered reasoning for modifying Hong’s device to incorporate Hasegawa’s magnetic sheet, for example, to increase power transfer efficiency and reduce heat, is sufficient to support the conclusion of obviousness.

Patent Owner does not present separate arguments for this limitation. *See generally* PO Resp.

3. *Summary*

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 9 and 19 would have been obvious over Hong, Park, and Hasegawa.

D. Obviousness over Hong, Park, and Sung

Petitioner asserts that claims 10 and 20 of the '565 patent would have been obvious over Hong, Park, and Sung. Pet. 68–73. Patent Owner does not separately dispute Petitioner's analysis regarding these claims. *See generally* PO Resp. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10 and 20 would have been obvious over Hong, Park, and Sung.

We provided an overview of Hong and Park above. *See supra* Part III.B.1. Before addressing Petitioner's analysis, we additionally provide an overview of Sung.

1. Overview of Sung

Sung describes “a contactless power receiver.” Ex. 1008 ¶ 62. The contactless power receiver includes a coil unit. *Id.* The coil unit includes a coil part, which may include a substrate and a coil pattern formed on the substrate. *Id.* ¶¶ 75–76. The substrate may be a thin film substrate, such as a flexible substrate. *Id.* ¶ 77.

2. Analysis of Claims 10 and 20

Claim 10 depends from claim 1 and requires that “the substrate is flexible.” Claim 20 depends from claim 12 and recites the same limitation.

Petitioner relies on the same discussion for claims 10 and 20. Pet. 73. We discuss both claims together.

For this limitation (“the substrate is flexible”), Petitioner points us to where Sung teaches disposing a power receiving coil on “a thin film substrate, for example, a flexible substrate.” Pet. 72 (quoting Ex. 1008 ¶ 77). Sung further teaches that the substrate “may be any substrate such as a film type printed circuit board, a thin type printed circuit board, or the like as long as it has a think thickness and includes a wiring patterned formed thereon.” Ex. 1008 ¶ 65 (cited by Pet. 72).

According to Petitioner, it would have been obvious “for Hong’s main circuit board to be implemented as a flexible printed circuit board, as taught by Sung.” Pet. 68–69; *see also id.* at 68–72. Petitioner asserts that “Hong chooses to omit implementation details that were known to [persons of ordinary skill in the art]—for example, details related to the main circuit board beneath the power-receiving coil,” and that “when considering the general description in Hong, a [person of ordinary skill in the art] would have naturally considered Sung, as it more fully describes known types of circuit boards for use beneath a power-receiving coil.” *Id.* at 69–70. Petitioner adds that “[o]ne of ordinary skill in the art would have been specifically motivated to utilize a flexible circuit board as Hong’s main circuit board because . . . using a flexible circuit board as taught by Sung would improve Hong’s apparatus by reducing manufacturing cost and complexity.” *Id.* at 70. As support, Petitioner asserts that “Sung explains that when ‘the coil unit and the circuit unit are configured on a single flexible substrate, . . . the contactless power receiver may be significantly slim.” *Id.* (quoting Ex. 1008 ¶ 67). Petitioner also asserts that “the flexible

circuit board may be attached ‘using a simple attachment method such as the use of double sided tape, whereby a manufacturing cost and a process cost may be reduced,’” and that “‘it may be simply attached even to an electronic device having a curved shape.’” *Id.* (quoting Ex. 1008 ¶¶ 67–68). Petitioner relies on the declaration testimony of Dr. Phinney as support. *Id.* (citing Ex. 1003 ¶ 146).

Based on Petitioner’s argument and evidence, we are persuaded that the proposed combination of Hong, Park, and Sung teaches the recited substrate of claims 10 and 20. We also are persuaded that Petitioner’s proffered reasoning for modifying Hong’s device to incorporate Sung’s flexible printed circuit board, for example, to reduce manufacturing cost and complexity, is sufficient to support the legal conclusion of obviousness.

Patent Owner does not present separate arguments for this limitation. *See generally* PO Resp.

3. Summary

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10 and 20 would have been obvious over Hong, Park, and Sung.

IV. REVISED MOTION TO AMEND

Patent Owner’s Revised Motion to Amend is contingent on a determination of unpatentability of challenged claims 1, 11, and 12. RMTA 1. Having determined that Petitioner has shown by a preponderance of the evidence that original claims 1, 11, and 12 of the ’565 patent are

unpatentable, we proceed to address Patent Owner’s Revised Motion to Amend.

Patent Owner proposes substitute claims 21–23 to replace challenged claims 1, 12, and 11, respectively. RMTA 1. A listing of proposed substitute claims 21–23 is provided by Patent Owner in the Appendix of its Revised Motion to Amend. *Id.* at 25–29. For the reasons explained below, we determine that Patent Owner has shown that proposed substitute claims 21–23 meet the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. We also determine that Petitioner has shown by a preponderance of the evidence that proposed substitute claims 21–23 are unpatentable over prior art. Accordingly, we deny Patent Owner’s Revised Motion to Amend.

A. Applicable Law

In an *inter partes* review, amended claims are not added to a patent as of right, but rather must be proposed as a part of a motion to amend claims (“MTA”). 35 U.S.C. § 316(d). Ordinarily, the petitioner “bears the burden of persuasion to show, by a preponderance of the evidence, that any proposed substitute claims are unpatentable.” 37 C.F.R. § 42.121(d)(2); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15, 3–4 (PTAB Feb. 25, 2019) (precedential).

Before considering the patentability of the substitute claims, however, we first must determine whether the motion to amend claims meets the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121. *Lectrosonics*, Paper 15, 4. In that regard, Patent Owner bears the burden of persuasion to show that: (1) the amendment proposes a

reasonable number of substitute claims; (2) the amendment responds to a ground of unpatentability involved in the trial; (3) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter; and (4) the original disclosure sets forth written description support for each proposed claim. *Id.*; 35 U.S.C. § 316(d); 37 C.F.R. § 42.121(d)(1).

B. Proposed Substitute Claims

We start by listing Patent Owner's proposed substitute claims. Proposed substitute independent claim 21 would replace independent claim 1, and is reproduced below with underlining to indicate text added to claim 1.

21. A wireless power receiver₂ comprising:

- a substrate comprising a receiving space of a predetermined shape formed therein for a discrete connecting unit configured to connect to a wireless power receiving circuit;

- a coil unit disposed on the substrate, the coil unit comprising a first connection terminal, a second connection terminal, and a coil; and

- a short-range communication antenna disposed on the substrate and surrounding the coil;

wherein the coil is configured to wirelessly receive power, wherein the coil is formed as a conductive pattern on or within the substrate,

wherein the conductive pattern comprises a conductive line wound at least two times and conductive pattern has a spiral shape, wherein the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil, wherein the coil unit overlaps the receiving space, and wherein the coil unit is disposed on the substrate in a first direction perpendicular to an upper surface the substrate,

wherein the connecting unit is disposed in the receiving space and connected to the coil unit,

wherein the connecting unit overlaps the receiving space, the connecting unit extending in a second direction parallel to the upper surface of the substrate, and

wherein the connecting unit comprises:

a circuit board having a wiring layer;

a third connection terminal on the circuit board, connected to the first connection terminal of the coil unit; and

a fourth connection terminal on the circuit board, connected to the second connection terminal of the coil unit, the fourth connection terminal located at the other end of the coil that is at an inside portion of the conductive pattern and wherein the connecting unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit.

RM TA 25–26.

Proposed substitute independent claim 22 would replace independent claim 12, and is reproduced below with underlining to indicate text added to claim 12.

22. A wireless power receiver, comprising:

a substrate comprising a receiving space of a predetermined shape formed therein for a discrete connecting unit configured to connect to a wireless power receiving circuit; and

coil unit comprising a first connection terminal, a second connection terminal, and a coil; and

a short-range communication antenna disposed on the substrate and surrounding the coil;

wherein the coil is configured to wirelessly receive power, wherein the coil is formed as a conductive pattern on or within the substrate,

wherein the conductive pattern comprises a conductive line wound at least two times and the conductive pattern has a spiral shape,

wherein the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil,

wherein the connecting unit is disposed in the receiving space and connected to the coil unit,

wherein the connecting unit overlaps the receiving space, the connecting unit extending in a direction parallel to the upper surface of the substrate, and

wherein the connecting unit comprises:

a circuit board having a wiring layer;

a third connection terminal on the circuit board, connected to the first connection terminal of the coil unit; and

a fourth connection terminal on the circuit board, connected to the second connection terminal of the coil unit, the fourth connection terminal located at the other end of the coil that is at an inside portion of the conductive pattern and wherein the connecting unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit; and

wherein the coil unit is disposed on the substrate and the connecting unit.

RMTA 26–27.

Lastly, proposed substitute dependent claim 23 would replace dependent claim 11, and is reproduced below with underlining to indicate text added to claim 11 and strikethroughs to indicate text deleted from claim 11.

23. The wireless power receiver of claim ~~42~~1, wherein the third connection terminal is located within a horizontal boundary defining the receiving space and is located at one end of the coil

that is at an outside portion of the conductive pattern, and the fourth connection terminal is located within the horizontal boundary defining the receiving space and is located at the other end of the coil that is at an the inside portion of the conductive pattern, and wherein the connecting unit comprises a fifth connecting terminal located within the horizontal boundary defining the receiving space and a sixth connecting terminal located within the horizontal boundary defining the receiving space, the short-range communication antenna comprises a seventh connection terminal and an eighth connection terminal, wherein the fifth connection terminal is connected to the seventh connection terminal of the short-range communication antenna within the horizontal boundary defining the receiving space and the sixth connection terminal is connected to the eighth connection terminal of the short-range communication antenna within the horizontal boundary defining the receiving space, wherein the fifth connection terminal to the seventh connection terminal connection and the sixth connection terminal to the eighth connection terminal connection occur on the connecting unit at a location outside the conductive pattern of the coil, wherein the connecting unit comprises a flexible circuit board with the third, fourth, fifth, and sixth connection terminals disposed on a surface of the connecting unit, and wherein the substrate has a horizontal upper surface and a horizontal lower surface opposite the upper surface, and wherein the receiving space extends between the horizontal upper surface and the horizontal lower surface of the substrate continually from inside the coil to outside the coil.

RMTA 28–29.

C. Statutory and Regulatory Requirements

As discussed above, Patent Owner must show that: (1) its amendment proposes a reasonable number of substitute claims; (2) its amendment responds to a ground of unpatentability involved in the trial; (3) its amendment does not seek to enlarge the scope of the claims of the patent or

introduce new subject matter; and (4) the original disclosure sets forth written description support for each proposed claim. *See Lectrosonics*, Paper 15, 4; 35 U.S.C. § 316(d); 37 C.F.R. § 42.121(d)(1). We address each factor in turn.

1. Reasonable Number of Substitute Claims

Patent Owner proposes no more than 1 substitute claim for each challenged claim. *See* RMTA 1. Petitioner does not contend that Patent Owner offers an unreasonable number of substitute claims. *See generally* Pet. RMTA Opp. We determine that Patent Owner proposes a reasonable number of substitute claims. *See* 35 U.S.C. § 316(d)(1)(B).

2. Responds to a Ground of Unpatentability

“A motion to amend may be denied where . . . [t]he amendment does not respond to a ground of unpatentability involved in the trial.” 37 C.F.R. § 42.121(a)(2)(i). The Petition asserts that claims 1, 11, and 12 are unpatentable over prior art. As shown above, through the Revised Motion to Amend, Patent Owner has sought to change the substantive features of both challenged independent claims 1 and 12, and dependent claim 11, and argues that the amendments overcome the grounds asserted against the original claims. *See* RMTA 20–22. Petitioner does not contend that the proposed amendments fail to respond to a ground of unpatentability in this trial. We determine that the proposed amendments are responsive to a ground of unpatentability involved in this trial.

3. *Scope of Amended Claims*

An amendment may not enlarge the scope of the claims of the patent. 35 U.S.C. § 316(d)(3); 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2). Patent Owner asserts that “proposed substitute claims 21, 22, and 23 retain all limitations of their corresponding original claims and therefore do not expand the scope of original claims 1, 12, and 11, respectively.” RMTA 19. We agree with Patent Owner. For instance, proposed substitute independent claims 21 and 22 include additional limitations not recited in challenged claims 1 and 12, respectively, and do not omit any original limitations. *See id.* at 25–27. Similarly, proposed substitute dependent claim 23 adds further limitations to challenged claim 11. *See id.* at 28–29.

Petitioner does not contend that any proposed substitute claim enlarges the scope of any challenged patent claim. We determine that each proposed substitute claim includes narrowing limitations and does not violate the statutory and regulatory prohibition on enlarging the scope of patent claims.

4. *New Matter and Written Description*

An amendment may not introduce new matter. 35 U.S.C. § 316(d)(3); 37 C.F.R. §§ 42.121(b)(1), 42.121(b)(2). New subject matter is any addition to the claims that lacks sufficient support in the subject patent’s original disclosure. *See TurboCare Div. of Demag Delaval Turbomach. Corp. v. Gen. Elec. Co.*, 264 F.3d 1111, 1118 (Fed. Cir. 2001) (“When [an] applicant adds a claim . . . , the new claim[] must find support in the original specification.”). Also, Patent Owner is required to show written description support in “the original disclosure of the patent for each claim that is . . .

amended,” and in “an earlier-filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought.” 37 C.F.R. § 42.121(b).

For the recitation that the connecting unit be “discrete,” added via proposed substitute claims 21 and 22, Patent Owner cites, *inter alia*, page 2, lines 23–29, of the original specification filed as Application No. 13/663,012 (“the ’012 application”), which matured into the ’565 patent. RMTA 3, 11 (citing Ex. 1002, 617 ll. 23–29 (prosecution history file)).

For the recitation that “the coil unit is disposed on the substrate,” added via proposed substitute claim 21, Patent Owner cites, *inter alia*, page 12, lines 13–18, and Figure 11 of the ’012 application. RMTA 6 (citing Ex. 1002, 627 ll. 13–18).

For the recitation “the connecting unit extending in a . . . direction parallel to the upper surface of the substrate,” added via proposed substitute claims 21 and 22, Patent Owner cites, *inter alia*, page 3, lines 14–16, and Figures 11, 12, and 27 of the ’012 application. RMTA 8–9 (citing Ex. 1002, 618 ll. 14–16); *see also id.* at 12.

For the recitation that the connecting unit comprises “a circuit board having a wiring layer,” and third and fourth connection terminals “on the circuit board,” where “the fourth connection terminal [is] located at the other end of the coil that is at an inside portion of the conductive pattern,” added via proposed substitute claims 21 and 22, Patent Owner cites, *inter alia*, page 7, lines 24–25, page 23, lines 22–26, and Figures 26–28 of the ’012 application. RMTA 9–10 (citing Ex. 1002, 622 ll. 24–25, 638 ll. 22–26); *see also id.* at 12.

For the recitation that “the connecting unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit,” added via proposed substitute claims 21 and 22, Patent Owner cites, *inter alia*, Figures 14 and 26–28 of the ’012 application. RMTA 10; *see also id.* at 12.

For the recitation that “the third connection terminal is located within a horizontal boundary defining the receiving space and is located at one end of the coil,” and the recitation that “the fourth connection terminal is located within the horizontal boundary defining the receiving space and is located at the other end of the coil,” added via proposed substitute claim 23, Patent Owner cites Figures 26 and 27 of the ’012 application. RMTA 13.

For the recitation that “the connecting unit comprises a fifth connecting terminal located within the horizontal boundary defining the receiving space and a sixth connecting terminal located within the horizontal boundary defining the receiving space,” added via proposed substitute claim 23, Patent Owner cites Figure 27 of the ’012 application. RMTA 13–14.

For the recitation that
the short-range communication antenna comprises a seventh connection terminal and an eighth connection terminal, wherein the fifth connection terminal is connected to the seventh connection terminal of the short-range communication antenna within the horizontal boundary defining the receiving space and the sixth connection terminal is connected to the eighth connection terminal of the short-range communication antenna within the horizontal boundary defining the receiving space,
added via proposed substitute claim 23, Patent Owner cites Figures 27 and 28 of the ’012 application. RMTA 14–15.

For the recitation that “the fifth connection terminal to the seventh connection terminal connection and the sixth connection terminal to the eighth connection terminal connection occur on the connecting unit at a location outside the conductive pattern of the coil,” added via proposed substitute claim 23, Patent Owner cites Figures 27 and 28 of the ’012 application. RMTA 15.

For the recitation that “the connecting unit comprises a flexible circuit board with the third, fourth, fifth, and sixth connection terminals disposed on a surface of the connecting unit,” added via proposed substitute claim 23, Patent Owner cites, *inter alia*, page 24, lines 7–8, and Figure 28 of the ’012 application. RMTA 16 (citing Ex. 1002, 639 ll. 7–8).

For the recitation that “the substrate has a horizontal upper surface and a horizontal lower surface opposite the upper surface,” where “the receiving space extends between the horizontal upper surface and the horizontal lower surface of the substrate continually from inside the coil to outside the coil,” added via proposed substitute claim 23, Patent Owner cites Figures 26–28 of the ’012 application. RMTA 16.

Petitioner does not contend that any proposed substitute claim introduces new matter. *See generally* Pet. RMTA Opp. We determine that each proposed substitute claim is supported by the ’012 application and does not introduce new matter.

5. Summary

Accordingly, we determine that Patent Owner has shown that proposed substitute claims 21–23 meet the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121.

D. Petitioner's Assertion of Obviousness over Park and Motoharu

Petitioner asserts that proposed substitute claims 21–23 would have been obvious over Park and Motoharu.⁸ Pet. RMTA Opp. 1. Patent Owner disputes certain aspects of Petitioner's analysis regarding these proposed substitute claims. PO RMTA Reply 4–11. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claims 21–23 would have been obvious over Park and Motoharu.

We provided an overview of Park above. *See supra* Part III.B.1.b. Before addressing Petitioner's analysis, we additionally provide an overview of Motoharu.

1. Overview of Motoharu

Motoharu is an English language translation of Japanese Publication No. H4-51115, titled “Rotary transformer.” Ex. 1025, 1, 19.⁹

Motoharu describes “a rotary transformer used in video tape recorders and the like.” Ex. 1025, 1. To illustrate, Figure 1 of Motoharu is reproduced below.

⁸ Motoharu et al., Japanese Publ'n No. H4-51115, published Apr. 30, 1992 (Ex. 1025, 1–9, 19 (certified English language translation)). In this citation, the pincites (i.e., pages 1–9 and 19) refer to the page numbers of Exhibit 1025. Unless otherwise noted, citations to Motoharu refer to the page numbers of the English language translation within Exhibit 1025, not the page numbers of Exhibit 1025.

⁹ Cited pages 1 and 19 refer to the page numbers of Exhibit 1025.

Fig. 1

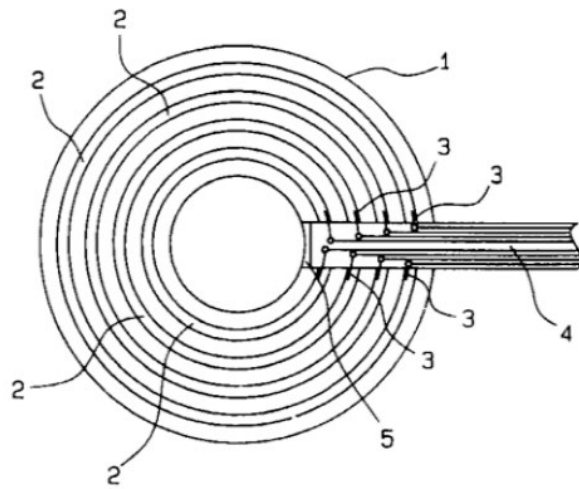


Figure 1 of Motoharu is a top view of a rotary transformer. *Id.* at 4. Figure 2 of Motoharu also is reproduced below.

Fig. 2

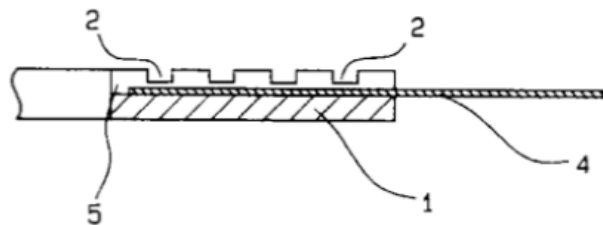


Figure 2 is a cross-sectional view of the rotary transformer. *Id.*

Motoharu's rotary transformer includes a pair of disk-shaped ferrite cores. Ex. 1025, 3–4. As Figures 1 and 2 show, ferrite core 1 has four coil placement grooves 2 formed on its principal plane, where coils are placed in these grooves 2. *Id.* at 4, 6. The coils comprise a conductive wire material wound in a spiral shape. *Id.* at 4. In the principal plane of ferrite core 1, board mounting groove 5 is formed extending in a radial direction, and flexible board 4 is mounted in board mounting groove 5. *Id.* at 4–5. Motoharu explains that “the leads 3 of the coils are soldered to the

connecting leads on the flexible board 4 in the board mounting groove 5 of the core 1” in order to “achiev[e] a thinner profile.” *Id.* The depth of board mounting groove 5 is determined based on the thickness of board 4 and “the thickness when the coil leads are connected and fixed.” *Id.* at 5. According to Motoharu, “the back sides of the cores are not bonded to boards, etc., so the dimensional accuracy of the back side of the core is higher and the manageability is improved.” *Id.*

2. Analysis

We turn now to our discussion of the proposed substitute claims.

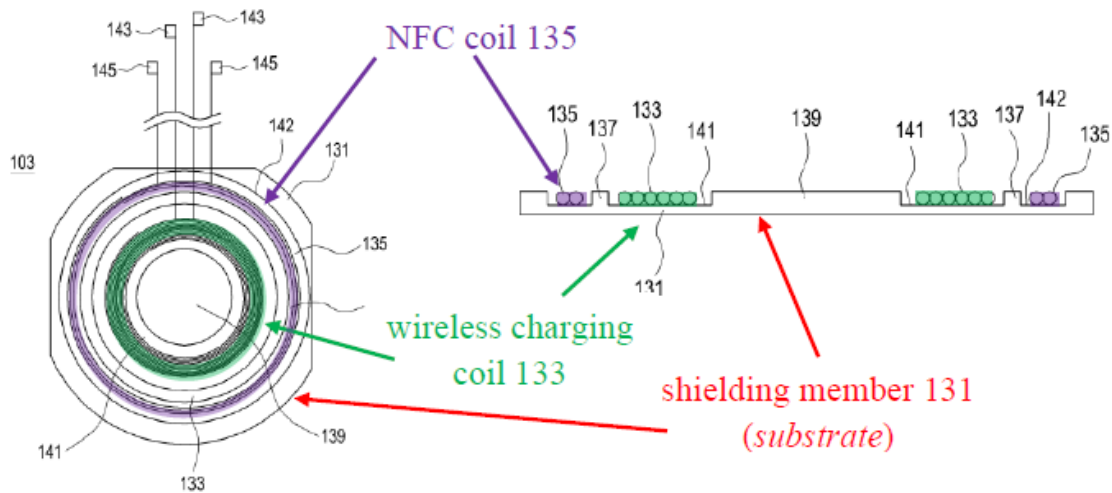
a. Proposed Substitute Independent Claim 21

Proposed substitute claim 21 is directed to a “wireless power receiver” that comprises a “substrate,” a “coil unit” including a “coil,” a “short-range communication antenna,” and a “connecting unit.” Proposed substitute claim 21 recites various limitations designated by Petitioner as limitations 21.1 through 21.9, and 21.10a through 21.10c. We address these limitations in turn and then consider the parties’ disputes.

i. Limitation 21.1: “substrate”

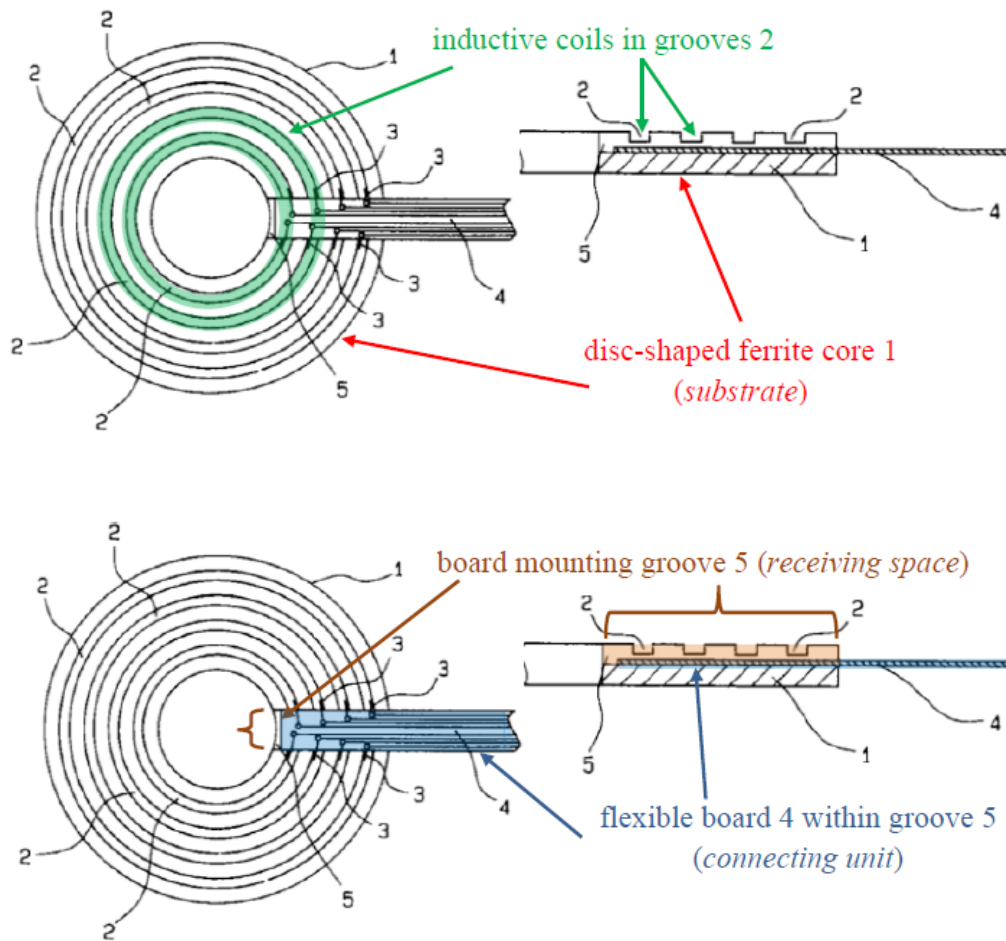
Proposed substitute claim 21 recites “a substrate comprising a receiving space of a predetermined shape formed therein for a discrete connecting unit configured to connect to a wireless power receiving circuit.” For this limitation, which Petitioner designates as limitation 21.1, Petitioner presents two alternative theories.

Under the first theory, Petitioner relies on Park alone. Petitioner identifies Park's shielding member 131 as a "substrate." Pet. RMTA Opp. 2–3. As support, Petitioner provides an annotated figure combining Figures 2 and 3 of Park, reproduced below. *Id.* at 3.



Petitioner's figure includes annotated versions of Figures 2 and 3 of Park, where Figure 2 is a plan view of a coil module, and Figure 3 is a sectional view of the same coil module. *See* Ex. 1006, 2:41–43. Petitioner asserts that Park's shielding member 131 "includes 'first and second accommodation grooves 141 and 142 on a surface' to accommodate the coils 133 and 135." Pet. RMTA Opp. 3 (citing Ex. 1006, 3:35–47).

Under the second theory, Petitioner contends that, "[t]o the extent Park does not teach that its shielding member includes a *receiving space of a predetermined shape formed therein for a discrete connecting unit* as claimed, a [person of ordinary skill in the art] would have found it obvious for Park's shielding member to include such a receiving space." Pet. RMTA Opp. 3. As support, Petitioner relies additionally on Motoharu. Petitioner provides two annotated figures, each combining Figures 1 and 2 of Motoharu, reproduced below. *Id.* at 4–5.

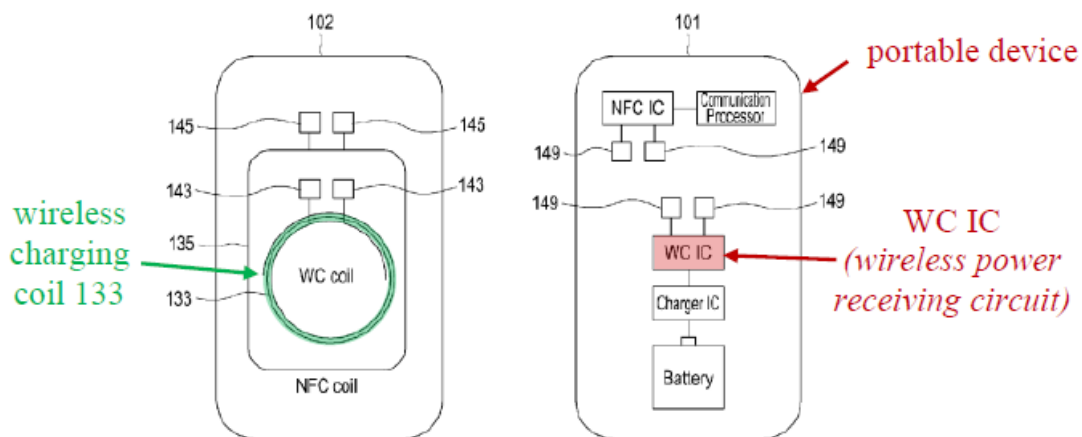


Each of Petitioner's figures includes annotated versions of Figures 1 and 2 of Motoharu, where Figure 1 is a top view of a rotary transformer, and Figure 2 is a cross-sectional view of the same rotary transformer. *See* Ex. 1025, 4. Motoharu teaches that its ferrite core 1 includes coil placement grooves 2 in which coils are placed and board mounting groove 5 in which flexible board 4 is placed. *Id.* at 4, 6. As depicted in Petitioner's figures, Petitioner identifies Motoharu's ferrite core 1 as a "substrate," Motoharu's board mounting groove 5 (shown with brown shading) as a "receiving space," and Motoharu's flexible board 4 (shown with blue shading) as a "connecting unit." Pet. RMTA Opp. 4–5. Petitioner asserts that Motoharu's

“groove 5 in ferrite core [1] is specifically a ‘**board mounting** groove’ and is thus of a *predetermined shape* to accommodate the flexible board 4.” *Id.* at 5 (citing Ex. 1025, 4, 6).

Petitioner further asserts that an ordinarily skilled artisan “would . . . have been motivated to apply Motoharu’s groove and board technique to Park’s substantially similar coil module to achieve a . . . thinner profile.” Pet. RMTA Opp. 7; *see also id.* at 5–8. According to Petitioner, “Motoharu teaches a technique to further reduce the thickness of a transformer coil module having accommodation grooves for multiple, concentric coils like Park’s[] . . . by replacing conventional coil leads (such as those in Park) with coil leads that connect to a flexible circuit board disposed in a ‘board mounting groove’ below the coils.” *Id.* at 6 (citing Ex. 1025, 2–5, Figs. 1–2).

Petitioner additionally provides an annotated figure combining Figures 4 and 5 of Park, reproduced below.



Petitioner’s figure includes annotated versions of Figures 4 and 5 of Park, where Figure 4 shows a coil module mounted to a battery cover of a portable terminal, and Figure 5 shows the portable terminal. *See* Ex. 1006, 2:44–48. Petitioner asserts that Park’s “coil module (and specifically the wireless

charging coil 133) connects to a wireless charging integrated circuit (‘WC IC’) in the portable terminal 100.” Pet. RMTA Opp. 9 (citing Ex. 1006, 5:11–26, Figs. 4, 5). Petitioner further asserts that Motoharu’s “flexible board connects to ‘an external circuit,’” and that “[w]hen Park’s coil module is modified to utilize a flexible board (*connecting unit*), . . . Park’s flexible board would similarly be configured to connect to Park’s WC IC in the portable device to transfer the power received by the wireless charging coil.” *Id.* (citing Ex. 1025, 2). Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1026, 11).

Patent Owner disputes Petitioner’s analysis for limitation 21.1. *See* PO RMTA Reply 4–10. We address the parties’ dispute in further detail below.

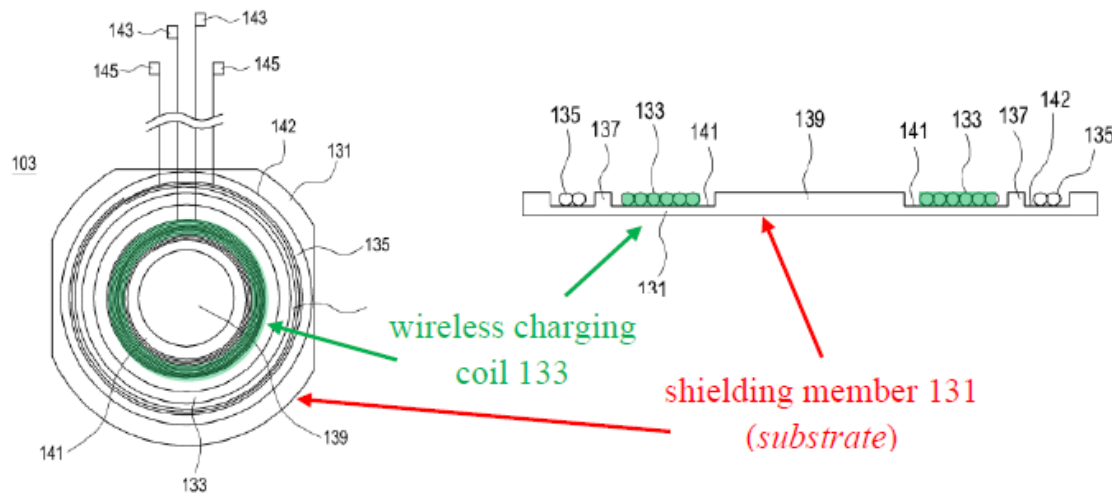
ii. Limitations 21.2, 21.6, and 21.7: “coil unit”

Proposed substitute claim 21 further recites “a coil unit disposed on the substrate, the coil unit comprising a first connection terminal, a second connection terminal, and a coil.” Petitioner designates this limitation as limitation 21.2. Pet. RMTA Opp. 10. Proposed substitute claim 21 requires that “the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil.”

Petitioner designates this limitation as limitation 21.6. *Id.* at 12.

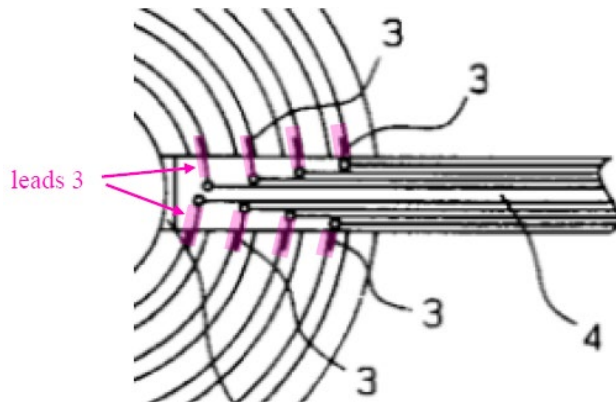
Additionally, proposed substitute claim 21 requires that “the coil unit overlaps the receiving space,” and that “the coil unit is disposed on the substrate in a first direction perpendicular to the upper surface of the substrate.” Petitioner designates this limitation as limitation 21.7. *Id.* We discuss these limitations in turn.

For limitation 21.2 (which recites “a coil unit disposed on the substrate, the coil unit comprising a first connection terminal, a second connection terminal, and a coil”), Petitioner provides an annotated figure combining Figures 2 and 3 of Park, reproduced below. Pet. RMTA Opp. 10.



Petitioner’s figure includes annotated versions of Figures 2 and 3 of Park, which respectively show plan and sectional views of a coil module. *See* Ex. 1006, 2:41–43. Petitioner asserts that “Park teaches that its coil module 103 includes a wireless charging coil 133 disposed on the shielding member 131 (*substrate*).” Pet. RMTA Opp. 10 (citing Ex. 1006, Figs. 2, 3). Based on Petitioner’s assertion, we understand Petitioner to be identifying Park’s wireless charging coil 133 as the recited “coil.” *See also id.* at 12 (referring to “Park’s coil 133 and inner and outer leads (together the *coil unit*)”).

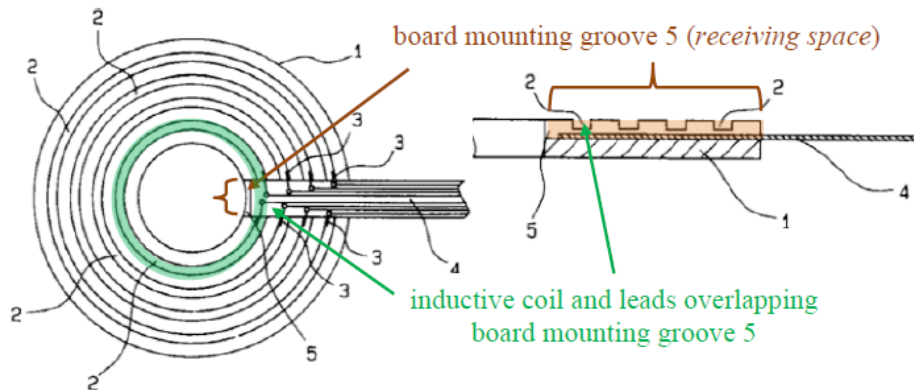
Petitioner also provides a cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 11.



Petitioner's version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that "Motoharu teaches that in its technique, each inductive coil includes two 'terminals' or 'leads 3' (*connection terminals*) that are 'soldered to the connecting leads on the flexible board 4.'" Pet. RMTA Opp. 10 (citing Ex. 1025, 4). In Petitioner's figure, leads 3 are shown with pink shading. According to Petitioner, "when Motoharu's techniques are applied to Park, it would have been obvious for Park's wireless charging coil 133 to include first and second leads (*connection terminals*) to connect to a flexible board, as taught by Motoharu." *Id.* at 11.

For limitation 21.6 (which recites "the first connection terminal is located at one end of the coil and the second connection terminal is located at the other end of the coil"), Petitioner cross-references its analysis for limitation 21.2. Pet. RMTA Opp. 12. Petitioner further asserts that "when Park is modified in view of Motoharu, it would have been obvious for a first lead 3 (*first connection terminal*) to be located at the outer end of the coil 133 and for a second lead 3 (*second connection terminal*) to be located at the inner end of the coil 133, for connection to Park's flexible board (*connecting unit*)." *Id.* (citing Ex. 1025, 4, Fig. 1). We note that Figure 1 of Motoharu shows a lead 3 located at each end of a coil. *See* Ex. 1025, Fig. 1.

For limitation 21.7 (which recites “the coil unit overlaps the receiving space, and . . . is disposed on the substrate in a first direction perpendicular to the upper surface of the substrate”), Petitioner provides an annotated figure combining Figures 1 and 2 of Motoharu, reproduced below. Pet. RMTA Opp. 13.



Petitioner’s figure includes annotated versions of Figures 1 and 2 of Motoharu, which respectively show top and cross-sectional views of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that “when Park is modified in view of Motoharu, it would be obvious that Park’s coil 133 and inner and outer leads (together the *coil unit*) would overlap the board mounting groove 5 so that the leads may be soldered to the flexible board (*connecting unit*) within the board mounting groove 5.” Pet. RMTA Opp. 12.

Petitioner adds that Figure 3 of Park shows “the coil 133 disposed on the shielding member 131 (*substrate*) in a first direction perpendicular to the upper surface of the shielding member 131.” Pet. RMTA Opp. 13.

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner’s proposed combination of Park and Motoharu teaches the recited coil unit of limitations 21.2, 21.6, and 21.7. Patent Owner does not dispute Petitioner’s analysis for any of these limitations. *See generally* PO RMTA Reply.

iii. Limitation 21.3: “short-range communication antenna”

Proposed substitute claim 21 further recites “a short-range communication antenna disposed on the substrate and surrounding the coil.” For this limitation, which Petitioner designates as limitation 21.3, Petitioner asserts that “Park teaches that a coil 135 for ‘short-range wireless communication,’ such as NFC, ‘surrounds’ wireless charging coil 133, where the two coils are disposed on the same substrate 131.” Pet. RMTA Opp. 11 (citing Ex. 1006, 3:56–64, 4:15–24).

Based on Petitioner’s argument and evidence, we are persuaded that Park teaches the recited short-range communication antenna of limitation 21.3. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO RMTA Reply.

iv. Limitations 21.4 and 21.5: “coil”

As discussed above, Park’s wireless charging coil 133 corresponds to the recited coil. *See* Pet. RMTA Opp. 10, 12. Proposed substitute claim 21 requires that “the coil is configured to wirelessly receive power, wherein the coil is formed as a conductive pattern on or within the substrate.” Petitioner designates this limitation as limitation 21.4. Pet. RMTA Opp. 11. Proposed substitute claim 21 additionally requires that “the conductive pattern comprises a conductive line wound at least two times and conductive pattern has a spiral shape.” Petitioner designates this limitation as limitation 21.5. *Id.* at 12.

With respect to both limitations, Petitioner asserts that “Park’s coil 133 is a ‘coil for wireless charging’ and is ‘formed by spirally winding enamel-insulated conductor wires’ at least two times on the shielding

member 131 (*substrate*).” Pet. RMTA Opp. 12 (citing Ex. 1006, 3:59–60, 4:15–24, Figs. 3, 4).

Based on Petitioner’s argument and evidence, we are persuaded that Park teaches the recited coil of limitations 21.4 and 21.5. Patent Owner does not dispute Petitioner’s analysis for either limitation. *See generally* PO RMTA Reply.

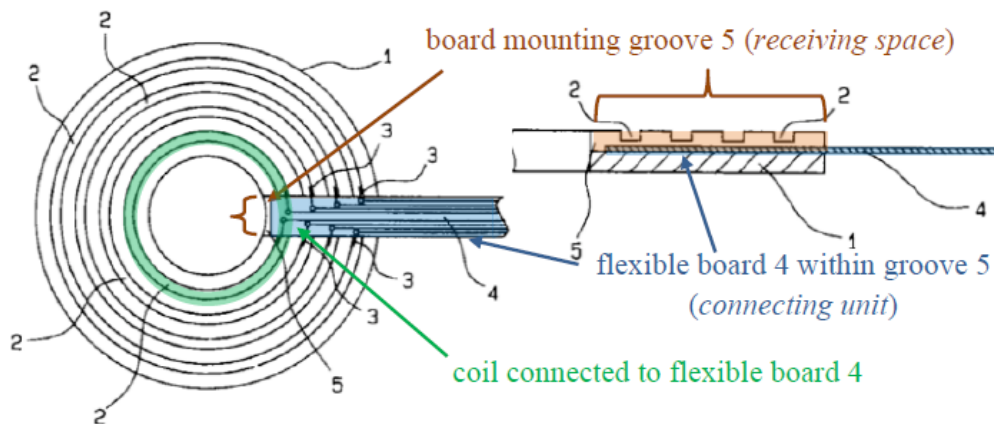
v. Limitations 21.8, 21.9, and 21.10a–21.10d: “connecting unit”

As discussed above, Petitioner identifies the flexible board as taught by Motoharu as the recited connecting unit. Pet. RMTA Opp. 4. Proposed substitute claim 21 requires that “the connecting unit is disposed in the receiving space and connected to the coil unit.” Petitioner designates this limitation as limitation 21.8. *Id.* at 13. Proposed substitute claim 21 further requires that “the connecting unit overlaps the receiving space, the connecting unit extending in a second direction parallel to the upper surface of the substrate.” Petitioner designates this limitation as limitation 21.9. *Id.* at 14.

In addition, proposed substitute claim 21 requires that “the connecting unit comprises[] a circuit board having a wiring layer.” Petitioner designates this limitation as limitation 21.10a. Pet. RMTA Opp. 14. Proposed substitute claim 21 requires that the connecting unit comprises “a third connection terminal on the circuit board, connected to the first connection terminal of the coil unit,” and “a fourth connection terminal on the circuit board, connected to the second connection terminal of the coil unit.” Petitioner designates this limitation as limitation 21.10b. *Id.* at 15. Proposed substitute claim 21 also requires that “the fourth connection

terminal [is] located at the other end of the coil that is at an inside portion of the conductive pattern.” Petitioner designates this limitation as limitation 21.10c. *Id.* at 16. Lastly, proposed substitute claim 21 requires that “the connection unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit.” Petitioner designates this limitation as limitation 21.10d. *Id.* at 17.

We discuss these limitations in turn. For limitation 21.8 (which recites “the connecting unit is disposed in the receiving space and connected to the coil unit”), Petitioner provides an annotated figure combining Figures 1 and 2 of Motoharu, reproduced below. Pet. RMTA Opp. 14.

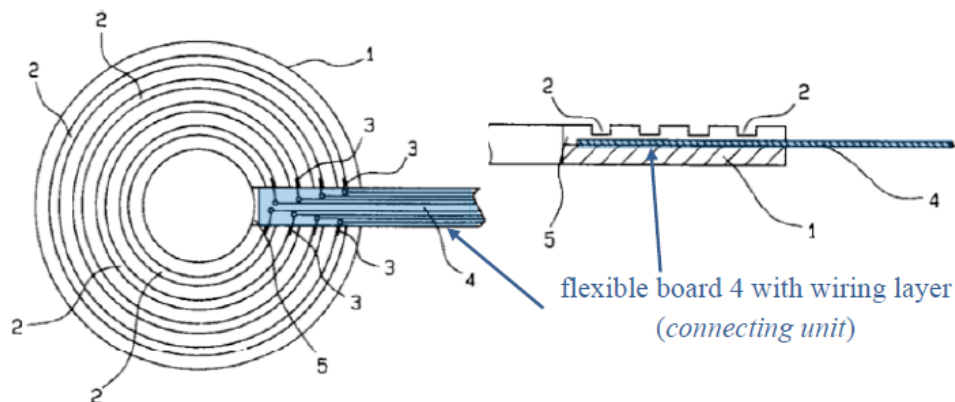


Petitioner’s figure includes annotated versions of Figures 1 and 2 of Motoharu, which respectively show top and cross-sectional views of a rotary transformer. *See* Ex. 1025, 4. Petitioner points us to where Motoharu teaches that “the leads 3 of the coils are soldered to the connecting leads on the flexible board 4 in the board mounting groove 5.” Pet. RMTA Opp. 13–14 (quoting Ex. 1025, 4). Petitioner asserts that “when Park is modified in view of Motoharu, it would be obvious for Park’s flexible board (*connecting unit*) to be disposed in the board mounting groove and connected to the leads

of the coil 133.” *Id.* at 13. Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* at 13–14 (citing Ex. 1026, 16–17).

For limitation 21.9 (which recites “the connecting unit overlaps the receiving space, the connecting unit extending in a second direction parallel to the upper surface of the substrate”), Petitioner asserts that “when Park is modified in view of Motoharu, it would be obvious that Park’s flexible board (*connecting unit*) would overlap the board mounting groove (*receiving space*) and extend in a second direction parallel to the upper surface of the shielding member (*substrate*).” Pet. RMTA Opp. 14 (citing Ex. 1025, 4, Fig. 2). Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1026, 18–19).

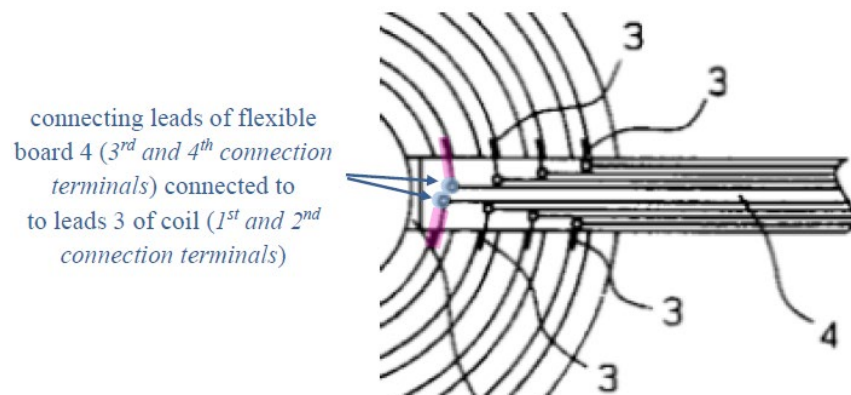
For limitation 21.10a (which recites “the connecting unit comprises[] a circuit board having a wiring layer”), Petitioner provides another annotated figure combining Figures 1 and 2 of Motoharu, reproduced below. Pet. RMTA Opp. 15.



This figure includes annotated versions of Figures 1 and 2 of Motoharu respectively showing top and cross-sectional views of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that “Motoharu teaches that its ‘flexible board 4’ is a circuit board with ‘connecting leads’ and associated wiring layer.” Pet. RMTA Opp. 14 (citing Ex. 1025, 4, Figs. 1, 2). We note that

Motoharu teaches specifically that “the leads 3 of the coils are soldered to the *connecting leads on the flexible board 4* in the board mounting groove 5,” and that Figure 1 of Motoharu shows wiring on flexible board 4. Ex. 1025, 4 (emphasis added), Fig. 1. According to Petitioner, “when Park is modified in view of Motoharu, this limitation [21.10a] is obvious.” *Id.* at 15. Petitioner relies on the declaration testimony of Dr. Phinney. Pet. RMTA Opp. 14–15 (citing Ex. 1026, 18–19).

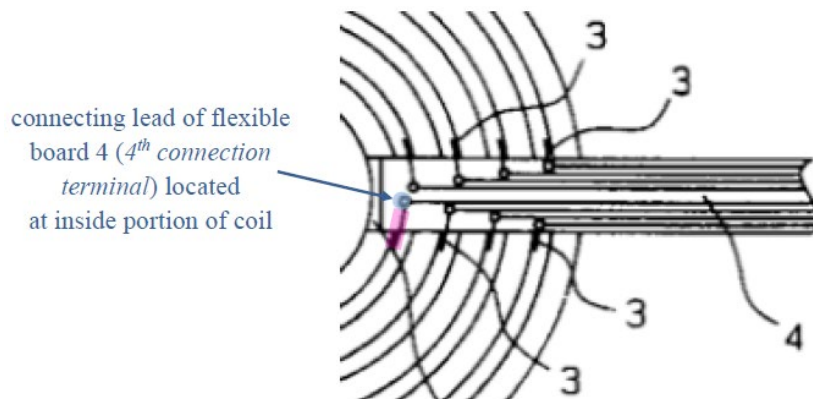
For limitation 21.10b (which recites “a third connection terminal on the circuit board, connected to the first connection terminal of the coil unit,” and “a fourth connection terminal on the circuit board, connected to the second connection terminal of the coil unit”), Petitioner provides a cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 16.



Petitioner’s version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Referring to the figure, Petitioner asserts that “Motoharu teaches that the flexible board 4 (*connecting unit*) includes ‘connecting leads’ (*connection terminals*) to which the ‘leads 3’ of the coils (*connection terminals*) are ‘soldered.’” Pet. RMTA Opp. 15 (citing Ex. 1025, 4). Petitioner asserts more specifically that the figure shows “connecting leads on the flexible board connected to the first and second

leads 3 at the inner end and outer end of each coil.” *Id.* According to Petitioner, “when Motoharu’s techniques are applied to Park, it would be obvious that Park’s wireless charging coil 133 would include first and second leads (*first and second connection terminals*) that respectively connect to third and fourth connecting leads (*third and fourth connection terminals*) on a flexible board (*connecting unit*), as taught by Motoharu.” *Id.* at 16. Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1026, 19).

For limitation 21.10c (which recites “the fourth connection terminal located at the other end of the coil that is at an inside portion of the conductive pattern”), Petitioner provides another cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 17.



This version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. According to Petitioner, the figure shows that “one of the ‘connecting leads’ of the flexible board 4 is located and connected to the coil lead 3 at an inside portion of the coil’s conductive pattern.” Pet. RMTA Opp. 16. Petitioner asserts that “when Park is modified in view of Motoharu, this limitation [21.10c] is obvious.” *Id.* Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1026, 20).

For limitation 21.10d (which recites “the connection unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit”), Petitioner provides an annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 17.

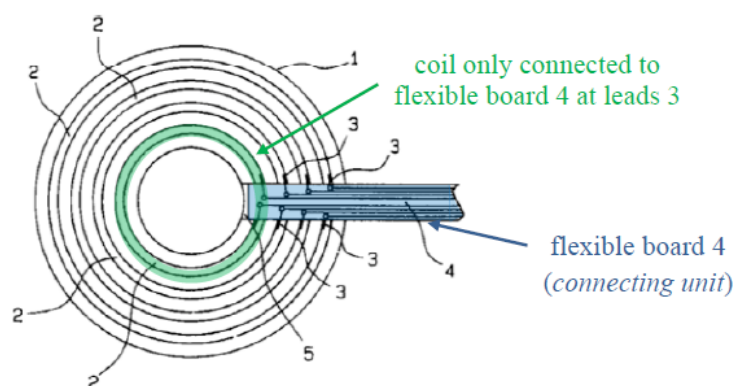


Figure 1 of Motoharu, as annotated by Petitioner, is a top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that “the flexible board 4 (*connecting unit*) is otherwise separate from the two leads 3 (*first and second connection terminals*) of the coil highlighted in green.” Pet. RMTA Opp. 17. Petitioner asserts in particular that “the flexible board 4 is only connected to the coil at the two leads 3.” *Id.* Relying on the declaration testimony of Dr. Phinney, Petitioner further contends that “when Park is modified in view of Motoharu, this limitation [21.10d] is obvious.” *Id.* at 18 (citing Ex. 1026, 20–21).

Based on Petitioner’s argument and evidence, we are persuaded that the proposed combination of Park and Motoharu teaches the recited connecting unit of limitations 21.8, 21.9, 21.10a, 21.10b, and 21.10c. Patent Owner does not dispute Petitioner’s analysis for these limitations. *See generally* PO RMTA Reply. Patent Owner does, however, dispute Petitioner’s analysis for limitation 21.10d. *See id.* at 4–10. We address the parties’ dispute in further detail below.

vi. The Parties' Disputes

Patent Owner's arguments focus on the "discrete connecting unit" of limitation 21.1 and the requirement that "the connecting unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit" of limitation 21.10d. *See* PO RMTA Reply 4–10. According to Patent Owner, these limitations require that "the connecting unit is . . . *discrete*, *i.e.*, distinct or separate, relative to the substrate, whereas the '*otherwise separate*' requirement relates to the coil." *Id.* at 6. Patent Owner asserts specifically that "the connecting unit is separate from the substrate and from the coil, except at the first-third and second-fourth terminal interconnections." *Id.*; *see also id.* at 5 ("[T]he connecting unit is connected to the coil only via the first-third and second-fo[u]rth connection terminal interconnections."). Petitioner does not dispute Patent Owner's claim interpretations in this regard. *See generally* Pet. RMTA Sur-reply; *see also id.* at 4 ("Patent Owner's interpretation that the claimed *discrete* connecting unit is a '**distinct structure**' or '**separate component**' appears to be the plain and ordinary interpretation."); *id.* at 6 ("[Patent Owner's] interpretation of [the '*otherwise separate*' requirement] does not distinguish Motoharu.").

We discuss these limitations in turn.

(A) Limitation 21.1: "discrete connecting unit"

With respect to limitation 21.1 (which recites "discrete connecting unit"), Patent Owner argues that "Park in view of Motoharu does not disclose a connecting unit that is 'discrete' relative to the substrate."

PO RMTA Reply 8 (emphasis omitted). As support, Patent Owner points to Figure 2 of Motoharu, which is reproduced below. *Id.* at 9.

Fig. 2

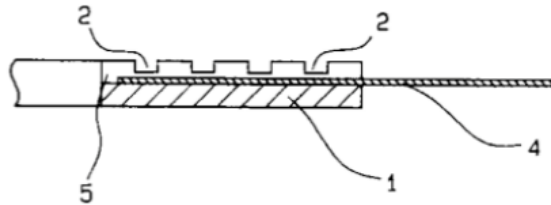


Figure 2 of Motoharu is a cross-sectional view of a rotary transformer. Ex. 1025, 4. Referring to Figure 2, Patent Owner asserts that “board 4 is sandwiched between layers of the ferrite core 1.” PO RMTA Reply 8 (citing Ex. 1025, Fig. 2). Patent Owner further asserts that “Motoharu teaches that board 4 is **attached** to the mounting groove 5 within the ferrite core 1.” *Id.* (citing Ex. 1025, 4). According to Patent Owner, “Motoharu, therefore, does not teach a *discrete* connecting unit relative to the substrate, that is, a connecting unit that is distinct/separate from the substrate, because Motoharu requires the board 4 and the ferrite core 1 to be attached.” *Id.*

Patent Owner adds that “Motoharu’s design requires this attaching of the split ferrite layers to board 4, because without this, the ferrite core is inherently weaker than even . . . the stepped design, which Motoharu stated was problematic.” PO RMTA Reply 8 (citing Ex. 1025, 3). Patent Owner accordingly asserts that “there is no reason to modify Motoharu to achieve the claimed invention, because doing so would weaken Motoharu’s ferrite core, contrary to Motoharu’s express purpose to provide a thinner assembly without weakening its strength.” *Id.* at 8–9. Patent Owner does not point to any evidence that Motoharu’s ferrite core is actually weaker, let alone inherently weaker, than the stepped design. Moreover, we note that

Petitioner proposes to modify Park to include Motoharu's flexible board and groove technique, not Motoharu's ferrite core.

Petitioner counters that "Motoharu unequivocally discloses that the flexible board is a **distinct structure** that is 'mounted' in the board mounting groove of the substrate." Pet. RMTA Sur-reply 4. As support, Petitioner asserts that "Motoharu teaches a substrate formed of 'ferrite' and separately teaches a 'flexible board 4' with connecting leads," where "[t]he ferrite core includes 'a board mounting groove where the board is mounted.'" *Id.* (quoting Ex. 1025, 4–5). Petitioner further asserts that "[a]fter the flexible board is so mounted, 'the leads 3 of the coils are soldered to the connecting leads on the flexible board 4 in the board mounting groove 5 of the core 1.'" *Id.* (quoting Ex. 1025, 4). Petitioner contends that "because the flexible board is a distinct structure, it is *discrete*." *Id.*

Petitioner acknowledges Motoharu's teaching that board 4 is "attached" to mounting groove 5, and asserts that "attachment does not negate the fact that the flexible board is a discrete component," but, rather, it "***proves*** the flexible board is discrete." Pet. RMTA Sur-reply 5. According to Petitioner, "[i]f the flexible board was an integrated portion of the ferrite core, attachment/mounting would be unnecessary." *Id.* Petitioner adds that "Patent Owner[']s contention that something 'attached' cannot be *discrete* is inconsistent with the surrounding claim language of substitute claim[] 21," which recites a "*discrete* connecting unit" that is "disposed in the receiving space and *connected* to the coil unit." *Id.* at 5–6.

During oral argument, Patent Owner's counsel clarified that proposed substitute claim 21 requires that the connecting unit "remains discrete after

the device itself is assembled.” Tr. 50:19–24; *see also id.* at 46:10–14 (“The connecting unit itself remains discrete or separate before and after assembly. . . . [O]nce the pieces are attached, it no longer meets this limitation of a discrete connecting unit.”); *id.* at 67:17–19 (“So the substrate has to be distinct and separate from the connecting unit. Once those two are attached, they’re no longer separate or discrete.”); *id.* at 70:14–17 (“[O]nce there’s an attachment between the connecting unit and the substrate, in addition to the solder connections, then this discrete element isn’t met.”).

Even with Patent Owner’s clarification, we are persuaded that Motoharu teaches the recited discrete connecting unit, as Petitioner contends. *See* Pet. RMTA Opp. 4–5. Patent Owner relies, in part, on Figure 26 of the ’012 application (which issued as the ’565 patent) as showing a discrete connecting unit. RMTA 3, 10. Figure 26 of the ’012 application, reproduced below, is an exploded view of a wireless power receiver. Ex. 1002, 620 ll. 12–13, 664 (Figure 26).

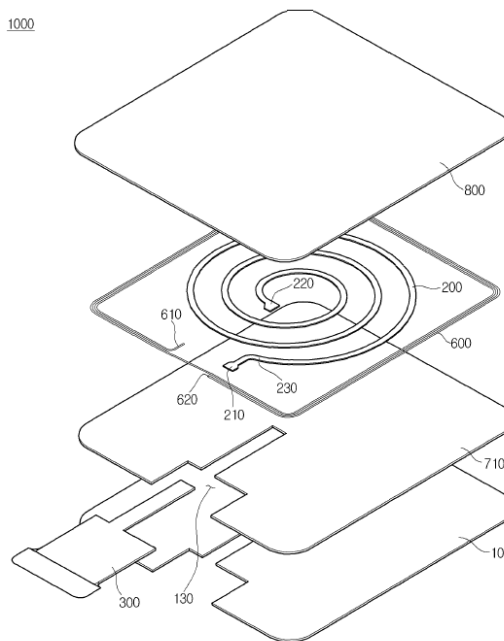


FIG. 26

Figure 26 shows wireless power receiver 1000, which includes magnetic substrate 100 and connecting unit 300. *Id.* at 637 ll. 9–12. Receiving space 130 is formed at a predetermined area of substrate 100. *Id.* at 638 ll. 3–4. Connecting unit 300 has a shape corresponding to the shape of receiving space 130 and may be disposed in receiving space 130. *Id.* at 639 ll. 1–2.

Figure 27 of the '012 application, reproduced below, shows the same wireless power receiver of Figure 26 in its assembled state. Ex. 1002, 637 ll. 5–6, 665 (Figure 27 (cited by RMTA 10)).

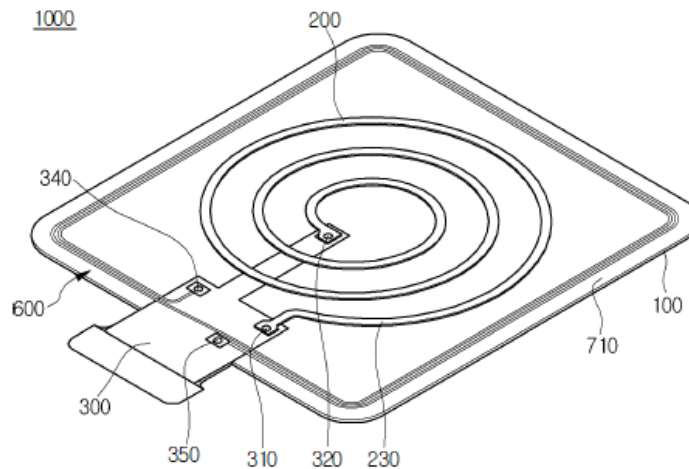


FIG. 27

Figure 27 shows in particular connecting unit 300 disposed in receiving space 130. *Id.* at 638, ll. 20–21.

Additionally, an annotated version of Figure 28 of the '012 application is reproduced below. Ex. 1002, 665 (Figure 28 (cited by RMTA 10)).

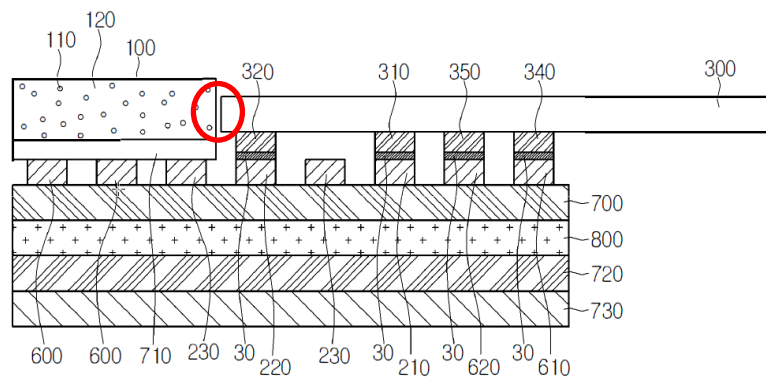


FIG. 28

Figure 28, as annotated, shows a sectional view of the wireless power receiver of Figures 26 and 28. *See Ex. 1002, 636 l. 29–637 l. 4.* As Patent Owner’s counsel pointed out during oral argument, Figure 28 shows “a space between the substrate [100] and the connecting unit [300].”

Tr. 51:14–16. In the annotated version of Figure 28, reproduced above, that space is encircled in red. The illustration of that space, however, appears to conflict with Figure 27 above, which shows no such space, thereby indicating Figure 27 may be imprecise or is merely exemplary.

Nevertheless, the space relied upon by Patent Owner is not determinative for several reasons. Figure 1 of Motoharu is reproduced below.

Fig. 1

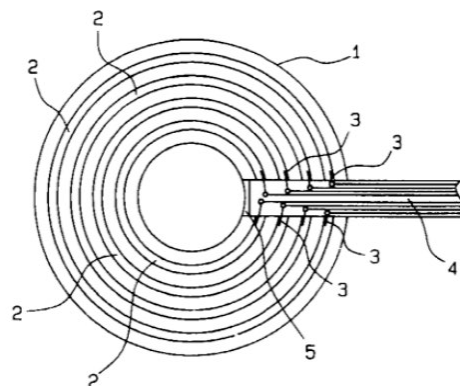


Figure 1 of Motoharu is a top view of a rotary transformer. Ex. 1025, 4. Like Figure 27 of the '012 application, Figure 1 of Motoharu shows the connecting unit (flexible board 4) disposed in the receiving space (board mounting groove 5), and it appears to show a space at the inner end thereof. *Compare* Ex. 1025, Fig. 1, *with* Ex. 1002, 665 (Figure 27); *see also* Ex. 1025, 4 (Motoharu describing “the flexible board 4 in the board mounting groove 5” (emphasis added)).

Turning back to Figure 27 of the '012 application, we note that the sides of connecting unit 300 along its length touch substrate 100 where receiving space 130 is formed. Counsel for Patent Owner essentially agreed during oral argument that “one skilled in the art would understand that there could be a tight fit or a gap all the way around.” Tr. 73:24–26. In Figure 1 of Motoharu, the sides of flexible board 4 along its length similarly appear to be touching ferrite core 1 where board mounting groove 5 is formed.

We further note that Patent Owner relies on Figure 14 of the '012 application, which is reproduced below, as “showing the connecting unit 300 (including circuit board 330) *separate* from the substrate 100.” RMTA 10 (emphasis added) (citing Ex. 1002, 656 (Fig. 14)).

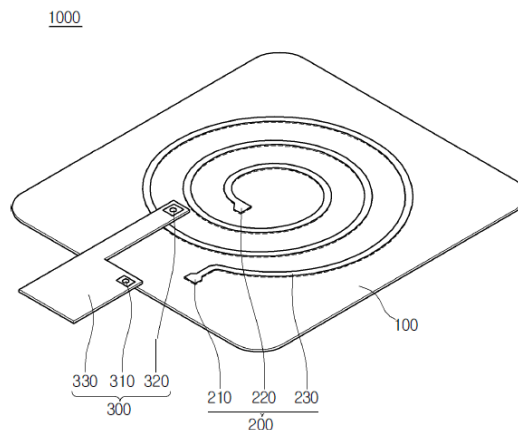


FIG. 14

Figure 14 of the '012 application is a perspective view of a wireless power receiver according to a different embodiment than the one shown in Figures 26–28 of the '012 application. Ex. 1002, 628 ll. 24–29. To further illustrate the physical relationship between connecting unit 300 and substrate 100 in Figure 14, Figure 16 of the '012 application is reproduced below. *Id.* at 658 (Fig. 16).

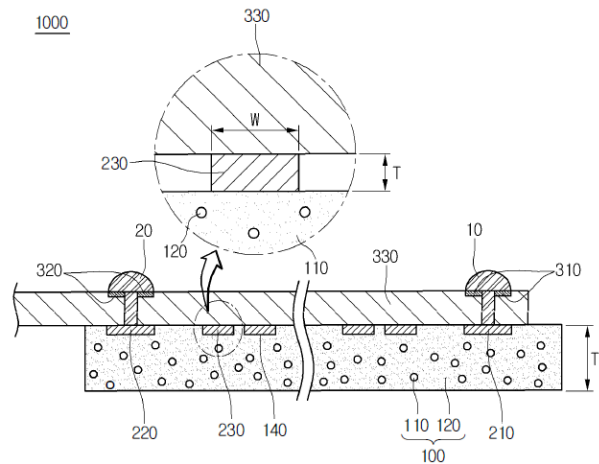


FIG. 16

Figure 16 of the '012 application is a sectional view of the wireless power receiver in Figure 14. *Id.* at 628 ll. 24–29. As Figure 16 shows, the bottom surface of connecting unit 300 (which includes circuit board 330) is touching the top surface of substrate 100 at various points. *See id.* at Fig. 16.

Motoharu's arrangement of flexible board 4 and ferrite core 1 as depicted in Figures 1 and 2 of Motoharu is similar to the arrangement of connecting unit 300 and substrate 100 as depicted in either of Figures 16 and 27 of the '012 application, where respective surfaces of the two components are touching. Patent Owner's counsel confirmed during oral argument that "you can touch and be separate," so long as there is no "electrical touching." Tr. 72:12–20. As mentioned above, Patent Owner's counsel added that "one

skilled in the art would understand that there could be a tight fit [between connecting unit 300 and substrate 100] or a gap all the way around [connecting unit 300]” in Figure 27. *Id.* at 73:24–26.

Turning now to Patent Owner’s contention that Motoharu’s flexible board 4 is not discrete because Motoharu teaches that it is “attached” to ferrite core 1, (*see* PO RMTA Reply 8), we note that Patent Owner’s counsel asserted during oral argument that “attached” in Motoharu means bonded, (*see* Tr. 52:17–54:4). As support, Patent Owner’s counsel directed us to where Motoharu teaches “[t]he leads 34 of the coil are led out to the back side through slit grooves 33 extending in radial directions, and the leads are connected to a flexible board 35 *bonded* to the back side.” Ex. 1025, 3¹⁰ (emphasis added) (cited by Tr. 53:13–16).

Patent Owner’s contention is unavailing. Motoharu describes bonding flexible board 35 to the back side of ferrite core 31 in its discussion of “a conventional example of a rotary transformer,” not in connection with its rotary transformer. *See* Ex. 1025, 2 (“Prior Art” section); *see also id.* at 3 (“A design with a stepped surface on the part of the back side of the disc-shaped ferrite core to which the flexible board is bonded has also been proposed, but the thickness of the stepped surface is extremely thin and there was a strength problem with it.”). Indeed, Motoharu explains that “the back sides of the cores are *not bonded* to boards” in its rotary transformer. *Id.* at 5 (emphasis added). Nowhere else does Motoharu use the word “bonded” to describe its rotary transformer.

¹⁰ Cited page 3 refers to the page number of Exhibit 1025.

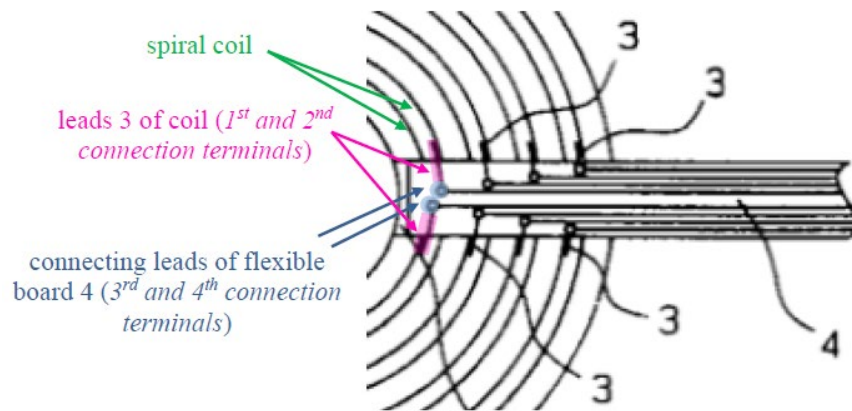
With respect to the physical relationship between flexible board 4 and board mounting groove 5, Motoharu explicitly teaches: “a board is *placed on* said board mounting structure,” (Ex. 1025, 4 (emphasis added)); “the flexible board 4 *in* the board mounting groove 5,” (*id.* (emphasis added)); “the board mounting groove *where the board is mounted*,” (*id.* at 5 (emphasis added)); and “a board mounting groove *in which the board is mounted*,” (*id.* (emphasis added)). These teachings are consistent with the depictions of the physical relationship between flexible board 4 and board mounting groove 5 in Figures 1 and 2 of Motoharu. *See id.* at Figs. 1, 2. Moreover, the teachings are broad enough to encompass both “a tight fit” between Motoharu’s flexible board 4 and ferrite core 1 and “a gap all the way around” Motoharu’s flexible board 4, which, according to Patent Owner, would support a finding that Motoharu’s flexible board 4 is discrete. *See* Tr. 73:24–26.

On the record before us, we find that “attached” in Motoharu does not require bonding, as Patent Owner contends. The word “attached” in Motoharu could refer to being “placed on,” “mounted in,” or simply “in.” *See* Ex. 1025, 4–5. Even if “attached” in Motoharu were to mean bonded, however, Motoharu’s teachings regarding the relationship between flexible board 4 and board mounting groove 5 contemplate alternative arrangements of these components that do not require bonding (e.g., “placed on,” “mounted in,” and “in”). Accordingly, we are persuaded that Motoharu’s flexible board 4 teaches the recited discrete connecting unit of limitation 21.1.

(B) Limitation 21.10d: “otherwise separate”

With respect to limitation 21.10d (which recites “the connecting unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit”), Patent Owner argues that “Park in view of Motoharu does not disclose a connecting unit that is . . . ‘otherwise separate’ from the coil,” (PO RMTA Reply 8 (emphasis omitted)), because “Park clearly teaches that the coils 133 and 135 are *attached* to the shielding member,” (*id.* at 9). According to Patent Owner, that means “Park in view of Motoharu teach that the coils are attached to the shielding member/ferrite core (the alleged *substrate*), and that the ferrite core is attached to the board (the alleged *connecting unit*).” *Id.* at 9. In other words, “the coils 133 and 135 are connected to the board (the alleged *connecting unit*) via the shielding member/ferrite core between them, which is contrary to the requirement of the ‘*otherwise separate*’ limitation that the coil is separate from the connecting unit, except at the first-third and the second-fourth interconnections.” *Id.*

Petitioner responds that Patent Owner’s interpretation of the “otherwise separate” limitation “does not distinguish Motoharu.” Pet. RMTA Sur-reply 6. As support, Petitioner provides a cropped and annotated version of Figure 1 of Motoharu, reproduced below. *Id.* at 7.



Petitioner's version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that "Motoharu's flexible board 4 is connected to the coil only via their respective leads," where "the leads 3 of the coils are soldered to the connecting leads on the flexible board 4." Pet. RMTA Sur-reply 6–7 (citing Ex. 1025, 4; Pet. RMTA Opp. 15–17). In its version of Figure 1 of Motoharu, Petitioner identifies leads 3 (shown with pink shading) of a coil as the recited first and second connection terminals, and connecting leads (shown with blue shading) of flexible board 4 as the recited third and fourth connection terminals. *Id.* at 7.

As to its proposed combination of Park and Motoharu, Petitioner asserts that Patent Owner's argument that "Park's flexible board will not be '*otherwise separate*' from its coil because the board will somehow be 'connected' to the coil 'via the shielding member/ferrite core between them[]' . . . appears to be further narrowing the '*otherwise separate*' limitation to exclude a configuration in which a substrate is interposed between the coil and connecting unit (i.e., the coil and connecting unit each connect to a common substrate)." Pet. RMTA Sur-reply 7–8. According to Petitioner, "logically, if an element is 'between' the connecting unit and coil, they are *separate*." *Id.* at 8.

Petitioner adds that “the allegedly offending configuration (coil—substrate—connecting unit) *must* be within the scope of the substitute claims because Patent Owner relied upon such a configuration [in Figure 14 of the ’012 application] for written description support.” Pet. RMTA Sur-reply 8 (citing RMTA 10 (citing Ex. 1002, 656 (Figure 14))). To illustrate, Petitioner provides an annotated version of Figure 16 of the ’012 application, reproduced below, which Petitioner describes as “the ‘connected’ version of the [embodiment in Figure 14].” *Id.* at 8–9.

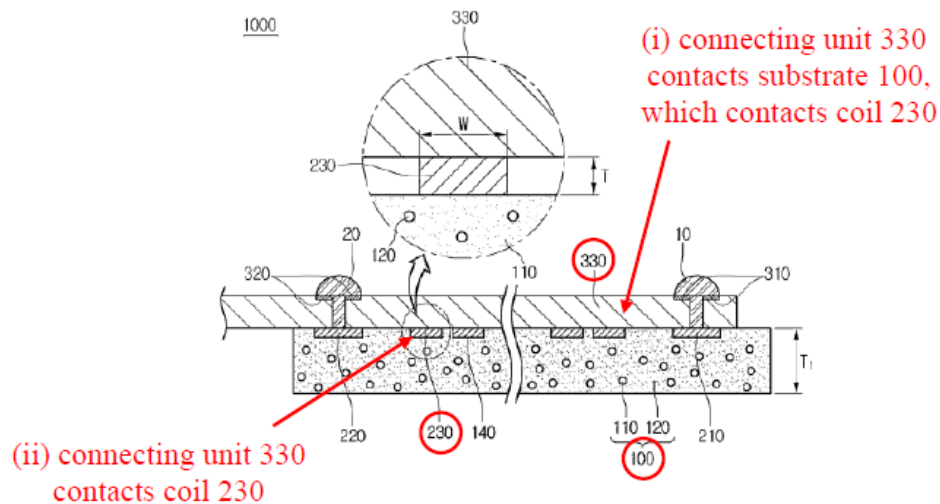


Figure 16 of the ’012 application, as annotated by Petitioner, is a sectional view of the wireless power receiver in Figure 14. Ex. 1002, 628 ll. 24–29. Petitioner asserts that Figure 16 “depicts the connecting unit 330 and coil 230 both contacting the substrate 100.” Pet. RMTA Sur-reply 8 (citing Ex. 1001, 10:58–61); *see also* Ex. 1002, 631, ll. 10–12 (corresponding disclosure). Petitioner further contends that “Patent Owner cannot simultaneously (i) rely on this configuration to provide [§] 112 support for the substitute claims and (ii) argue that this configuration is outside the scope of the claims.” Pet. RMTA Sur-reply 9.

We agree with Petitioner. Patent Owner’s argument that Petitioner’s proposed combination of Park and Motoharu “teach[es] that [Park’s] coils 133 and 135 are connected to [Motoharu’s] board (the alleged *connecting unit*) via [Park’s] shielding member/[Motoharu’s] ferrite core between them” is unavailing. See PO RMTA Reply 9. Patent Owner’s argument assumes that Motoharu’s ferrite core 1 and flexible board 4 are not separate components. As discussed above with respect to limitation 21.1 (“discrete connecting unit”), however, we find that Motoharu’s ferrite core 1 and flexible board 4 are separate components. In particular, as discussed above, we find that Motoharu’s teachings regarding the relationship between its flexible board 4 and ferrite core 1 do not require bonding, and that they encompass both “a tight fit” between Motoharu’s flexible board 4 and ferrite core 1 as well as “a gap all the way around” Motoharu’s flexible board 4. See Ex. 1025, 4–5, Figs. 1–2 (teachings that flexible board 4 may be “placed on,” “mounted in,” or “in” board mounting groove 5); Tr. 73:24–26 (Patent Owner’s counsel stating that “one skilled in the art would understand that there could be tight fit or a gap all the way around” in Figure 27 of the ’012 application).

Additionally, Patent Owner’s counsel indicated during oral argument that, “in the context of the [proposed substitute] claim, yes, you can touch and be separate,” so long as there is no “electrical touching” other than the first-third and second-fourth connection terminal interconnections. Tr. 72:2–20. Petitioner has persuasively shown that “Motoharu’s flexible board 4 is connected to the coil only via their respective leads.” Pet. RMTA Sur-reply 6–7 (citing Ex. 1025, 4, Fig. 1; Pet. RMTA Opp. 15–17). Petitioner identifies leads 3 of a coil as the recited first and second

connection terminals, and connecting leads of flexible board 4 as the recited third and fourth connection terminals, where the leads of the coil are connected to respective connecting leads of flexible board 4. *Id.* at 7.

On the record before us, we are persuaded that Motoharu’s flexible board 4 (the recited connecting unit) is “otherwise separate” from the coil and its leads 3 (together comprising the recited coil unit) as required by limitation 21.10d.

(C) Other Arguments

Patent Owner makes additional arguments. In particular, Patent Owner argues that Dr. Phinney’s declaration testimony “[is] not entitled to any weight” because it “find[s] no support in any of the evidence of record and simply mirror[s] the arguments in Petitioner’s Opposition.” PO RMTA Reply 7. Patent Owner also argues that “Petitioner has failed to satisfy its burden of persuasion” because “Petitioner has not provided any construction or analysis of either the ‘discrete’ or the ‘otherwise separate’ limitations, which are critical to the understanding of the scope of proposed claims 21–22.” *Id.* Lastly, Patent Owner argues that, “based on Petitioner’s contentions with respect to Park and Motoharu, the ‘discrete’ or the ‘otherwise separate’ limitations have no meaning” because the components in the references “are clearly attached in a way that the proposed substitute claims require them not to be.” *Id.* at 7–8.

Patent Owner’s additional arguments do not sufficiently undermine Petitioner’s showing for limitations 21.1 and 21.10d. As discussed above, Petitioner does not appear to dispute Patent Owner’s interpretations of the meaning of these limitations. *See* Pet. RMTA Sur-reply 4 (“Patent Owner’s

interpretation that the claimed *discrete* connecting unit is a ‘**distinct structure**’ or ‘**separate component**’ appears to be the plain and ordinary interpretation.”); *id.* at 6 (“[Patent Owner’s] interpretation of [the ‘otherwise separate’ requirement] does not distinguish Motoharu.”). Moreover, our analysis applies Patent Owner’s interpretation of the limitations.

Additionally, as explained above, we are persuaded by Petitioner’s argument and evidence that its proposed combination of Park and Motoharu teaches the recited connecting unit of limitations 21.1 and 21.10d.

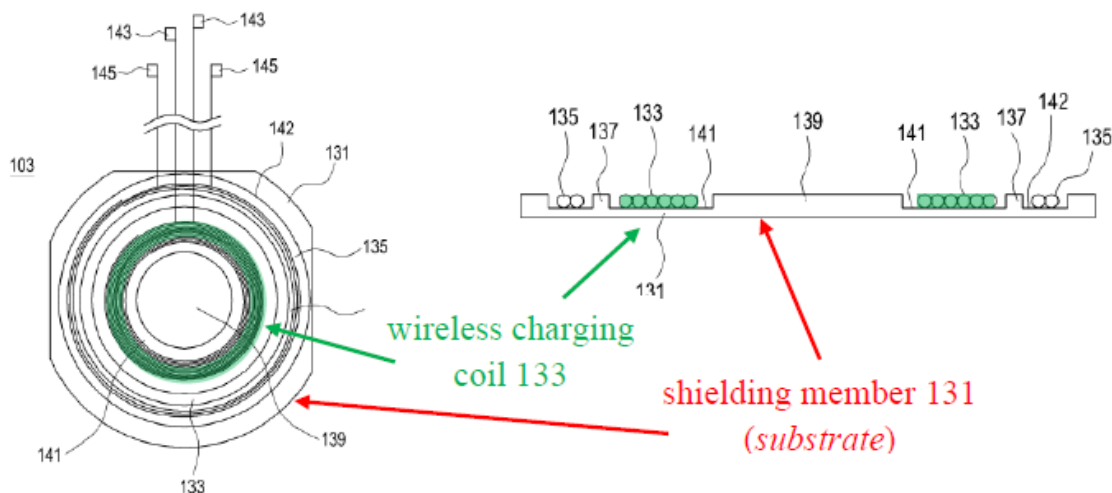
We noted above that Patent Owner does not present separate arguments for other limitations of proposed substitute claim 21. *See generally* PO RMTA Reply. Accordingly, we are persuaded that Petitioner’s proposed combination of Park and Motoharu teaches all the recited limitations of proposed substitute claim 21, and that Petitioner’s proffered reasoning for modifying Park’s coil module to apply Motoharu’s groove and board technique, for example, to achieve a thinner profile, provides sufficient articulated reasoning with rational underpinnings to support the legal conclusion of obviousness.

b. Proposed Substitute Independent Claim 22

Proposed substitute claim 22 is directed to a “wireless power receiver” and recites similar limitations as proposed substitute claim 21, including “a discrete connecting unit” and the requirement that “the connecting unit is otherwise separate from the first connection terminal, the second connection terminal, and the coil unit.” RMTA 25–27. With respect to the similarly recited limitations, Petitioner relies on its discussion of proposed substitute claim 21 for its analysis of proposed substitute claim 22. Pet. RMTA

Opp. 18–19. Patent Owner’s arguments disputing proposed substitute claim 21 apply to proposed substitute claim 22. PO RMTA Reply 5–10. Likewise, our analysis of proposed substitute claim 21 applies to proposed substitute claim 22.

We note that proposed substitute claim 22 recites an additional limitation, which requires that “the coil unit is disposed on the substrate and the connecting unit.” RMTA 27. For this limitation, Petitioner cross-references its analysis for limitation 21.2 and refers to its annotated figure combining Figures 2 and 3 of Park (*see* Pet. RMTA Opp. 10), which is reproduced below. Pet. RMTA Opp. 19.



Petitioner’s figure includes annotated versions of Figures 2 and 3 of Park, which respectively show plan and sectional views of the same coil module. *See* Ex. 1006, 2:41–43. Petitioner asserts that “Park teaches that the coil 133 is disposed on the shielding member 131 (*substrate*),” and that “when Park is modified in view of Motoharu, it would be obvious that the leads of Park’s coil 133 would be soldered to (*disposed on*) the connecting leads of the flexible board (*connecting unit*), as taught by Motoharu.” Pet. RMTA Opp. 19 (citing Ex. 1006, Figs. 2–3; Ex. 1025, 4).

Based on Petitioner's argument and evidence, we are persuaded that Petitioner's proposed combination of Park and Motoharu teaches the recited coil unit. Patent Owner does not dispute Petitioner's analysis for this limitation. *See generally* PO RMTA Reply.

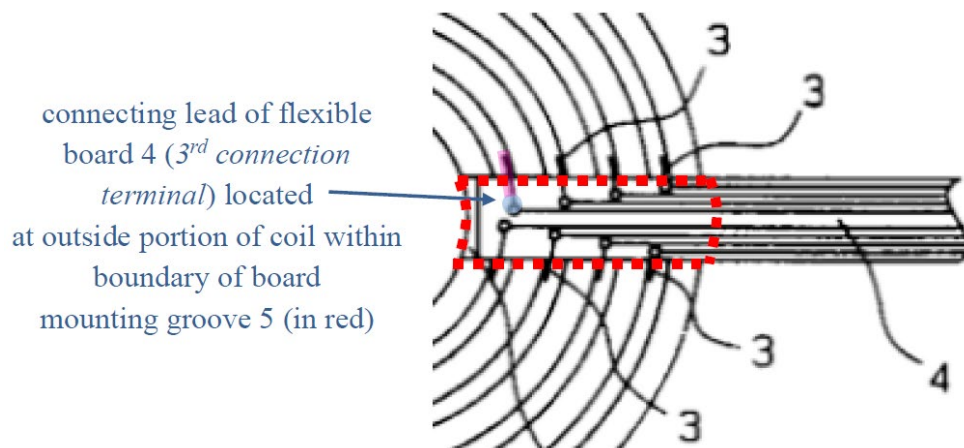
For the reasons given above, we are persuaded that Petitioner's proposed combination of Park and Motoharu teaches all the recited limitations of proposed substitute claim 22, and that Petitioner's proffered reasoning for combining the references provides sufficient articulated reasoning with rational underpinnings to support the legal conclusion of obviousness.

c. Proposed Substitute Dependent Claim 23

Proposed substitute claim 23 depends from proposed substitute claim 21 and recites various limitations designated by Petitioner as limitations 23.1 through 23.8. We address these limitations in turn and then consider the parties' disputes.

i. Limitation 23.1

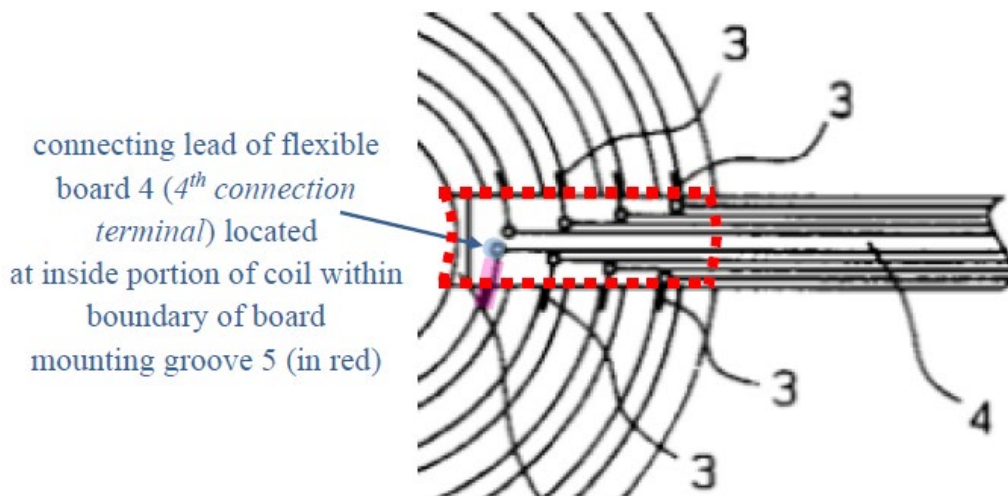
Proposed substitute claim 23 requires that "the third connection terminal is located within a horizontal boundary defining the receiving space and is located at one end of the coil that is at an outside portion of the conductive pattern." For this limitation, which Petitioner designates as limitation 23.1, Petitioner provides a cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 20.



Petitioner's version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that "one of the 'connecting leads' [shown with blue shading] of the flexible board 4 is located within a horizontal boundary defining the board mounting groove 5 (*receiving space*) and located/connected to the coil lead 3 [shown with pink shading] at an outside portion of the coil's conductive pattern." Pet. RMTA Opp. 20 (citing Ex. 1025, 4, Fig. 1). As the figure depicts, Petitioner identifies the connecting lead shown with blue shading as the recited third connection terminal, and outlines the boundary of board mounting groove 5 in red.

ii. Limitation 23.2

Proposed substitute claim 23 requires that "the fourth connection terminal is located within the horizontal boundary defining the receiving space and is located at the other end of the coil that is at the inside portion of the conductive pattern." For this limitation, which Petitioner designates as limitation 23.2, Petitioner provides another cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 21.

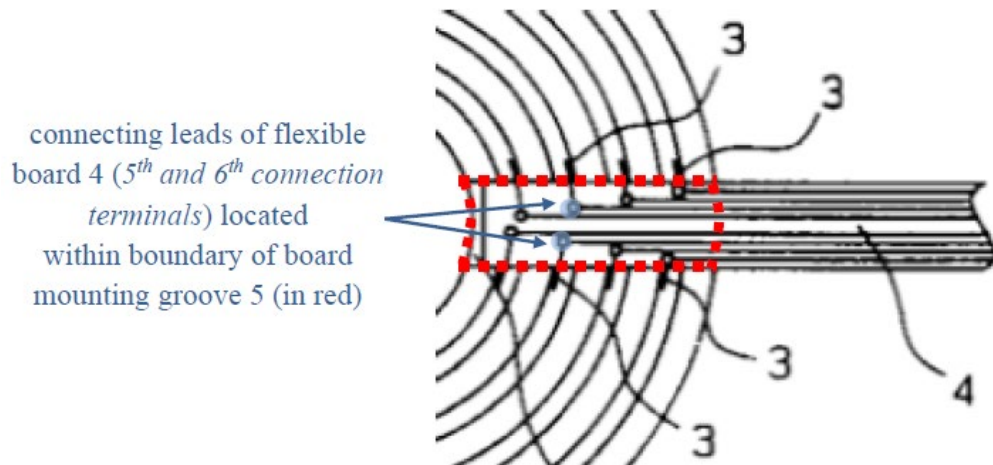


This version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that “the other of the ‘connecting leads’ [shown with blue shading] of the flexible board 4 is located within a horizontal boundary defining the board mounting groove 5 (*receiving space*) and located/connected to the coil lead 3 [shown with pink shading] at an inside portion of the coil’s conductive pattern.” Pet. RMTA Opp. 21 (citing Ex. 1025, 4, Fig. 1). As the figure depicts, Petitioner identifies the connecting lead shown with blue shading as the recited fourth connection terminal, and outlines the boundary of board mounting groove 5 in red.

iii. Limitation 23.3

Proposed substitute claim 23 requires that “the connecting unit comprises a fifth connecting terminal located within the horizontal boundary defining the receiving space and a sixth connecting terminal located within the horizontal boundary defining the receiving space.” For this limitation, which Petitioner designates as limitation 23.3, Petitioner provides yet

another cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 22.



This version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that “the flexible board 4 (*connecting unit*) includes a pair of ‘connecting leads’ for each coil, where the connecting leads are with[in] the horizontal boundary defining [the board mounting groove 5] (*receiving space*).” Pet. RMTA Opp. 21–22 (citing Ex. 1025, 4, Fig. 1). As the figure depicts, Petitioner identifies a pair of connecting leads shown with blue shading as the fifth and sixth connection terminals, and outlines the boundary of board mounting groove 5 in red.

iv. Limitation 23.4

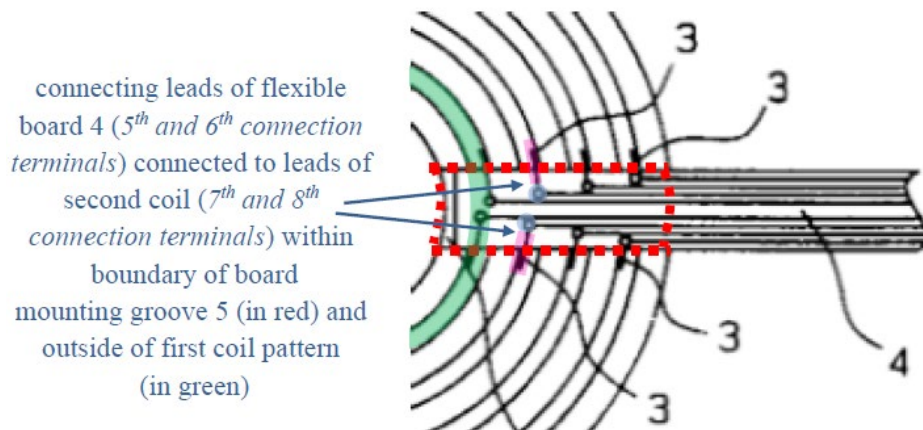
Proposed substitute claim 23 requires that “the short-range communication antenna comprises a seventh connection terminal and an eighth connection terminal.” For this limitation, which Petitioner designates as limitation 23.4, Petitioner asserts that “[w]hen Motoharu’s techniques are applied to Park, it would be obvious for Park’s NFC coil 135 to include two ‘leads’ (*seventh and eighth connection terminals*) for connection to the

flexible board (*connecting unit*), as taught by Motoharu. Pet. RMTA Opp. 22 (citing Ex. 1025, 4, Fig. 1). Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1026, 30). As discussed above with respect to limitation 23.3, Petitioner asserts that Motoharu’s Figure 1 shows that “the flexible board 4 (*connecting unit*) includes a pair of ‘connecting leads’ for each coil.” *Id.* at 21–22.

v. Limitations 23.5 and 23.6

Proposed substitute claim 23 requires that “the fifth connection terminal is connected to the seventh connection terminal of the short-range communication antenna within the horizontal boundary defining the receiving space and the sixth connection terminal is connected to the eighth connection terminal of the short-range communication antenna within the horizontal boundary defining the receiving space.” Petitioner designates this limitation as limitation 23.5. Pet. RMTA Opp. 22. Proposed substitute claim 23 further requires “the fifth connection terminal to the seventh connection terminal connection and the sixth connection terminal to the eighth connection terminal connection occur on the connecting unit at a location outside the conductive pattern of the coil.” Petitioner designates this limitation as limitation 23.6. *Id.* at 23.

For these limitations, Petitioner provides a cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Opp. 23.



This version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. Petitioner asserts that “when Motoharu’s techniques are applied to Park, it would be obvious for the two leads [shown with pink shading] of Park’s NFC coil 135 to be respectively connected to two ‘connection leads’ [shown with blue shading] of the flexible board (*connecting unit*) within a horizontal boundary defining the board mounting groove 5 (*receiving space*), as taught and illustrated by Motoharu.” Pet. RMTA Opp. 23 (citing Ex. 1025, 4, Fig. 1). According to Petitioner, “[t]hese connections for Park’s NFC coil 135 would be at a location outside the conductive pattern of Park’s wireless charging coil 133 (hypothetically shown in green . . .).” *Id.* Petitioner relies on the declaration testimony of Dr. Phinney. *Id.* (citing Ex. 1026, 31–32).

vi. Limitation 23.7

Proposed substitute claim 23 requires that “the connecting unit comprises a flexible circuit board with the third, fourth, fifth, and sixth connection terminals disposed on a surface of the connecting unit.” For this limitation, which Petitioner designates as limitation 23.7, Petitioner asserts that “Motoharu teaches a ‘flexible board 4’ with ‘connecting leads’ on its

surface to which the coil leads are connected.” Pet. RMTA Opp. 24 (citing Ex. 1025, 4, Fig. 1). As depicted in Petitioner’s various versions of Figure 1 in Motoharu, reproduced above in connection with limitations 23.1, 23.2, and 23.3, the leads of flexible board 4 (shown with blue shading) are disposed on a surface of flexible board 4. *See id.* at 20–22.

vii. *Limitation 23.8*

Proposed substitute claim 23 requires that “the substrate has a horizontal upper surface and a horizontal lower surface opposite the upper surface,” and that “the receiving space extends between the horizontal upper surface and the horizontal lower surface of the substrate continually from inside the coil to outside the coil.” For this limitation, which Petitioner designates as limitation 23.8, Petitioner provides an annotated version of Figure 2 of Motoharu, reproduced below. Pet. RMTA Opp. 24.

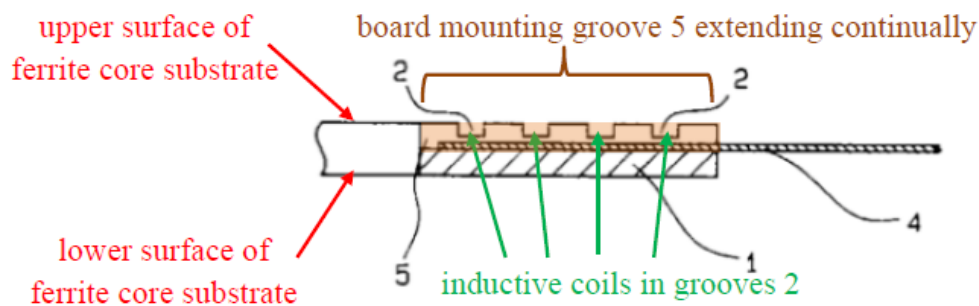


Figure 2 of Motoharu, as annotated by Petitioner, is a cross-sectional view of the rotary transformer in Figure 1 of Motoharu. *See* Ex. 1025, 4. Referring to its version of Figure 2 of Motoharu, Petitioner asserts that Motoharu’s “ferrite core substrate [1] includes a horizontal upper surface and a horizontal lower surface opposite the upper surface, where the board mounting groove 5 [shown with brown shading] extends between the upper surface and lower surface continually from inside the innermost coil to

outside of the outermost coil.” Pet. RMTA Opp. 24. Petitioner adds that “the claim language does not require the receiving space to extend ‘completely’ between the horizontal upper surface and the horizontal lower surface,” and, “[a]s such, Motoharu’s disclosure of the board mounting groove that extends approximately halfway between the upper surface and the lower surface of the ferrite core substrate continually is sufficient to meet this claim limitation.” *Id.* at 24–25.

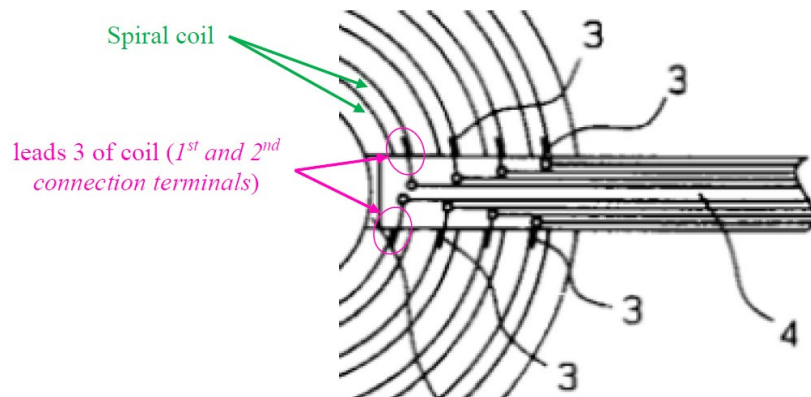
viii. The Parties’ Disputes

Patent Owner disputes Petitioner’s analysis for proposed substitute claim 23. For example, Patent Owner argues that Motoharu “fails to disclose separate and distinct first-fourth connection terminals.” PO RMTA Reply 10. Patent Owner asserts that “the Board construed the first and second connection terminals as separate and distinct from the coil and also from the connection unit” in a related case, and that “[t]he same construction applies here.” *Id.*; *see also id.* at 1–2 (referencing related case IPR2022-00118, Paper 44). Patent Owner also asserts that “[b]ecause the coil unit is separate and distinct from the connecting unit, the third and fourth connection terminals are also separate and distinct from the coil unit.” *Id.* at 10. According to Patent Owner, “Motoharu[] describes the leads 3 of the coil soldered to the connecting leads on the flexible board 4,” and, therefore, “Park and Motoharu fail to disclose the limitations of claim 23.” *Id.*

Petitioner responds that “[a]lthough the ’565 patent is the parent of the [patent involved in the related case], the ’565 claims are substantively different with respect to the ‘coil,’ ‘coil unit,’ and ‘first and second connection terminals.’” Pet. RMTA Sur-reply 10. As support, Petitioner

asserts that one of the challenged claims of the related patent “merely recites a ‘coil’ and first and second connection terminals ‘connected’ to the coil,” whereas the ’565 patent “recites a ‘**coil unit** comprising a first connection terminal, a second connection terminal, and a coil,’ where ‘the first connection terminal is **located** at one end of the coil and the second connection terminal is **located** at the other end of the coil.’” *Id.* These latter claim limitations recited in the ’565 patent also are recited in Patent Owner’s proposed substitute claims. RMTA 25–27. Petitioner asserts that “to the extent Patent Owner is relying upon the Board’s claim construction analysis in [the related case], such reliance should be given little weight.” Pet. RMTA Sur-reply 10.

Petitioner further provides a cropped and annotated version of Figure 1 of Motoharu, reproduced below. Pet. RMTA Sur-reply 11.



Petitioner’s version of Figure 1 of Motoharu is a partial top view of a rotary transformer. *See* Ex. 1025, 4. According to Petitioner, “Motoharu teaches exactly what is recited in the substitute claims of the ’565 patent.” Pet. RMTA Sur-reply 10. Referring to the annotated figure, Petitioner asserts that “Motoharu’s *coil unit* includes a spiral coil with ‘leads 3’ (also called ‘terminals’) located at each end (*first and second connection terminals*), where the leads 3 are connected via solder to two ‘connecting leads’ (*third*

and fourth connection terminals) on the flexible board 4.” *Id.* at 10–11.

Referring still to the annotated figure, Petitioner also asserts that “even if the Board’s . . . claim construction [in the related case] is applied to substitute claims 21–23, Motoharu nevertheless illustrates that its ‘leads 3’ are separate and distinct from the spiral coil in Fig. 1.” *Id.* at 11.

Petitioner adds that “[s]oldered connection terminals are expressly within the scope of the claims.” Pet. RMTA Sur-reply 11. As support, Petitioner directs us to where Patent Owner relies on Figure 28 of the ’012 application for written description support, and asserts that Figure 28 “shows **solder 30** between connection terminals.” *Id.* (citing RMTA 9–10 (citing Ex. 1002, 665 (Figure 28))).

We agree with Petitioner. As Petitioner points out regarding the recited first and second connection terminals, Motoharu refers to leads 3 of the coil as “terminals.” Pet. RMTA Sur-reply 10–11 (citing Ex. 1025, 4); Ex. 1025, 4 (“[T]he terminals of the coils are connected to the board.”); *see also* Ex. 1025, 1 (“Scope” section explaining that “the terminals of these coils are connected to the board”). We understand a terminal and a wire to be separate and distinct components. *See* Ex. 1025, 4 (describing “coils . . . made of a conductive wire” and “terminals of the coils”). As Petitioner also points out, Motoharu illustrates leads 3 as separate and distinct from the coil. Pet. RMTA Sur-reply 11 (citing Ex. 1025, Fig. 1). In particular, Motoharu illustrates leads 3 without the coil. Ex. 1025, Fig. 1; *see also id.* at 2 (referring to “coils (not shown)” in Fig. 4¹¹). Moreover, we note that Park

¹¹ Although Figure 4 of Motoharu describes “a conventional example of a rotary transformer,” it appears that the coils in Motoharu’s rotary transformer also are not shown in Figure 1 of Motoharu. *Compare*

similarly illustrates terminals as separate and distinct components. *See* Ex. 1006, Fig. 2 (connection ends 143, 145), Fig. 5 (terminals 149). Because we find that Petitioner’s proposed combination of Park and Motoharu teaches a coil and terminals as separate components, we do not address whether the claim language actually requires the components to be separate.

Regarding the recited third and fourth connection terminals, we disagree with Patent Owner’s argument that “Park and Motoharu fail to disclose the limitations of [proposed substitute] claim 23” because “Motoharu[] describes the leads 3 of the coil soldered to the connecting leads on the flexible board 4.” *See* PO RMTA Reply 10. As Petitioner points out, Patent Owner relies on Figure 28 of the ’012 application in its Revised Motion to Amend as providing written description support for its proposed substitute claims. Pet. RMTA Sur-reply 11 (citing RMTA 10). Patent Owner relies on Figure 28 in particular as “showing the connecting unit 300 . . . separate from the substrate 100 and coil unit 200, except at the connection points 210-310 and 220-320.” RMTA 10. Petitioner correctly observes that Figure 28 shows solder 30 between the connection terminals. Pet. RMTA Sur-reply 11. The ’012 application specifically teaches that “[t]he first connection terminal 310 of connecting unit 300 may be connected to the first connection terminal 210 of the coil unit 200 by a solder 30, [and] the second connection terminal 320 of the connecting unit 300 may be connected to the second connection terminal 220 of the coil unit

Ex. 1025, Fig. 4, *with id.* at Fig. 1.

200 by the solder 30.” Ex. 1002, 642 ll. 10–16; *see also* Ex. 1001, 18:23–28 (corresponding disclosure) (cited by Pet. RMTA Sur-reply 11).

On the record before us, we are persuaded that Petitioner’s proposed combination of Park and Motoharu teaches the recited first, second, third, and fourth connection terminals.

Patent Owner additionally argues that “Petitioner has further failed to provide sufficient reasons for the combination of Park and Motoharu,” and that Petitioner “did not explain how and why one skilled in the art would modify Park and Motoharu to achieve the claimed invention.” PO RMTA Reply 10–11. We disagree. As discussed above with respect to proposed substitute claim 21 (from which proposed substitute claim 23 depends), Petitioner contends that an ordinarily skilled artisan “would . . . have been motivated to apply Motoharu’s groove and board technique to Park’s substantially similar coil module to achieve a . . . thinner profile.” Pet. RMTA Opp. 7; *see also id.* at 5–8. Petitioner asserts that “Motoharu teaches a technique to further reduce the thickness of a transformer coil module having accommodation grooves for multiple, concentric coils like Park’s[] . . . by replacing conventional coil leads (such as those in Park) with coil leads that connect to a flexible circuit board disposed in a ‘board mounting groove’ below the coils.” *Id.* at 6 (citing Ex. 1025, 2–5, Figs. 1, 2). Petitioner’s reasoning is consistent with Motoharu’s explicit teaching that its rotary transformer uses “a board mounting groove in which the board is mounted, and the coil leads are connected to it, thereby achieving a thinner rotary transformer.” Ex. 1025, 5–6.

Accordingly, we are persuaded that Petitioner’s proffered reasoning for modifying Park’s coil module to include Motoharu’s “board mounting

groove in which [a] board is mounted, and . . . coil leads are connected to it,” to achieve, for example, a thinner device, provides sufficient articulated reasoning with rational underpinnings to support the legal conclusion of obviousness. And, based on Petitioner’s argument and evidence as discussed above, we are further persuaded that Petitioner’s proposed combination of Park and Motoharu teaches all the limitations of proposed substitute claim 23.

3. *Summary*

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claims 21–23 would have been obvious over Park and Motoharu.

V. PETITIONER’S MOTION TO STRIKE

Petitioner filed a Motion to Strike Exhibit 2017 and Exhibit 2018. Paper 28. Patent Owner opposed. Paper 31. Exhibit 2017 is a transcript of a deposition of Dr. Phinney. Paper 28, 2. Exhibit 2018 is a copy of U.S. Patent No. 10,674,610 B1. *Id.*

We do not rely on either of Exhibits 2017 and 2018. Accordingly, Petitioner’s Motion to Strike is dismissed as moot.

VI. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–12 and 14–

20 of the '565 patent are unpatentable.¹² We also determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 13 is unpatentable. In addition, we determine that Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claims 21–23 are unpatentable. Our determinations are summarized below.

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–8, 11–18	103	Hong, Park	1–8, 11, 12, 14–18	13
9, 19	103	Hong, Park, Hasegawa	9, 19	
10, 20	103	Hong, Park, Sung	10, 20	
Overall Outcome			1–12, 14–20	13

Motion to Amend Outcome	Claims
Original Claims Cancelled by Amendment	
Substitute Claims Proposed in the Amendment	21–23
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	21–23
Substitute Claims: Not Reached	

¹² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this Decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

VII. ORDER

For the reasons given, it is

ORDERED that claims 1–12 and 14–20 of the '565 patent have been shown to be unpatentable;

FURTHER ORDERED that claim 13 of the '565 patent has *not* been shown to be unpatentable;

FURTHER ORDERED that Patent Owner's Revised Motion to Amend is denied as to the request to add proposed substitute claims 21–23 to the '565 patent;

FURTHER ORDERED that Petitioner's Motion to Strike is dismissed as moot; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2022-00350
Patent 9,806,565 B2

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