

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INDUCTEV, INC.,
Petitioner,

v.

WITRICITY CORPORATION,
Patent Owner.

IPR2024-00140
Patent 8,466,654 B2

Before JAMESON LEE, CHRISTOPHER L. OGDEN, and
SCOTT RAEVSKY, *Administrative Patent Judges*.

OGDEN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

InductEV, Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) under 35 U.S.C. §§ 311–319 requesting *inter partes* review (“IPR”) of claims 1, 4–10, 12–16, 18, and 19 of U.S. Patent No. 8,466,654 B2 (Ex. 1001, “the ’654 patent”). WiTricity Corporation (“Patent Owner”) filed a Patent Owner Response (Paper 21, “PO Resp.”), Petitioner filed a Reply to the Patent Owner Response (Paper 31, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 34, “PO Sur-reply”).

We held a combined oral hearing in this proceeding and IPR2024-00105 on March 5, 2025, and the transcript is entered into the record. Paper 37 (“Tr.”).

This is a final written decision under 35 U.S.C. § 318(a) as to whether the claims challenged in the *inter partes* review are unpatentable. For the reasons below, we conclude that Petitioner has shown that claims 1, 7–10, 12–16, 18, and 19 of the ’654 patent are unpatentable but that Petitioner has not shown that claims 4–6 are unpatentable.

II. BACKGROUND

A. THE ’654 PATENT (EX. 1001)

The ’654 patent describes a wireless “battery-charging system for a vehicle.” Ex. 1001, code (57). It involves the transfer of power that “couples energy from a primary structure (a transmitter) to a distal positioned secondary structure (a receiver) via a magnetic field.” *Id.* at 1:18–20. An example of this is shown in Figure 1, reproduced below:

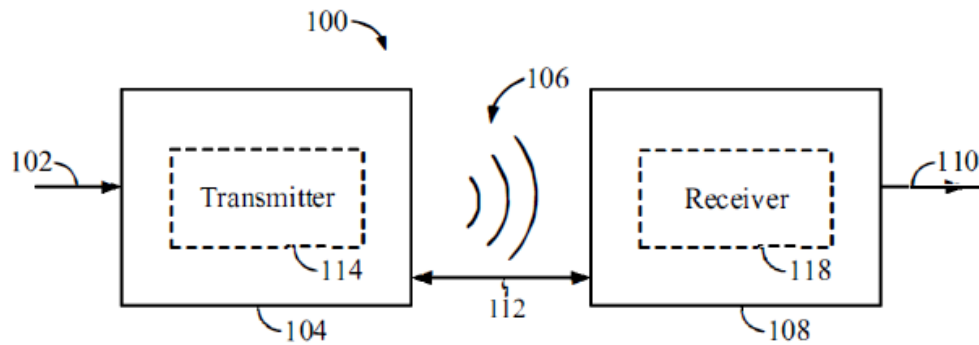


FIG. 1

Figure 1 depicts wireless charging system 1001 in which input power 102 is provided to transmitter 104, which generates radiated field 106. Ex. 1001, 2:11–15. Receiver 108 couples to radiated field 106 and generates output power 110. *Id.* at 2:15–18. Transmitter 104 and receiver 108 are separated by distance 112. *Id.* at 2:18–19. They each contain antennas 114 and 118, respectively, which preferably transfer power “by coupling a large portion of the energy in the near[]field of the transmitting antenna to a receiving antenna rather than propagating most of the energy in the electromagnetic wave to the far field.” *Id.* at 2:31–36. The ’654 patent refers to the “area around . . . antennas 114 and 118 where this near-field coupling may occur” as “a coupling-mode region.” *Id.* at 2:38–40.

According to the ’654 patent, antennas (such as transmitting antenna 114 and receiving antenna 118) may be loop antennas, and may “include an air core or a physical core such as a ferrite core” which “may decrease the effect of extraneous objects.” Ex. 1001, 2:62–64. According to the ’654 patent, air cores have certain advantages over ferrite cores, including that “an air core loop antenna allows the placement of other components within the core area” and may better allow the transmitting and receiving loops to be placed near each other on the same plane, “where the coupled-mode

region of the transmit antenna . . . may be more powerful.” *Id.* at 3:7–13. In addition, “[low frequency f]errites may be used as magnetic shield[s] to prevent fields [from] generating eddy currents in metallic parts of the antenna surrounding.” *Id.* at 3:1–3.

Figure 5, reproduced below, depicts the wireless transfer structures as part of a vehicle charging system.

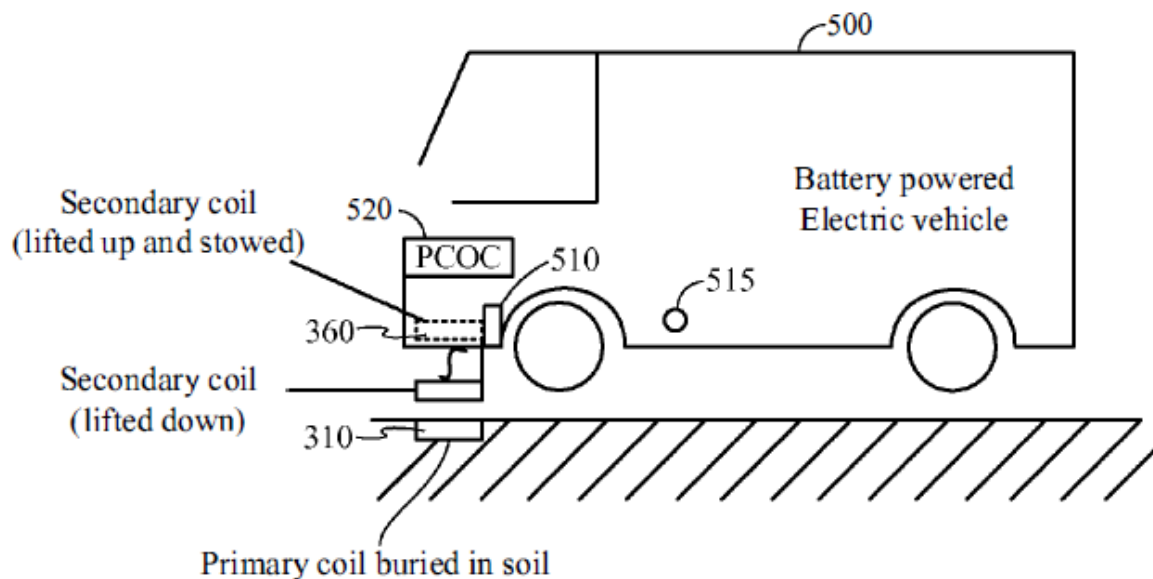


FIG. 5

Figure 5 depicts “primary” (transmitting) coil 310, which “delivers the charging power to the vehicle [500]” and is “buried into the soil of a parking lot at a position corresponding to where the secondary [receiving] coil 360 is likely to be on [vehicle 500].” Ex. 1001, 5:46–49. Secondary coil 360 can be lowered from vehicle 500 to be closer to primary coil 310 via lifting mechanism 510 as guided by processor 520. *Id.* at 5:54–61.

The charging system may also include a guidance system for coarse positioning of the vehicle so that it arrives at the proper location in which the coils are nearly aligned, relying for alignment on “a degree of coupling

between the primary . . . and secondary [coils]” based on, for example, the power received from the primary coil. *Id.* at 6:5:13. The system can also include “fine positioning control” in the X and Y axes, which provides fine movement of either the primary or secondary coils for better alignment. *See id.* at 5:66–67, 6:15–24.

B. CHALLENGED CLAIMS AND GROUNDS

Representative independent claim 13 is as follows:

- 13[pre] 13. A method, comprising:
- 13[a] guiding a receiving antenna of a vehicle to a first alignment position relative to a transmitting antenna;
- 13[b] responsive to detecting a degree of coupling in the first alignment position between the receiving antenna and the transmitting antenna that is measured at the receiving antenna, moving one of the receiving antenna and the transmitting antenna from the first alignment position to a second alignment position to improve alignment of the receiving antenna with the transmitting antenna and improve the degree of coupling.

Ex. 1001, 9:23–10:5 (Petitioner’s reference numbers added).

Petitioner argues four grounds for *inter partes* review, as summarized in the following table (*see* Pet. 2, 7):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
13, 15	102(a), (b), (e) ¹	Odachi, ²
1, 7, 18	103(a)	Odachi, Wang ³
4–6	103(a)	Odachi, Wang, Partovi ⁴
8–10, 12–14, 16, 19	103(a)	Ross, ⁵ Wang

C. DECLARATORY TESTIMONY

Petitioner submits two declarations by Dr. Mark Allen. Exs. 1003, 1032. Patent Owner submits three declarations by Dr. Mark N. Horenstein. Exs. 2001, 2005, 2010.

D. RELATED PROCEEDINGS

As a related matter, the parties identify *WiTricity Corp. v. InductEV, Inc.*, No. 23-cv-01099 (E.D. Penn. filed Mar. 21, 2023); *transferred*, No. 24-cv-00406 (D. Del. Apr. 1, 2024). Pet. 76–77; Paper 4, 1.

¹ 35 U.S.C. §§ 102, 103, *amended by* Leahy–Smith America Invents Act (“AIA”), Pub. L. No. 112-29 §§ 102, 103, sec. (n)(1), 125 Stat. 284, 287, 293 (2011) (effective Mar. 16, 2013). InductEV applies the pre-AIA version of §§ 102 and 103. *See* Pet. 7, 20, 39, 47.

² Odachi et al., US 5,617,003, issued Apr. 1, 1997 (Ex. 1005).

³ Chwei-Sen Wang, Design Considerations for Inductively Coupled Power Transfer Systems (2004) (Ph.D. thesis, University of Auckland) (Ex. 1008).

⁴ Partovi et al., US 7,952,322 B2, issued May 31, 2011 (Ex. 1006).

⁵ Ross, US 5,669,470, issued Sept. 23, 1997 (Ex. 1007).

III. ANALYSIS

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To assess the level of ordinary skill, we construct a hypothetical “person of ordinary skill in the art,” from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct “presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Petitioner argues that a person of ordinary skill in the art “would have had . . . a bachelor’s degree in electrical engineering, microelectronics, or equivalent and . . . two to three years of industry or research experience in the field of wireless energy transfer,” and that “a higher level of education or skill might make up for less experience, and vice-versa.” Pet. 6 (citing Ex. 1003 ¶¶ 39–44). Patent Owner does not contest this. *See* PO Resp.

Petitioner’s proposed articulation is supported by testimonial evidence and appears to be consistent with the types of problems and solutions in the ’654 patent. *See* Ex. 1001, 1:15–28. We adopt it for this decision.

B. CLAIM CONSTRUCTION

In an *inter partes* review, we construe a patent claim “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).” 37 C.F.R. § 42.100(b). This generally includes “construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* The ordinary and customary meaning of a claim term “is its meaning to the ordinary artisan after reading the entire patent” and “as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1313, 1321.

In its Petition, Petitioner argues that the challenged claims are unpatentable “under any reasonable construction [of the claim terms], including their plain meaning,” and does not propose any explicit claim constructions. Pet. 6–7 (citing Ex. 1003 ¶¶ 58–59).

Patent Owner argues that we should construe “transmitting antenna” and “receiving antenna” as follows:

Term	Patent Owner’s Proposed Construction
transmitting antenna	“a primary coil that produces a near-field component of flux into free space that is intercepted by a secondary coil to effect resonant inductive coupling”
receiving antenna	“a secondary coil that intercepts and receives a near-field component of flux in free space that is generated by a primary coil to effect resonant inductive coupling”

PO Resp. 8; *id.* at 12 (citing Ex. 2001 ¶ 26). According to Patent Owner, the “near field” is a region within a particular defined distance from a transmitting antenna, as compared to the “far field,” which is the region beyond that distance “in which the transmitted energy from an antenna behaves as if it were emanating from a point source in the vicinity of [the] antenna.” *Id.* at 11–12 (quoting Ex. 2005 ¶ 38).

Petitioner disagrees with Patent Owner’s proposed constructions and instead proposes the following:

Term	Petitioner’s Proposed Construction
transmitting antenna	“an antenna that transmits energy”
receiving antenna	“an antenna that receives energy”

Pet. Reply 2 (citing Ex. 1001, 2:26–39 (an embodiment includes “a transmit antenna . . . for providing a means for energy transmission and . . . a receive antenna . . . for providing a means for energy reception”); Ex. 1032 ¶¶ 10–21).

We agree with Petitioner that the evidence does not suggest (and Patent Owner does not explicitly argue) that the terms “transmitting antenna” and “receiving” antenna depart from the ordinary and customary meanings of those terms. Pet. 1–2. However, for the reasons discussed below, the outcome of our decision would be the same whether we adopted Petitioner’s or Patent Owner’s proposed construction. Thus, we need not adopt either party’s proposed construction for this decision. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

C. ANTICIPATION GROUND BASED ON ODACHI (CLAIMS 13, 15)

Petitioner argues that claims 13 and 15 are unpatentable under §§ 102(a), (b), and (e) as anticipated by Odachi. Pet. 2, 7.

To show anticipation under § 102, a petitioner must locate every element in a claim, arranged as recited in the claim, in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed.

Cir. 2008). The limitations may be present in the reference “either explicitly or inherently.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). In making this determination, we consider the reference “together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

For the reasons below, Petitioner has shown that Odachi anticipates claims 13 and 15.

1. Overview of Odachi

Odachi describes a method of “charging a battery of an electric vehicle through inductive coupling between a primary inductive device” on a moveable arm of a ground charger, and “a secondary inductive device” mounted on the bottom of the vehicle. Ex. 1005, code (57). Elements involved in the method are depicted in Figure 6, reproduced below:

Fig. 6

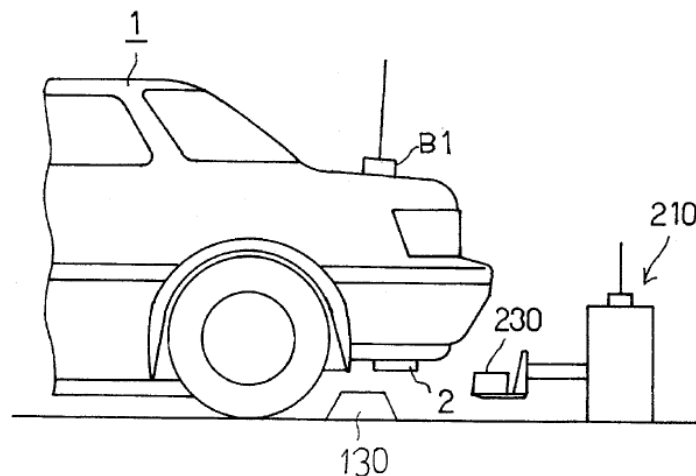


Figure 6 depicts electric vehicle 1, with secondary inductive device 2 on the bottom of its rear end, and wheels parked adjacent to wheel stops 130 in a garage. Ex. 1001, 8:1–15. Depicted behind wheel stops 130 is ground battery

charger 210, which includes primary inductive device 230 on a moveable support arm. *Id.* at 8:16–22.

Figure 12, reproduced below, depicts primary inductive coupler 230 and secondary inductive coupler 2 (not labeled) in more detail:

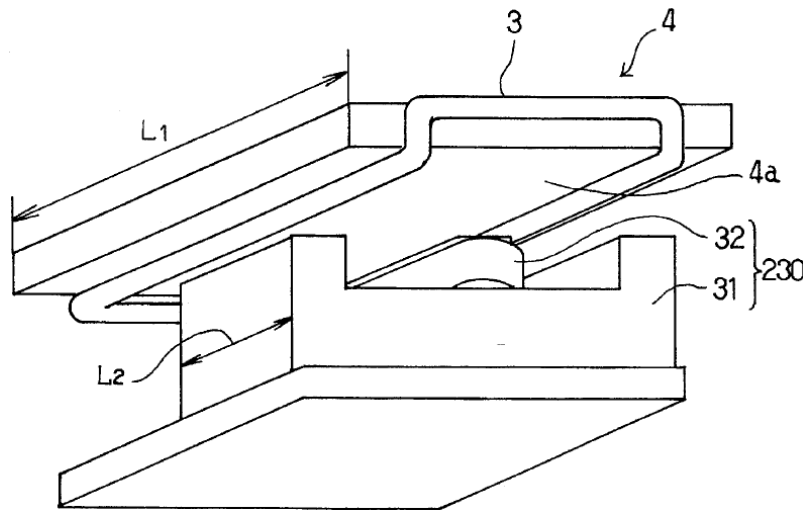


Figure 12 depicts primary inductive coupler 230 at the bottom, which includes E-shaped core 31 and primary coil 32 which is wound around the middle projection of core 31. Ex. 1005, 8:40–43. Secondary inductive coupler 2 (not labeled) is depicted above that, and includes core 3, which is a flat plate fixed at its top end to the bottom of the vehicle and fixed at its bottom end to secondary coil 4, which is connected to the vehicle’s battery. *Id.* at 8:3–11. The interior of secondary coil 4 forms oval-shaped cavity 4a, into which primary coil 32 can fit when the primary and secondary inductive couplers are magnetically coupled for charging. *Id.* at 8:9–10, 8:43–54.

Odachi discloses that “[t]he position where the primary inductive device should be placed with respect to the secondary inductive device just before coupling thereof is determined on the basis of the change of the check current which is monitored while moving the primary inductive device

relative to the secondary inductive device.” Ex. 1005, code (57). To illustrate this, Figure 4 is reproduced below:

Fig. 4

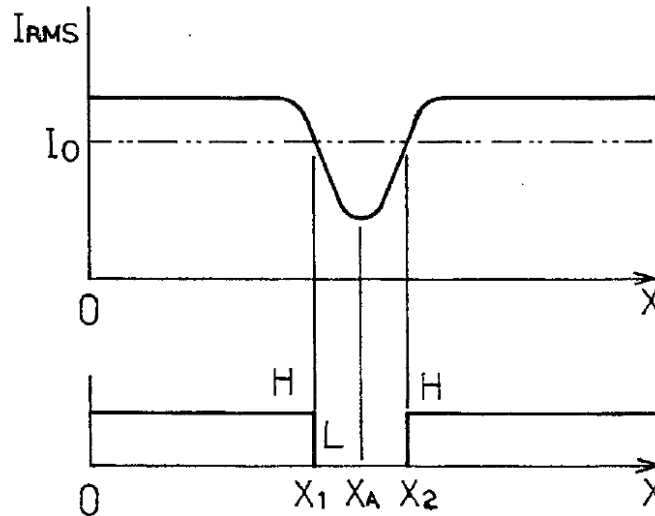


Figure 4 is a graph showing “electric current I_{RMS} flowing in the coil of the primary inductive device and the output signals H and L generated to a controller during the positioning mode operation.” Ex. 1005, 3:38–41. When a vehicle is parked, the controller is set into positioning mode. *Id.* at 5:42–56. The power circuit then provides check current I_{RMS} to the primary coil 32, and the carriage holding primary inductive coupler 230 starts to move at a constant rate in the x -direction while the system monitors current I_{RMS} . *Id.* at 5:56–64. A circuit “generates a discriminating H (high) or L (low) signal in response to the variation in the current I_{RMS} . *Id.* at 5:65–67. As primary inductive coupler 230 approaches the corresponding inductive coupler in the vehicle, I_{RMS} drops until it reaches a minimum and then begins to rise. *Id.* at 6:8–21. The coils are in alignment when I_{RMS} is at its minimum. *Id.* at 6:21–27.

“ X_1 represents a carriage position along the X-axis where the discriminating signal from the circuit 25 changes from H to L and X_2 a carriage position where the discriminating signal changes from L to H, as measured from the home position of the carriage 9, respectively.” *Id.* at 6:34–38. X_A is an estimate of the minimum I_{RMS} value, based on calculating the midpoint between X_1 and X_2 . *Id.* at 6:43–45.

Alternatively to monitoring I_{RMS} , “positions X_1 and X_2 may be determined by monitoring a voltage (V_{RMS}) which is induced across the secondary coil on the vehicle by applying an AC voltage across the primary coil.” *Id.* at 13:42–46.

2. *Claim 13*

(a) Preamble

The preamble of claim 13 recites “[a] method.” Ex. 1001, 9:23. Petitioner argues that, to the extent the preamble is limiting, Odachi discloses a method as recited. Pet. 11 (citing Ex. 1005, code (57); Ex. 1001 ¶¶ 100–101). Patent Owner does not contest this. *See* PO Resp.

Without deciding whether the preamble is limiting, we find Petitioner’s arguments sufficiently persuasive that Odachi discloses the preamble of claim 13.

(b) Limitation 13[a]

Limitation 13[a] recites “guiding a receiving antenna of a vehicle to a first alignment position relative to a transmitting antenna.” Ex. 1001, 9:24–25.

(1) *Arguments in the Petition*

Petitioner argues that the recited “receiving antenna” corresponds to Odachi’s secondary inductive coupler 2, the recited “transmitting antenna” corresponds to primary inductive coupler 230, and the recited “guiding” step corresponds to the driver parking the car adjacent to wheel stops 130 such that inductive couplers 2 and 230 are adjacent to each other. Pet. 11–13 (citing Ex. 1005, 4:6–15, 8:1–28, 8:40–54, 9:52–65, 10:36–11:17, 11:60–12:26, 12:43–52, Figs. 6, 7, 11, 14; Ex. 1003 ¶¶ 102–109).⁶

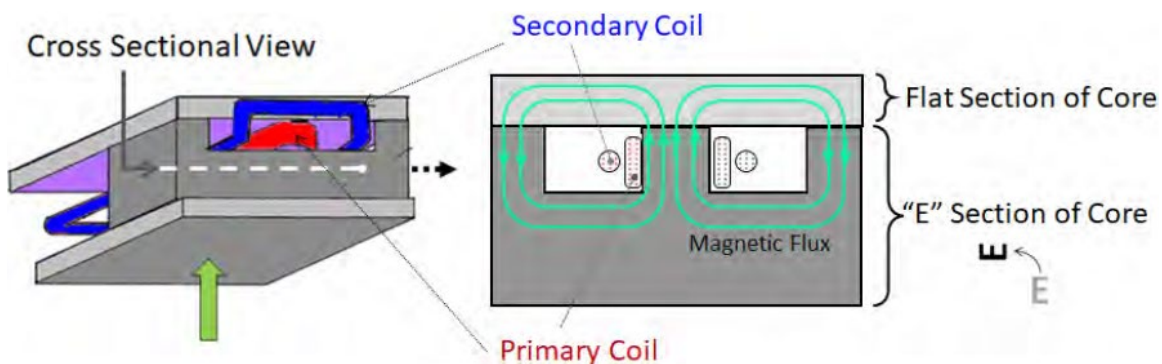
(2) *Arguments in Patent Owner’s Response*

In response, Patent Owner argues that Odachi does not describe a “transmitting antenna” or a “receiving antenna” as Patent Owner understands those terms. PO Resp. 19–34. According to Patent Owner, “Odachi describes a traditional transformer, not an antenna.” *Id.* at 19–20. Patent Owner contends that “the fields from a transmitting antenna are emitted into free space and away from the antenna.” *Id.* at 22–23 (citing Ex. 2006, 2, 5, 8; Ex. 2010 ¶¶ 34–36); *see also id.* at 24 (arguing that a transmitting antenna “*must be capable* of producing a far field, even if the far field is not used in the transfer of power.”).

⁶ In its Reply, Petitioner argues, alternatively, that it would have been obvious to modify Odachi to perform wireless power transfer without inductive couplers 2 and 230 ever being in contact. Pet. Reply 11 (citing Pet. 23–25; Ex. 1032 ¶ 37). Patent Owner objects to this as untimely. PO Sur-reply 9–10. Because we find Petitioner persuasive on its primary anticipation argument, we need not address this alternative argument, or its timeliness, in our decision.

By contrast, Patent Owner argues that “a person of skill in the art would understand that a “transformer” is a device that is utilized to transfer electrical energy from one circuit to another via magnetic or electromagnetic induction.” *Id.* at 20 (citing Ex. 2006, 8; Ex. 2010 ¶ 34). Thus, it differs from an antenna in that a transformer includes “a magnetic core structure, usually made from ferrite composite,” and achieves inductive coupling by “rel[ying] solely on the routing of the magnetic flux which is constrained to remain in the core.” *Id.* at 20 (citing Ex. 2001 ¶ 27; Ex. 2010 ¶¶ 31, 34); *see also id.* at 23–24 (arguing that “[a] transformer *requires* a core to operate and *cannot* produce a far field.” (citing Ex. 2010 ¶ 41)).

According to Patent Owner, Odachi’s structure operates as a transformer because when Odachi’s inductive couplers 2 and 230 are engaged, the magnetic flux lines circulate within the ferrite core structure as depicted in the modified illustration below, based on Figure 12:



PO Resp. 21; *accord* Ex. 2010 ¶ 29. On the left of this modified figure, couplers 2 and 230 are shown in an engaged position with primary coil 32 colored red and secondary coil 4 colored blue. On the right is a cross-sectional view with flat core 3 and E-shaped core 31 depicted as a single structure with two cavities, and Patent Owner adds green circles around the cavities labeled as “magnetic flux.” *See id.* at 21; *see also id.* at 24–25

(providing a similar modified version of Figure 12). According to Petitioner, this structure “is an E-core transformer that produces only the induction-field⁷ component, but no near field or far field. *Id.* at 24 (citing Ex. 2001 ¶¶ 29–33; Ex. 2010 ¶ 43).

Patent Owner argues that certain passages in the ’654 patent, Odachi, Ross, and Wang support this proposed distinction between an antenna and a transformer. PO Resp. 25–28 (citing Ex. 1:15–22; Ex. 1005, 4:34–44, 7:23–26, 8:43–48, 9:48–51, 11:60–12:7; Ex. 1007, 9:30–43; Ex. 1008, 1, 13; Ex. 2001 ¶¶ 29–33, 44). Patent Owner points to a passage in Wang describing power transfer that occurs “*without contact*,” and Patent Owner distinguishes that from “a transformer that uses a common core to contain magnetic flux.” *Id.* at 27–28 (quoting Ex. 1008, 1).

Patent Owner acknowledges that “electromagnetic induction occurs between the coupler and the receptacle” during the alignment phase before Odachi’s inductive couplers 2 and 230 come into contact. PO Resp. 28 (citing Ex. 1005, 6:1–6). But according to Patent Owner, “[e]ven though at this point the primary core and the secondary core may not be in contact yet, the two cores still act to confine or guide the magnetic flux lines, rather than radiate them into free space.” *Id.* at 28–29 (citing Ex. 2010 ¶ 69); *see also* PO Sur-reply 7–8 (citing Ex. 1041, 2:22–24, 3:28–31, Fig. 3(a)) (reiterating the argument that ferrite structures can confine magnetic flux lines).

⁷ Patent Owner argues that the induction field is “the portion of the electromagnetic field which behaves as if *permanently associated with* [the transmitting antenna].” PO Resp. 11 (citing Ex. 2012, 3)

Patent Owner also acknowledges the '654 patent discloses using a ferrite core with a “loop antenna” to “decrease the effect of extraneous objects.” PO Resp. 30 (emphasis omitted) (quoting Ex. 1001, 2:62–64). But according to Patent Owner, a person of ordinary skill in the art would have understood that this refers to “the known technique of placing a thin ferrite disk beneath or inside the transmitting resonator to limit eddy currents in a mounting structure made of metal.” *Id.* at 30–33 (citing Ex. 2010 ¶ 51). Patent Owner argues that in this configuration, unlike Odachi’s configuration, “the transmitting antenna still radiates energy in the near field, despite the presence of the ferrite core.” *Id.* at 33 (citing Ex. 1001, 2:63–64, 3:1; Ex. 2007, Fig. 3; Ex. 2008, Fig. 3; Ex. 2010 ¶¶ 52–54, 56); *see also* PO Sur-reply 5–7 (reiterating the argument).

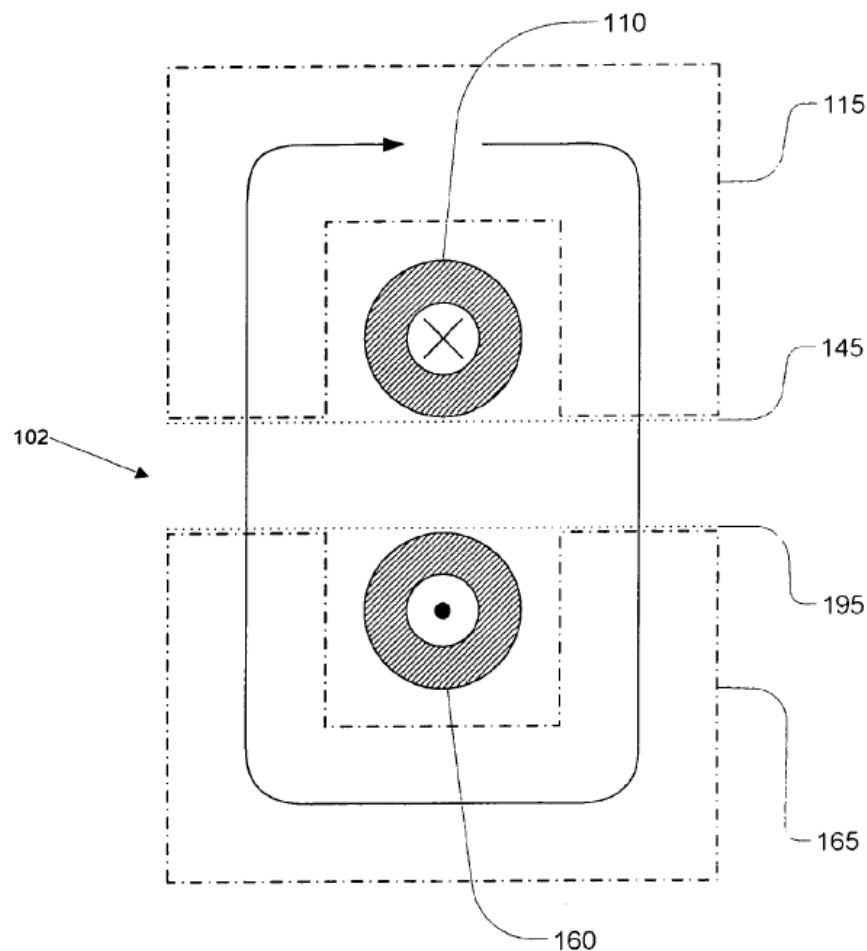
(3) *Arguments in Petitioner’s Reply and Patent Owner’s Sur-reply*

(a) *Whether Flux Lines are Confined to Odachi’s Cores*

In its Reply, Petitioner argues that “Odachi discloses and renders obvious the claims even under [Patent Owner]’s constructions.” Pet. Reply 5. Petitioner argues that Odachi’s structures are equivalent to a loop antenna, “wrapped around a ‘core such as a ferrite core,’ also known as a ‘magnetic antenna,’” as disclosed in the '654 patent. *Id.* (quoting Ex. 1001, 2:59–63) (citing Ex. 1001, 1:15–17, 1:36–37, Fig. 3; Ex. 1032 ¶¶ 22–26); *see also id.* at 6–9 & n.2 (citing Ex. 1001, 1:15–17, 1:36–37, Fig. 3; Ex. 1005, 5:18–25, 6:1–27, 7:27–50, 13:39–64; Ex. 1008, 38; Ex. 1037, 915; 4:8–10, Fig. 5; Ex. 1042, 620; Ex. 1043, 711; Ex. 1032 ¶¶ 15, 27–33, 47–52.) (arguing that even when primary inductive coupler 230 is coupled with secondary

inductive coupler 2, Odachi's primary coil 32 will still radiate into the surrounding space and flux lines will escape into the surrounding space).

Petitioner also argues that magnetic flux lines will escape from Odachi's inductive cores when they are not yet in contact and there is an air gap between them. Pet. Reply 8–9. Petitioner points to what it contends is a similar arrangement in Dobbs, US 2007/0188284 A1, published Aug. 16, 2007 (Ex. 1038), which describes a “shielded power coupling device.” Ex. 1038 ¶ 6. Figure 2 of Dobbs is reproduced below:



This figure is a cross-sectional view of two adjacent coils 110 and 160 surrounded by core materials 115 and 165. Ex. 1038 ¶ 17. According to Dobbs, when this structure is used in “power coupling devices . . . operating

at frequencies above 20 kHz, it can be expected that the structure of, say, ferrite and copper [in core half-shells 116 and 166] will generate a dipole field and will radiate strongly to the surrounding space.” *Id.* ¶ 54.

According to Petitioner, a person of ordinary skill in the art “would have understood that the same occurs in Odachi: its primary coil/core is separated from the secondary coil/core and will radiate strongly to the surrounding space.” Pet. Reply 9 (citing Ex. 1032 ¶¶ 48–52). Petitioner argues that the scope of the challenged claims includes the configuration in which Odachi’s cores are separated from each other, because the claims “require analysis at the time of ‘test[ing] coupling,’ ‘adjust[ing] an x–y alignment of the transmitting antenna,’ ‘guiding a receiving antenna,’ and ‘moving one of’ the antennas.” *Id.* at 12–13 (alterations in original) (quoting Ex. 1001, 8:28, 8:32–33, 9:24, 10:1) (citing Ex. 1005, 6:1–40, 10:64–11:43, Figs. 6, 12, 14; Ex. 1032 ¶ 41). Petitioner argues that “[e]ven across this distance, ‘electromagnetic induction occurs between the coupler and the receptacle’ and ‘an electromotive force is induced in the secondary coil.’” *Id.* at 13 (quoting Ex. 1005, 6:6–8).

Responding to this argument about Dobbs in its Sur-reply, Patent Owner argues that Dobbs teaches that its “cores” can be “located anywhere relative to the coils, and are not limited to being ‘centrally located within the turn(s) of a winding as might be the case in a *conventional transformer*.’” PO Sur-reply 8 (citing Ex. 1038 ¶¶ 47, 49). Patent Owner suggests that this means Dobbs is describing a transformer rather than antennas. *Id.* And because the structure in Dobbs does not have an E-shaped primary core, as Odachi does, Patent Owner contends that “any radiation through airgaps in Dobbs is irrelevant to Odachi.” *Id.* (citing Ex. 1021 ¶¶ 29, 43, 53, 69).

(b) Whether Odachi's Coils Couple
Through Free Space

Turning to Petitioner's next Reply argument, Petitioner argues that while aligning (and even when the two cores are engaged), there is free space between coils 4 and 32 and no intervening core material, so flux will be transmitted through free space between the two coils. Pet. Reply 9–10 (citing Ex. 1005, 2:32–37, 6:1–27, 8:50–54, Fig. 12; Ex. 2001 ¶ 24; Ex. 1032 ¶ 31–37). According to Petitioner, a person of ordinary skill in the art would have understood this to occur in the near field. *Id.* at 10 (citing Ex. 1045, 2:60–66 (equating “magnetic field induction” with “near field communication”); Ex. 1032 ¶ 36). And Petitioner notes that coils 4 and 32 are wrapped around different cores (core 3 and core 31, respectively). Pet. Reply 11–12 (citing Ex. 1001, 1:15–17, 2:59–63; Ex. 1005, 6:6–8, 8:1–54, 11:6–59, Figs. 6, 11, 12, 14; Ex. 1008, 13 (“In a traditional transformer, the primary and secondary are fixed on a common core for tight coupling.”); Ex. 1032 ¶¶ 26, 31–32, 38–42); *see also id.* at 15 (citing Ex. 1005, 4:34–47, 6:1–45, 6:33–57, 7:51–58, 11:42–59, 13:53–64, Figs. 4–5; Ex. 1032 ¶¶ 35, 42, 45, 55) (arguing that a magnetic circuit is not formed until the primary and secondary inductive couplers abut each other).

Responding to this in the Sur-reply, Patent Owner points out that although coils 4 and 32 in Odachi are not in contact when cores 3 and 31 are engaged, the cores themselves are still in contact, so there is no “spaced distance” between the cores in that configuration. PO Sur-reply 9 (citing Ex. 1001, 8:50–54; Ex. 1005 8:50–54; Ex. 2010 ¶ 29). According to Patent Owner, the open spaces within the cavities between coils 4 and 32 are irrelevant to whether primary coil 32 produces a near-field component of

flux into free space, according to Patent Owner’s proposed construction. *Id.* (citing Ex. 1001, 4:34–44, 7:23–26, 9:48–51; Ex. 2010 ¶¶ 29–33, 44). Patent Owner contends that the fact that Odachi’s windings are around different cores is irrelevant because the cores are in contact, or when they are not in contact, they confine the magnetic flux lines so that they do not radiate into free space. *Id.* at 10 (citing Ex. 1001, 4:34–44, 7:23–26, 9:48–51; Ex. 2010 ¶ 69).

(c) Whether the Terminology Overlaps

Next, Petitioner argues in its Reply that there is no binary distinction between antennas and transformers, and sometimes the terms are used interchangeably. Pet. Reply 13 (citing Ex. 1007, 9:30–43; Ex. 1016, cl. 8; Ex. 1036, 1:38–45, 3:21–23; Ex. 1045, 5:4–6; Ex. 1032 ¶¶ 43–56). Petitioner contends that Patent Owner has not presented any evidence, other than conclusory testimony by Dr. Horenstein, “that coils functioning similarly to a transformer are not antennas” or that no flux lines in Odachi’s configuration leave the gap area and enter the air space beyond the cores. *Id.* at 14 & n.3 (citing Ex. 2010 ¶ 69; Ex. 1044, 6 (“As with any transformer, isolation transformers radiate magnetic fields.”); Ex. 2001 ¶ 27 (Dr. Horenstein opining that “[i]n a practical transformer, a small amount of flux . . . will escape the core, but the effect of this leakage is negligible.”)).

In its Sur-reply, Patent Owner argues that one of Petitioner’s citations supports Patent Owner’s contention that antennas radiate into the near field. PO Sur-reply 10–11 (citing Ex. 1036, 1:37–40). In addition, Patent Owner contends that “just because two different components may share some functional similarity does not make them equivalent. *Id.* at 11 (citing Ex. 1007; Ex. 1016).

Patent Owner also disagrees with Petitioner that Dr. Horenstein's testimony that no flux lines would escape from the small gap between Odachi's coupled inductors is conclusory, because he "explains how the cores in Odachi contain the magnetic flux both when the cores are in contact, and even if there is a small gap." PO Sur-reply 11 (citing Ex. 2010 ¶¶ 29, 42–44, 68–70).

(d) Whether the Induction Field is Part of the Near Field

Finally, Petitioner argues in its Reply that Dr. Horenstein is incorrect in his assertion (Ex. 2010 ¶ 37) that the induction field and the near field are mutually exclusive, and that a person of ordinary skill in the art would have regarded the induction field to be part of the near field. Pet. Reply 15–17 (citing Ex. 2006, 498 (defining "near-field region" as "the electromagnetic field extending no further than a distance of $2D^2/\lambda$, where D is the maximum overall dimension of said antenna, and λ is the wavelength considered. Beyond this distance, the *far-field region* begins"); Ex. 1045, 5:4–7 ("near field (e.g., 'induction field,' . . ."); Ex. 1032 ¶¶ 53–54).

Patent Owner responds that Dr. Horenstein's testimony about the distinction between induction, near, and far fields was taken from the same dictionary Petitioner cites, and there are separate definitions for each of the three terms. PO Sur-reply 12 (citing Ex. 2006, 275, 498; Ex. 2010 ¶¶ 37–41).

(4) Analysis

We are persuaded by Petitioner's argument that during the alignment process in Odachi corresponding to claim 13, there is a "spaced distance between the primary inductive coupler [230] and the secondary inductive

receptacle 2” which is “reduced gradually and electromagnetic induction occurs between the coupler to the receptacle when the former coupler comes close to the latter receptacle.” Ex. 1005, 6:1–6. Thus, prior to any contact or precise alignment between the two cores, “an electromotive force is induced in the secondary coil 4 and this induced force is increased with the decrease in the spaced distance.” *Id.* at 6:6–8.

At least in that spaced configuration, the evidence of record suggests that primary coil 31 produces a near-field component of flux into free space (the air space between the coils where there is no intervening core material) that is intercepted by secondary coil 4 to effect resonant inductive coupling, and that secondary coil 4 intercepts and receives the near-field component of flux in free space that is generated by primary coil 31 to effect resonant inductive coupling. *See* Ex. 1032 ¶¶ 48–52, 55. Thus, we find that Odachi discloses a “transmitting antenna” (coil 31) and a “receiving antenna” (coil 4) under Patent Owner’s proposed construction. We would reach the same finding under Petitioner’s proposed broader construction because the evidence suggests that Odachi’s coils 31 and 4 would have been considered “antennas” under the parties’ uncontested definition of that term, which is “a device that radiates and/or receives radio waves.” *See id.* ¶¶ 43–47, 53–54; Ex. 1032 ¶ 15 (Dr. Allen agreeing with this definition of “antenna”); Ex. 2001 ¶ 25 (Dr. Horenstein agreeing with this definition of “antenna”).

In addition, Petitioner persuasively shows that the free space between Odachi’s coils in the spaced configuration includes the “near-field region,” which includes the induction field around primary coil 31. *See* Ex. 2006, 498; Ex. 1045, 5:4–7; Ex. 1032 ¶¶ 53–54). Dr. Horenstein’s testimony does not contradict this. Although he points out that there are separate terms for

inductive, near, and far fields, he also acknowledges that “[t]he region of space closer to the antenna than the far field is the near-field region.”

Ex. 2010 ¶ 37 (citing Ex. 2006, 275).⁸

Also, Petitioner persuasively argues that all the flux lines in Odachi’s spaced configuration are not confined to ferrite cores 32 and 3, and that at least a component of the flux lines will escape the cores. *See* Ex. 1032 ¶¶ 48–52; Ex. 1038 ¶ 54 Fig. 2. Indeed, the evidence suggests (and Dr. Horenstein acknowledges in his first declaration) that at least a component of flux will escape the core of even a traditional transformer. *See* Ex. 1032 ¶¶ 45–47; Ex. 1044, 6; Ex. 2001 ¶ 27.

In his second declaration, Dr. Horenstein provides contrary testimony that in Odachi’s open configuration during alignment, cores 32 and 3 “act to confine or guide the magnetic flux lines, rather than radiate them into free space,” and “the flux lines would [not] leave the gap area and enter into the space distal to the magnetic circuit.” Ex. 2010 ¶ 69. But in view of Dr. Horenstein’s contrary position in his first declaration, and the lack of supporting evidence in his second, we do not find it credible. 37 C.F.R. § 42.65(a) (2022) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”); *Apple Inc. v. MPH Techs. Oy*, 28 F.4th 254 (Fed. Cir. 2022).

We also find it irrelevant whether Odachi’s inductive couplers would have been considered a transformer in their engaged configuration, since we

⁸ Similarly, Dr. Horenstein provides overlapping definitions for “radiation field” and the “far-field region.” *See* Ex. 2010 ¶ 37 (citing Ex. 2006, 275; Ex. 2012, 626).

base our decision on the open configuration. To the extent that the couplers could, collectively, be considered a transformer even though they are not in contact, we also find that irrelevant. The evidence of record suggests that there is some overlap in the terminology in the field and that transformer-like devices are sometimes called antennas, even if they are associated with a ferrite core. Ex. 1032 ¶¶ 43–44; Ex. 1001, 2:59–3:3. Moreover, neither the claims nor Patent Owner’s proposed construction would explicitly exclude a pair of antennas simply because they exhibit some of the properties of a transformer. *See* Ex. 1032 ¶¶ 43–47, 53–54. The parties’ uncontested construction of “antenna” as “[a] device that radiates and/or receives radio waves” (Ex. 1032 ¶ 15; Ex. 2001 ¶ 25) would not explicitly exclude a transformer or transformer-like device that radiates or receives radio waves.

For the above reasons, we find that Petitioner has shown that Odachi discloses limitation 13[a].

(c) Limitation 13[b]

Limitation 13[b] recites

responsive to detecting a degree of coupling in the first alignment position between the receiving antenna and the transmitting antenna that is measured at the receiving antenna, moving one of the receiving antenna and the transmitting antenna from the first alignment position to a second alignment position to improve alignment of the receiving antenna with the transmitting antenna and improve the degree of coupling.

Ex. 1001, 9:26–10:5.

Petitioner argues that Odachi discloses this limitation because it moves the support arm for primary inductive coupler 230 from one position to another in response to measuring V_{RMS} , which is the induced voltage across secondary coil 4. Pet. 13–17 (citing Ex. 1005, 3:1–5, 4:1–2, 5:54–

6:45, 9:66–10:12, 10:31–12:42, 13:39–64, Figs. 4, 5, 11, 14; Ex. 1003 ¶¶ 110–125); *id.* at 18 (citing Ex. 1005, 6:34–45, 11:43–12:26, 13:3–9, 13:53–64, 14:5–32, 14:56–58, 15:12–26; Ex. 1003 ¶¶ 121–125). Petitioner contends that a person of ordinary skill in the art would have understood, in particular, that “monitoring V_{RMS} constitutes detecting the degree of coupling between the two coils, measured at the receiving antenna,” because “ V_{RMS} goes up when the coils are better coupled, and down when the coils are less-well coupled, and scales proportionally with the amount of power being transferred to the secondary coil.” *Id.* at 17 (citing Ex. 1005, 13:39–64, Fig. 5; Ex. 1003 ¶ 120).

Patent Owner argues that, as illustrated in Figure 4 (reproduced above, Section III.C.1), Odachi does not move the transmitting antenna “responsive to a degree of coupling in the first alignment position.” PO Resp. 37. Patent Owner argues that “the ‘first alignment position’ corresponds to the far[-]left end of the x-axis.” *Id.* (citing Ex. 2011, 15:13–16:9, 22:24–23:5). According to Patent Owner, Odachi’s alignment process “determines the point X_A of maximum coupling by detecting the positions X_1 and X_2 at which the . . . current cross over [threshold level I_0].” *Id.* at 37–38 (citing Ex. 2010 ¶ 62). Thus, determining the point X_A of maximum coupling is not “responsive to detecting a degree of coupling in the first alignment position.” *Id.* at 38 (citing Ex. 2010 ¶ 62).

In its Reply, Petitioner argues that “Odachi’s positioning system determines coupling (i.e., measures . . . I_{RMS}) at every point along the sweep including the operative home position (the claimed first alignment position),” and “uses all of these measured coupling values—including the operative home position value—to determine points X_1 and X_2 , which are

used to calculate and move the primary coil to the target position.” Pet. Reply 18 (citing Ex. 1005, 11:43–59 (disclosing that the controller “calculates the number of pulses necessary for the primary inductive coupler 230 to be brought back to the position X_A ”); Ex. 1032 ¶¶ 57–58). Petitioner contends that X_1 could as likely be the operative home position (the “first alignment position”) as any other position if the car happens to be parked in that alignment. *Id.* at 18–19 (citing Ex. 1032 ¶¶ 59–63).

In its Sur-reply, Patent Owner counters that “The I_{RMS} value is constant from the start position until it begins to decrease just prior to position X_1 .” PO Sur-reply 13 (citing Ex. 1005, Fig. 4). “But even if the I_{RMS} value at the start position was doubled, and decreased until it crossed threshold I_0 at position X_1 , the different I_{RMS} start value would not change the position of X_1 .” *Id.* (citing Ex. 1005, 6:34–36). Patent Owner also argues that Odachi’s system for calculating how to return to position X_A , using clock pulses, has nothing to do with the degree of coupling at the starting position. *Id.* at 13–14 (citing Ex. 1005, 11:33–59). Patent Owner also contends that there is no relevance to whether the first alignment position *could be* X_1 .

We find Petitioner’s argument persuasive that Odachi’s controller detects a degree of coupling at each location along the graph shown in Figure 4, including the home location if that location is at the far-left end of the graph. *See* Ex. 1032 ¶¶ 57–58. The controller determines the location X_A “responsive to” the degree of coupling along the entire graph shown in Figure 4, including the first alignment position. It is relevant that the first alignment position could be X_1 because the controller needs to check, at each position including the first one, whether I_{RMS} drops below threshold I_0 .

See Ex. 1032 ¶¶ 59–61. X_1 is set—or not set—responsive to that determination, and this will affect how the transmitting antenna is ultimately moved from the first alignment position to X_A after doing a full scan. *See id.*

Thus, we find that Odachi discloses limitation 13[b].

(d) Conclusion as to claim 13

For the above reasons, we find that Petitioner has shown, by a preponderance of the evidence, that Odachi identically discloses every limitation of claim 13. We therefore determine that claim 13 is unpatentable under § 102 as anticipated by Odachi.

3. *Claim 15*

Limitation 15 depends from claim 13 and further recites “wherein moving one of the receiving antenna and the transmitting antenna comprises moving the transmitting antenna laterally relative to the receiving antenna.” Ex. 1001, 10:11–14.

Petitioner argues that Odachi discloses moving primary inductive coupler 230 laterally (i.e., moving in the X-axis or Y-axis direction) relative to secondary inductive coupler 2, and thus meets the additional limitation of claim 13. Pet. 19 (citing Ex. 1005, 11:6–59, 14:19–32; Ex. 1003 ¶¶ 126–128).

Patent Owner does not specifically contest Petitioner’s arguments regarding claim 15. *See* PO Resp. We find the arguments persuasive by a preponderance of the evidence. Thus, we find that claim 15 is unpatentable under § 102 as anticipated by Odachi.

D. OBVIOUSNESS GROUND BASED ON ODACHI AND WANG (CLAIMS 1, 7, 18)

Petitioner argues that claims 1, 7, and 18 are unpatentable under § 103(a) as obvious over Odachi and Wang.

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). When a ground in a petition is based on a combination of references, we consider “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *Id.* at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

We base our obviousness inquiry on factual considerations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) any objective indicia of obviousness or non-obviousness that may be in evidence. *See Graham*, 383 U.S. at 17–18.

Considering these factors,⁹ we determine that Petitioner has shown claim 1, 7, and 18 to be unpatentable on this ground.

1. *Overview of Wang*

Wang is a doctoral thesis about the design of inductively coupled power transfer (“ICPT”) systems to “transfer electric power from a primary

⁹ Neither party argues that there are objective indicia of obviousness or non-obviousness, so this factor is not part of our analysis.

source (power supply) to one or more secondary loads (pickups)” with “no physical contact between the primary and secondary.” Ex. 1008, i.

According to Wang, “[b]oth the primary and secondary of the electromagnetic structure are often compensated by capacitors to boost the power transfer capability of the pickup, while minimizing the [volt-ampere] rating of the power supply.” *Id.* at 20.

Wang states that “[in] ICPT systems, the coupling strength of the electromagnetic structure is normally weak and cannot deliver the required power with reasonable size and cost at the line frequency of 50/60 Hz.” Ex. 1008, 38. Thus, Wang suggests “[i]t is often necessary to increase the frequency to between several kHz and many MHz, depending on the application requirements,” and “[t]he increased reactance of the primary and secondary windings that arises from these increases in the operating frequency often must be compensated by capacitors connected in series or parallel.” *Id.*

Wang describes several circuits for compensating wireless power circuits with capacitors, as depicted in Figure 2-12, reproduced below:

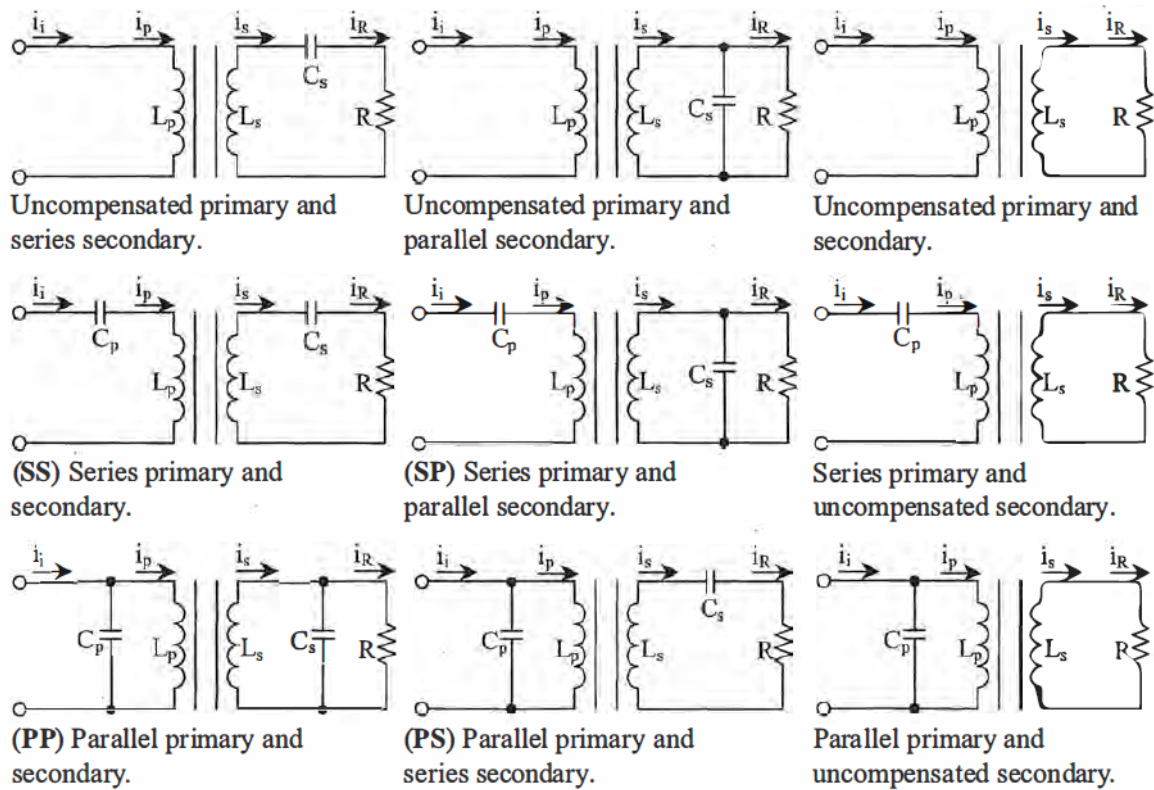


Fig. 2-12. Basic compensation topologies of ICPT systems.

Ex. 1008, 24. Figure 2-12 includes nine circuit diagrams, each of which depicts a wireless power-transfer circuit having a primary inductor (with self-inductance L_p) and a secondary inductor (with self-inductance L_s). *Id.* at xii, 25. Capacitors on the primary side are labeled with capacitance C_p , while capacitors on the secondary side are labeled with capacitance C_s . *Id.* at xi. The designs also depict pickup loads with equivalent AC resistance R on the secondary side. *Id.* at xii, 25. Various primary, secondary, and pickup load currents (i_p , i_s , i_R , respectively) are also shown. *Id.* at xi.

2. Claim 1

(a) Preamble

The preamble of claim 1 recites “[a] transmitter system for wireless power.” Ex. 1001, 8:18.

Petitioner argues that Odachi discloses the preamble (to the extent it is limiting). Pet. 22–25 (citing Ex. 1005, code (57), 3:64–65, 4:41–47, 8:40–54, 12:14–26, Fig. 12; Ex. 1003 ¶¶ 131–140). For example, Petitioner argues that in Odachi, power is transferred wirelessly via inductive coupling rather than through physical electrical contacts or conductors. Pet. 22 (citing Ex. 1005, code (57); Ex. 1003 ¶ 133).

Alternatively, Petitioner argues that it would have been obvious to implement Odachi wirelessly, either alone in view of Odachi’s teaching that electromagnetic induction occurs before the inductive couplers come into contact or in view of Wang. Pet. 23–25 (citing Ex. 1005, 3:64–65, 4:41–47, 6:1–8:8:40–54, Fig. 12; Ex. 1008, i; Ex. 1019, 694; Ex. 1020, 6; Ex. 1021, 839; Ex. 1003 ¶¶ 136–140).

Patent Owner does not specifically contest Petitioner’s arguments for the preamble. *See* PO Resp. 38–46. Having considered Petitioner’s arguments and the associated evidence of record, we find Petitioner’s arguments persuasive and therefore we need not determine whether the preamble is limiting.

(b) Limitation 1[a]

Limitation 1[a] recites “a transmitting antenna including an inductive element and a capacitor, said transmitting antenna being resonant at a first frequency, said transmitting antenna being configured to generate a wireless field for charging a device including a receiving antenna.” Ex. 1001, 8:24–27. Most notably, the limitation recites a transmitting antenna that includes a capacitor and a resonant frequency, and a receiving antenna.

Petitioner argues that “Odachi is silent about the use of a capacitor and a resonant frequency,” but in view of Wang, a person of ordinary skill in

the art “would have considered it obvious to include a capacitor connected to each of Odachi’s primary and secondary coils, creating circuits that resonate at a particular frequency.” Pet. 27 (citing Ex. 1008, 47; Ex. 1032 ¶¶ 145–155). According to Petitioner, a person of ordinary skill in the art would have added a capacitor connected in series or parallel with the primary coil, as Wang teaches, and this would have created a resonant frequency. Pet. 27–28 (citing Ex. 1008, 4–7, 11, 20, 22–25, 38, 47; Ex. 1012, 5:6–22; Ex. 1014, 19; Ex. 1025, 996; Ex. 1032 ¶¶ 146–149).

Petitioner argues that there would have been a motivation to combine Odachi with Wang’s capacitor-compensation teachings because “this design was nothing more than a combination of known elements (inductive coils and capacitors) arranged according to known methods (connected in series or parallel resonant circuits) to yield predictable results (a resonant power transfer system).” Pet. 28–29 (citing Ex. 1008, 4, 20, 47–48; Ex. 1003 ¶¶ 150–151); Ex. 1003 ¶¶ 145–149.¹⁰

Patent Owner, referring to its arguments in the context of claim 13, argues that adding a capacitor to Odachi does not convert Odachi’s inductive transfer coils to a “transmitting antenna” or a “receiving antenna.” PO Resp. 38–39 (citing Ex. 2001 ¶¶ 29–33, 35–36, 71).

¹⁰ Alternatively, Petitioner argues that a person of ordinary skill in the art would have been motivated add a capacitor “to efficiently transfer power, including at higher voltages or current.” Pet. 29–31 (citing Ex. 1002, 118, 120–21; Ex. 1008, 4–5, 20–21, 23–24, 38, 47; Ex. 1017, 86; Ex. 1025, 995; Ex. 1032 ¶¶ 152–155); Pet. Reply 20 (citing Ex. 1003 ¶¶ 152–155; Ex. 1032 ¶¶ 65–67); *see also* PO Sur-reply (responding to the efficiency rationale). Because we find Petitioner’s first rationale for combining Odachi and Wang persuasive, we need not address the efficiency-based rationale.

We addressed these arguments in the context of claim 13 above, and we disagree with Patent Owner that Odachi fails to disclose a transmitting antenna and a receiving antenna. *See supra* Section III.C.2(b).

Next, Patent Owner argues that Petitioner has failed to adequately explain why a person of ordinary skill in the art would have been motivated to modify Odachi with Wang’s teachings about capacitor compensation. PO Resp. 39–40 (citing Ex. 2010 ¶ 72). According to Patent Owner, “Wang is directed to ICPT systems that use electromagnetic fields to transfer electric power from a primary coil to a secondary load ‘*without contact.*’” *Id.* at 40 (citing Ex. 1008, 1).

Patent Owner argues that Wang’s stated motivation for compensating ICPT systems with capacitors is because of the need to operate the systems at higher frequencies when primary and secondary coils are spaced apart by greater distances. PO Resp. 40–41 & n.8 (citing Ex. 1008, 4, 38; Ex. 2010 ¶ 74). But according to Patent Owner, Odachi does not suggest that its inductive coupling structures “suffer from weak coupling that would necessitate operating at higher frequencies for which compensating capacitors would be needed.” *Id.* at 41 (citing Ex. 2010 ¶ 74). Rather, “Odachi already provides strong coupling via its transformer,” so “there would be no need for the compensation capacitor(s) of Wang.” *Id.* at 41–43 (citing Ex. 1005, 4:34–41, 7:19–26; 9:47–52, 11:60–12:1; Ex. 2010 ¶¶ 75–77).

In its Reply, Petitioner reiterates that (at least during the alignment phase) “Odachi transfers energy across a ‘spaced distance’ between primary and secondary devices, and in any event, Petitioner contends that it would

have been obvious to implement Odachi wirelessly. Pet. Reply 19–20 & n.5 (citing Ex. 1003 ¶¶ 145–155; Ex. 1032 ¶¶ 33, 38–41, 65–66).

In its Sur-reply, Patent Owner disagrees that Odachi conducts power transfer across a spaced distance between the primary and secondary couplers. PO Sur-reply 14–15 (citing Ex. 1005, 4:34–41, 7:19–32, 9:47–51, 11:60–12:1).

Patent Owner does not directly contest Petitioner’s argument that combining Odachi with Wang would have merely been combining known elements in a known way to yield predictable results. Pet. 29; Ex. 1003 ¶¶ 150–151; PO Resp. 39–40 (acknowledging the argument but not directly challenging its substance). We find this rationale persuasive and sufficiently articulated. As Patent Owner concedes, “capacitors are . . . very common elements in circuits.” PO Resp. 40 (citing Ex. 2010 ¶ 72). And Wang teaches that adding capacitors to wireless power-transfer circuits is well known, and that there are many ways of doing so. Ex. 1008, 20, 24, 47–48, 71–72; Ex. 1003 ¶¶ 145–146, 150–151, 154. The evidence also suggests that a person of ordinary skill in the art would have been able to add capacitors to primary or secondary power-transfer coils using well-known, predictable methods. *See* Ex. 1003 ¶¶ 145–156, 154; Ex. 1032 ¶ 64.

We disagree with Patent Owner that an ordinarily skilled artisan would not have looked to Wang because Wang teaches contactless power transfer. PO Resp. 40. As we discuss above in the context of claim 13, we are persuaded by Petitioner’s arguments that Odachi teaches an embodiment, at least during the alignment phase, in which inductive coupling and power transfer occurs over an air gap. *See supra* Section III.C.2(b).

For the above reasons, we determine that Petitioner has shown that Odachi, in combination with Wang, teaches limitation 1[a] and that a person of ordinary skill in the art would have had reason to modify Odachi by adding a capacitor according to known arrangements by known methods, yielding predictable results.

(c) Limitation 1[b]

Limitation 1[b] recites “a charging control system coupled to said transmitting antenna and configured to generate a signal at said first frequency and provide said signal to said transmitting antenna.” Ex. 1001, 8:24–27.

Petitioner argues that Odachi discloses such a control system, and in light of Wang, it would have been obvious to drive Odachi’s modified compensated primary device with a current signal whose operating frequency was the same of the resonant frequency of the primary and secondary coils. Pet. 31–34 (citing Ex. 1005, 5:18–39, 7:27–38, 10:13–30, 12:8–26, Fig. 13; Ex. 1008, 16–17, 19–24, 31–32, 52; Ex. 1003 ¶¶ 156–161).

Patent Owner does not specifically contest Petitioner’s arguments for limitation 1[b]. *See* PO Resp. 38–46. Having considered Petitioner’s arguments and the associated evidence of record, we find Petitioner’s arguments persuasive.

(d) Limitation 1[c]

Limitation 1[c] recites

an alignment controller configured to test coupling of said transmitting antenna to the receiving antenna in the first alignment position and based on a degree of the

coupling, the alignment controller further configured to adjust an x-y alignment of the transmitting antenna relative to the receiving antenna from the first alignment position to a second alignment position having a finer alignment between the receiving antenna and the transmitting antenna than the first alignment position to improve said coupling.

Ex. 1001, 8:28–37.

Petitioner’s argument for limitation 1[c] is like its argument for limitation 13[b], also noting that Odachi performs alignment in x- and y-axes. *See* Pet. 34–37 (citing Ex. 1003 ¶¶ 162–170); *supra* Section III.C.2(c). According to Petitioner, “[t]his functionality would remain unchanged when Odachi is modified to used capacitor-compensated circuits as taught in wang. Pet. 37 (citing Ex. 1003 ¶ 170).

Patent Owner reiterates the same argument it made for limitation 13[b], and argues that “there is nothing in Odachi that teaches or discloses basing the y-axis adjustment on a degree of coupling,” only a disclosure of alignment along an x-axis. PO Resp. 43–44 (citing Ex. 1005, 11:6–59, Figs. 7, 13–14; Ex. 2010 ¶ 81); *see also* PO Sur-reply 16 (reiterating the argument).

In its Reply, Petitioner points out that “Odachi teaches ‘positioning . . . in the vehicle longitudinal direction . . . in the same method as in the positioning along the X-axis.” Pet. Reply 21 (alterations in original) (quoting Ex. 1005, 14:29–32) (citing Ex. 1005 4:65–5:4; Ex. 1032 ¶¶ 69–70).

We disagree with Patent Owner that Odachi’s alignment is limited to the x-axis. As Petitioner persuasively shows, Odachi discloses alignment in the y-axis using a similar method as its x-axis alignment. Ex. 1005, 14:29–32; Ex. 1032 ¶¶ 69–70. As we discuss in the context of limitation 13[b], we

find that Petitioner has shown that Odachi's alignment is "based on a degree of coupling," and the same will be true with the y-axis alignment. Ex. 1005, 14:29–32.

Thus, we determine that Petitioner has shown that Odachi discloses limitation 1[c].

(e) Conclusion as to Claim 1

For the above reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that the combination of Odachi and Wang teaches every limitation of claim 1 and that there would have been a motivation to combine the two references with a reasonable expectation of success. We conclude that claim 1 is unpatentable under § 103(a) as obvious over Odachi and Wang.

3. *Claim 7*

Claim 7 depends from claim 1 and further recites "wherein said charging control system configured to generate a signal of a type that, when output to said transmitting antenna, transmits power to a remote receiving antenna." Ex. 1001, 8:54–57.

Citing its arguments for limitation 1[b], Petitioner argues that Odachi's transmitting antenna 32 generates an "AC current signal" that transmits power wirelessly to Odachi's secondary coil. Pet. 37–38 (citing Ex. 1005, 11:60–12:26; Ex. 1032 ¶¶ 171–173).

Patent Owner argues that Petitioner has not shown that Odachi's secondary coil is "remote," given that Odachi's couplers are brought directly into contact with each other. PO Resp. 44–45 (citing Ex. 2001 ¶ 84); PO Sur-

reply 16–17 (citing Ex. 1001, 4:34–44, 7:23–26, 9:48–51; Ex. 2010 ¶¶ 43, 53, 69).

In its Reply, Petitioner argues that Odachi’s receiving antenna is “remote” because there is a “spaced distance” between the transmitting and receiving antennas. Pet. Reply 21–22 (citing Ex. 1032 ¶¶ 72–74).

The parties agree that the word “remote” in the context of the receiving antenna in claim 7 would include a receiving antenna that is spaced distally from the transmitting antenna. *See* PO Resp. 45 (citing Ex. 2010 ¶ 84 (Dr. Horenstein opining that “[t]he receiving antenna in the ’654 patent is distal to the transmitting antenna and is thus ‘remote.’”)); Pet. Reply 21–22 (citing Ex. 1032 ¶¶ 72–74). For the reasons discussed above in the context of limitations 13[a] and 1[a], we determine that Odachi discloses a receiving antenna that is “remote” as the parties understand that term. *See supra* Sections III.C.2(b), III.D.2(b).

For the above reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 7 is unpatentable under § 103(a) as obvious over Odachi and Wang.

4. *Claim 18*

Claim 18 depends from claim 1 and further recites “wherein the coupling test comprises a measurement of the amount of power that is transferred to the receiving antenna.” Ex. 1001, 10:22–24.

Petitioner argues that during the coupling measurements made during the alignment process, Odachi discloses measuring either current (I_{RMS}) or voltage (V_{RMS}). Pet. 38 (citing Ex. 1005, 10:13–30, 11:6–59, 13:39–64; 14:12–32; Ex. 1003 ¶¶ 174–176). According to Petitioner, a person of ordinary skill in the art “would have understood that measuring I_{RMS} or V_{RMS}

constitutes measuring the amount of power transferred to the receiving antenna.” Pet. 38–39 (citing Ex. 1005, 6:4–27, 13:39–64; Ex. 1003 ¶ 176).

Patent Owner argues that “Odachi’s coupling test, based on an injected current I_{RMS} , is not “equivalent to measuring the amount of power transferred to the receiving antenna.” PO Resp. 45. According to Patent Owner, this is a “check current” or test current only, which a person of ordinary skill in the art would have known was “only a fraction of the current that flows during actual power transfer.” *Id.* at 46 (citing Ex. 2010 ¶¶ 86–87).

In its Reply, Petitioner notes that claim 18 refers to a measurement that occurs during a coupling test, so “[a]ll that is required is to measure the amount of power that is transferred during the coupling test, which [Patent Owner] does not dispute is accomplished by measuring I_{RMS} or V_{RMS} using the check current.” Pet. Reply 22.

In its Sur-reply, Patent Owner argues that Petitioner’s phrase “measuring I_{RMS} or V_{RMS} using the check current” is nonsensical because I_{RMS} *is* the check current.” PO Sur-reply 17. Patent Owner also argues that “Petitioner fails to explain how monitoring a check current is equivalent to measuring the amount of power transferred, and therefore fails to establish that Odachi and Wang disclose this feature.” *Id.*

We find Petitioner’s argument persuasive that Odachi describes measuring voltage V_{RMS} or current I_{RMS} associated with an amount of power transferred to the receiving antenna during the coupling test, and that this would have been regarded as teaching a measurement of the amount of power transferred to the receiving antenna. *See* Ex. 1003 ¶ 176; *see also* Ex. 1005, 14:50–55 (“monitoring a change of *electric power* in one of said

primary and secondary coils; stopping said primary inductive device at a position where said primary inductive device is located substantially closest to said secondary inductive device on the basis of information of said change of *electric power*” (emphases added)).

For the above reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 18 is unpatentable under § 103(a) as obvious over Odachi and Wang.

E. OBVIOUSNESS GROUND BASED ON ODACHI, WANG, AND PARTOVI (CLAIMS 4–6)

Petitioner argues that that claims 4–6 are unpatentable under § 103(a) as obvious over Odachi, Wang, and Partovi. Pet. 2, 19–47.

1. Overview of Partovi

Partovi describes an inductive power system comprising “a pad or similar base unit that contains a primary [inductor].” Ex. 1006, code (57). One embodiment of the primary inductor is depicted in Figure 1, reproduced below:

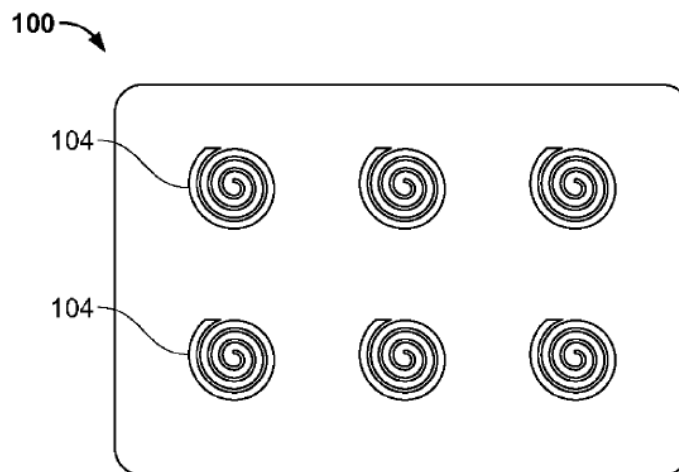


FIG. 1

Figure 1 depicts charging pad 100 comprising multiple receiver or energizer coils 104, each of which comprises a coil or set of wires. Ex. 1006, 6:33, 6:37.

2. *Claims 4–6*

Claims 4–6 are as follows:

4. The transmitter system of claim 1, wherein said transmitting antenna includes an array of antennas that extend over a specified area of a parking space.

5. The transmitter system of claim 4, wherein said charging control system is further configured to select one of said antennas of said array.

6. The transmitter system of claim 5, further comprising a switching device connected between the charging control system and each of the antennas of the array, the switching device configured to transmit the signal to the selected antenna of the array.

Ex. 1001, 8:43–53.

In each of claims 4–6, the transmitting antenna “includes an array of antennas that extend over a specified area of a parking space.” Ex. 1001, 8:43–45. For this limitation, Petitioner argues that a person of ordinary skill in the art would have had reason “to implement Odachi’s capacitor-compensated system such that the primary inductive device comprises an array of ‘multiple coils’ as in Partovi, rather than a single coil.” Pet. 40 (citing Ex. 1006, 6:33–40, Fig. 3; Ex. 1003 ¶¶ 180–189). According to Petitioner, “[d]oing so would expand the ‘total area’ covered by the charger, allowing for vehicle charging to occur ‘regardless of [the] position’ of the vehicle.” Pet. 40–41 (quoting Ex. 1006, 8:53–59) (citing Ex. 1005, 3:18–22, 8:1–15, 12:42–52, Fig. 11; Ex. 1003 ¶¶ 182–183).

Petitioner proposes modifying the support arm that holds Odachi's primary coupler 230 so that instead of a single coupler 230, the arm would hold an array of coils as Partovi discloses, which would free the driver from the need to put the car in a central parking position and allow for a significantly greater margin of error. Pet. 42–43 (citing Ex. 1005, 7:39–50, 10:43–53, 12:1–7, 12:43–52, Fig. 11; Ex. 1006, Fig. 3; Ex. 1003 ¶¶ 184–186).

Petitioner also argues that a person of ordinary skill in the art would have added a switch between Odachi's power circuit “and each ‘primary coil’ in the array, such that when the power circuit selectively suppl[ies] . . . an electric current for battery charging,’ it supplies that current only to the best-coupled coil in the array.” Pet. 45 (citing Ex. 1005, 10:13–30, Fig. 13; Ex. 1003 ¶ 192). During the alignment process, Odachi's modified system would measure all the coils in the array and select for alignment the one that has the smallest comparative I_{RMS} value or highest comparative V_{RMS} value, and then activate only that coil during the charging, to minimize interference and save power. Pet. 46–47 (citing Ex. 1005, 6:5–27, 11:6–42, 13:39–64; Ex. 1003 ¶¶ 193–195).

Petitioner also argues that a person of ordinary skill in the art would have had a reasonable expectation of success in this combination because coil arrays were well known, “required no specialized knowledge or technique, and because the coils could have been implemented, for interoperability, in “other shapes and sizes, including . . . coils sized like Odachi's original coil,” and involved combining prior-art elements by known methods to yield predictable results. Pet. 43–44 (citing Ex. 1005,

4:16–32; Ex. 1009, 5:1–15; Ex. 1007, 15:47–16:22; Ex. 1013 ¶ 53, Fig. 8; Ex. 1015, code (57), 2:35–56, 5:49–56; Ex. 1003 ¶¶ 187–188).

Patent Owner argues that Petitioner has not shown that there would have been a reasonable expectation of success in adding coils to Odachi’s primary inductive coupler, or that the changes could have been carried out in a well-known manner. PO Resp. 51–52 & nn.9–10 (citing Ex. 2010 ¶ 100). Patent Owner points to some of the changes that would have needed to be accounted for in this modification, including the following: Partovi’s coils are two-dimensional rather than three-dimensional as in Odachi (*id.* at 47–50); Partovi’s coils lack cores (*id.* at 51–52); and the combination would require new alignment methods (*id.* at 52–57).

In its Reply, Petitioner contends that a person of ordinary skill in the art “would have implemented Partovi’s coil-array concept with ‘coils sized like Odachi’s original coil,’” or in other words, “[a]n array of coils each shaped and sized like Odachi’s original coil.” Pet. Reply 23 (quoting Pet. 44; Ex. 1003 ¶ 185) (citing Ex. 1032 ¶¶ 75–76).

We find Petitioner’s argument unpersuasive that a person of ordinary skill in the art would have been able to modify Odachi to add multiple coils in a well-known manner with no specialized knowledge or technique. Pet. 43; Ex. 2010 ¶ 100. Petitioner has not shown that its proposed method for aligning multiple coils was known in the art or that a person of ordinary skill would have been able to successfully implement it using ordinary creativity.

Although Petitioner proposes a theory as to how Odachi’s alignment system *could* have been modified to account for multiple primary inductor coils, such as by adding a switch and a step of comparing I_{RMS} or V_{RMS} values between multiple coils (Pet. 45–47), this modification is not drawn

from the prior art and is an improper hindsight reconstruction. Petitioner has not pointed to anything in Odachi, Wang, or Partovi that teaches a way to align multiple primary coils with a single secondary coil. Nor has Petitioner persuasively shown that such an alignment would have been within the knowledge of a person of ordinary skill in the art.

Thus, we determine that Petitioner has not persuasively shown that claims 4–6 are unpatentable under § 103(a) as obvious over the combination of Odachi, Wang, and Partovi.

F. OBVIOUSNESS GROUND BASED ON ROSS AND WANG (CLAIMS 8–10, 12–14, 16, AND 19)

Petitioner argues that claims 8–10, 12–14, 16, and 19 are unpatentable under § 103(a) as obvious over Ross in view of Wang. Pet. 9, 19–36.

1. *Overview of Ross*

Ross describes “[a] roadway-powered electric vehicle system,” in which “charging occurs through a network of power coupling elements, e.g., coils, embedded in the roadway,” which charges the vehicle through inductive coupling to the vehicle’s “corresponding onboard power coupling elements, e.g., coils.” Ex. 1007, code (57).

Ross describes inductive charging in two phases. First, charging occurs on the roadway while the vehicle is cruising under automated control or while the vehicle is approaching a loading/unloading zone that has a “roadway power transmitting module . . . embedded in the roadway.” Ex. 1007, 12:33–47. On this approach to the loading/unloading zone, the vehicle is automatically steered “to within a rough tolerance, e.g., ± 5 –10 cm,

of the optimum lateral position” next to the transmitting coil. *Id.* at 12:48–52.

Second, once the vehicle has stopped, a “horizontal coil positioning unit . . . controls the lateral position of the [receiving coil] so that it is more closely aligned, e.g., to within ± 1 –2 cm, of the optimum lateral position.” *Id.* at 12:52–57. Concurrently or thereafter, the vehicle’s receiver coil is lowered to reduce its air gap with the roadway power transmitting module. *Id.* at 12:57–62. The vehicle uses “conventional hydraulic and/or electronic positioning devices” to move the coil laterally and horizontally. *Id.* at 12:52–54, 12:60–61.

2. *Claim 8*

(a) Preamble

The preamble of claim 8 recites “[a] receiver system for wireless power.” Ex. 1001, 8:58.

Petitioner argues that, to the extent the preamble is limiting, Ross discloses it. Pet. 59 (citing Ex. 1007, 7:57–8:13, 9:11–10:5; 16:38–50, Figs. 1, 7; Ex. 1003 ¶¶ 220–221). Patent Owner does not contest this. PO Resp. 57–66.

Because we find Petitioner’s argument that Ross discloses the preamble persuasive, we need not determine whether the preamble is limiting.

(b) Limitation 8[a]

Limitation 8[a] recites “a receiving antenna coupled to a device, the receiving antenna including a coil and capacitor that are resonant at a first frequency.” Ex. 1001, 8:59–61.

Petitioner argues that Ross discloses a receiving antenna as recited, except that “Ross is silent about a capacitor or resonant frequency.” Pet. 59 (citing Ex. 1007, 7:57–8:13, 9:11–43, 20:29–40, Figs. 1–2, 7; Ex. 1003 ¶¶ 222–236). However, using an argument like the one for limitation 1[a], Petitioner argues that a person of ordinary skill in the art would have looked to Wang to implement a compensated receiving coil having a particular resonant frequency, which would have led to increased efficiency. Pet. 59–62 (citing Ex. 1002, 118, 120–121; Ex. 1007, 9:11–29; Ex. 1008, 1, 4–7, 11, 20–25, 38, 47–48; Ex. 1003 ¶¶ 226–239).

Patent Owner argues that “Ross discloses preferred driving frequencies in the range 1–10 kHz (typically around 2–3 kHz) which it calls ‘significantly higher than the conventional 60 Hz or 400 Hz [AC] signals that are commonly used in the prior art.’” PO Resp. 58 (quoting Ex. 1007, 5:42–45). But according to Patent Owner, Wang “justifies the use of compensation capacitors to correct power factor at higher frequencies and focuses on driving frequencies up to the megahertz (MHz) range.” *Id.* at 58–59 (citing Ex. 1007, 38 (“It is often necessary to increase the frequency to between several kHz and many MHz”); Ex. 2010 ¶¶ 111–112).

Patent Owner also argues that “Ross already addresses the issue of coupling efficiency without the need for compensation capacitors . . . solely by increasing its driving frequency to the kHz range” and by using an [electromechanical battery] as the storage element,” which can achieve efficiency that exceeds 90%. PO Resp. 59–60 (citing Ex. 1007, 5:29–31, 5:35–38, 5:45–47; Ex. 2010 ¶ 113). Patent Owner also argues that Ross teaches away from the use of Wang’s frequencies because frequencies above 10 kHz might create magnetic fields that penetrate the vehicle or

surrounding areas and create a potential safety issue. *Id.* at 60 (citing Ex. 1007, 5:53–60).

In its Reply, Petitioner argues that Ross’s range of 1–10 kHz overlaps with Wang’s range of “between several kHz and many MHz.” Pet. Reply 23–24 (quoting Ex. 1008, 38) (citing Ex. 1007, 5:40–43; Ex. 1032 ¶¶ 77–78).

In addition, Petitioner argues that “[t]he fact that a device already functions well does not negate the motivation to ‘make further improvements.’” Pet. Reply 24 (quoting *Transtex Inc. v. Laydon Composites*, 848 F. App’x 901, 907 (Fed. Cir. 2021)). And according to Petitioner, compensating Ross’s capacitors would have yielded even higher efficiency, and Wang teaches that such higher frequencies would have been safe. *Id.* 24 & n.6 (citing Ex. 1007, 5:29–39; Ex. 1008, i, 1; Ex. 1032 ¶¶ 79–80).

In its Sur-reply, Patent Owner argues that Petitioner’s argument is overly literal, and “just because the operating frequency of Ross (1–10 kHz) slightly overlaps with the very bottom of the increased frequency range disclosed by Wang, does not mean that Ross suffers from the increased reactance that requires compensation capacitors.” PO Sur-reply 19 (citing Ex. 2010 ¶¶ 111–112). Patent Owner also argues that Petitioner has not addressed “the specific safety concern of Ross related to the use of high frequencies that would necessitate the use of compensation capacitors.” PO Sur-reply 19–20 (citing Ex. 1007, 5:53–60; Ex. 1008, I, 1).

We find Petitioner’s argument persuasive that Ross and Wang discloses compatible operating frequencies. Wang’s range, which begins at “several kHz” (Ex. 1008, 38), is well within Ross’s range of 1–10 kHz (Ex. 1007, 5:41–42). Because the ranges overlap, Ross does not teach away

from at least part of the range that Wang teaches would result from using a capacitor with a receiving antenna. *See* Ex. 1032 ¶¶ 77–78. We also find persuasive Petitioner’s argument that a person of ordinary skill in the art would have been motivated to use a compensated receiving coil as part of optimizing the efficiency of a wireless power-transfer system, even if Ross is already efficient in certain ways. *See id.* ¶¶ 79–80.

Thus, we determine that the combination of Ross and Wang teaches limitation 8[a].

(c) Limitations 8[b] and 8[c]

Limitation 8[b] recites “a guidance controller configured to guide the receiving antenna of the device to a first alignment position relative to a transmitting antenna that is not physically connected to said device coupled to the receiving antenna.” Ex. 1001, 8:62–65.

Petitioner argues that Ross discloses such a guidance controller to automatically steer a vehicle to a rough initial position over an embedded roadway coil corresponding to the recited “first alignment position.” Pet. 62–63 (citing Ex. 1007, 9:11–43, 12:33–62, Figs. 1–2, 7; Ex. 1003 ¶¶ 237–239).

Limitation 8[c] recites “a lifting device for said receiving antenna configured to lift and lower said receiving antenna.” Ex. 1001, 66–67.

Petitioner argues that Ross discloses such a lifting device as “vertical (air gap) positioning unit 48.” Pet. 63–64 (citing Ex. 1007, 12:33–13:4; Ex. 1003 ¶¶ 240–241).

Patent Owner does not specifically contest Petitioner’s arguments for these limitations. *See* PO Resp. 57–66. We find the arguments persuasive

and determine that Petitioner has shown that Ross discloses limitations 8[b] and 8[c].

(d) Limitation 8[d]

Limitation 8[d] is as follows:

an alignment controller configured to sense a degree of coupling of said receiving antenna and the transmitting antenna based on a detection of the coupling that is measured at the receiving antenna, the alignment controller being further configured to move said receiving antenna from the first alignment position to a second alignment position to better align the receiving antenna with the transmitting antenna.

Ex. 1001, 9:1–8.

Petitioner argues that Ross discloses the recited alignment controller as horizontal coil position unit 46, with or without controller 56 and related sensors and circuitry. Pet. 64 (citing Ex. 1003 ¶¶ 242–249). According to Petitioner, after the vehicle is steered into place with a rough tolerance, this alignment controller “‘further controls the lateral position of the coil 42 so that it is more closely aligned’ with the roadway-embedded coil.” *Id.* (quoting Ex. 1007, 12:33–62; Ex. 1003 ¶ 244); Pet. Reply 25 (citing Ex. 1007, 9:60–66) (reiterating the argument).

According to Petitioner, a person of ordinary skill in the art would have understood that this horizontal movement better aligns the two coils, and that the alignment involves sensing a degree of coupling, which is “how the system determines how far, and in what direction, to move the coil” for optimal alignment and to achieve the maximum possible coupling. Pet. 65–66 (citing Ex. 1007, 3:66–67, 6:25–39, 9:44–10:5, 12:44–62; Ex. 1003 ¶¶ 245–246).

Patent Owner disagrees that Ross discloses “moving the receiving antenna to a second alignment position to achieve an alignment that is better than the alignment detected based on the degree of coupling measured at the receiving antenna.” PO Resp. 60–62 (citing Ex. 2010 ¶ 116). Patent Owner argues that “Ross does not disclose that the degree of coupling at the ‘rough tolerance’ position is measured at the receiving antenna,” and instead, “Ross discloses the use of sensors such as optical sensors that are used to position the vehicle within a rough tolerance of a designed stopped location, such as loading/unloading zone.” *Id.* at 62–63 (citing Ex. 1007, 10:60–61, 12:37–52, 13:9–14). According to Patent Owner, “this makes sense because the sensors can look for markers indicating the location of the known stopped location, and then position the vehicle within a rough tolerance of the known stopped location based on those markers.” *Id.* at 63 (citing Ex. 2010 ¶ 119).

Patent Owner contends that Petitioner’s argument relies on portions of Ross that discuss automated driving within a rough tolerance while the vehicle is on the electrified highway, not on the fine alignment that happens after the vehicle stops at the parking location. PO Resp. 63–64 (citing Ex. 1007, 13:15–31; Ex. 2010 ¶ 120).

In its Reply, Petitioner argues that the discussion in Ross about aligning the receiving antenna based on maximizing the degree of coupling (Ex. 1007, 13:15–32) also applies to alignment that occurs after the vehicle has stopped at a parking location (*id.* at 12:33–62). Pet. Reply 25–26 (citing Ex. 1007, 9:60–66; Ex. 1032 ¶¶ 81–86). Petitioner acknowledges that Ross disclosing aligning with optical sensors but argues that this is just one alternative embodiment. *Id.* at 26 (citing Ex. 1007, 13:5–31; Ex. 1032 ¶ 82).

In its Sur-reply, Patent Owner argues that “Petitioner improperly combines two separate teachings of Ross (alignment while driving or parking and fine alignment after the vehicle has parked) to argue that Ross discloses moving the receiving antenna from a first position to a second position with better alignment.” PO Sur-reply 20–21 (citing Ex. 2010 ¶ 119).

We find Petitioner’s arguments persuasive. Ross begins by discussing both types of alignment: (1) the course alignment that occurs when the vehicle is under automated control on a roadway (Ex. 1007, 12:32–52) and (2) the finer alignment that occurs after the vehicle is parked (*id.* at 12:52–62).

Then Ross discusses sensors used for operating the vehicle, which may include “optical sensors that look for markers placed on the roadway power transmitting module . . . embedded in the roadway,” as well as “acoustic, mechanical, and electromagnetic sensors.” *Id.* at 13:5–14. In addition to these sensors, Ross discloses that the vehicle’s “lateral (horizontal positioning device” can be activated so that the coil is maintained at a rough tolerance within the optimum lateral position of the coils embedded in the roadway. *Id.* at 13:15–20. Although Ross states this in the context of when the vehicle is driving, Ross makes this disclosure applicable “even when the vehicle is stopped. *Id.* at 13:15, 13:20–21. In both cases, “instead of using the [optical, etc.] sensors or in combination with using the sensors,” the controller determines “the approximate lateral position . . . by monitoring the change in the amplitude of the inductively received power signal as the [receiving coil] is laterally moved in one direction or the other.” *Id.* at 13:21–26. The receiver coil is then maintained “at a lateral position

that keeps the induced power signal at a peak or maximum level.” *Id.* at 13:27–31.

Thus, we find that Ross discloses performing its fine alignment, which occurs after the vehicle has stopped, based on sensing a degree of coupling. We credit Dr. Allen’s testimony to that effect, including his disagreement with Dr. Horenstein’s opinion. *See* Ex. 1032 ¶¶ 81–86. We also agree with Dr. Allen that given the disclosure in Ross, a person of ordinary skill in the art would have understood Ross’s teachings about alignment based on the degree of coupling to be a viable alternative to alignment based on other sensors such as optical sensors, regardless of whether the vehicle is parked temporarily on a roadway or parked in a loading/unloading zone. *See* Ex. 1003 ¶¶ 246–248.

For the above reasons, we determine that Petitioner has shown that Ross discloses limitation 8[d].

(e) Conclusion as to Claim 8

For the above reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that the combination of Ross and Wang teaches every limitation of claim 8 and that there would have been a motivation to combine the two references with a reasonable expectation of success. We conclude that claim 8 is unpatentable under § 103(a) as obvious over Ross and Wang.

3. *Claims 9, 10, 12, and 19*

Claims 9, 10, 12, and 19 depend from claim 8 and recite further limitations. Ex. 1001, 9:9–17, 9:20–22, 10:25–27.

Petitioner argues that Ross, in combination with Wang, teaches each of the added limitations in these claims, relying on declaratory testimony of Dr. Allen. Pet. 66–72 (citing Ex. 1003 ¶¶ 250–267).

Patent Owner does not specifically contest Petitioner’s arguments for these claims, relying instead on its arguments for parent claim 8. *See* PO Resp. 64.

We find Petitioner’s arguments persuasive, for the reasons provided in the Petition. Thus, we determine that claims 9, 10, 12, and 19 are unpatentable under § 103(a) as obvious over Ross and Wang.

4. *Claim 13*

Limitations 13[a] and 13[b] are similar to limitations 8[a] and 8[d], respectively. *Compare* Ex. 1001, 9:24–9:25, and *id.* at 9:26–10:5, with *id.* at 8:59–61, and *id.* at 9:1–8. *See supra* Sections III.C.2, III.F.2.

(a) Preamble

Petitioner argues that, to the extent the preamble is limiting, Ross discloses a “method” as recited in the preamble. Pet. 50 (citing Ex. 1007, code (57), 20:29–41; Ex. 1001 ¶¶ 198–199). Patent Owner does not contest this. *See* PO Resp.

Without deciding whether the preamble is limiting, we find Petitioner’s arguments persuasive.

(b) Limitation 13[a]

Once again, limitation 13[a] recites “guiding a receiving antenna of a vehicle to a first alignment position relative to a transmitting antenna.” Ex. 1001, 9:24–25.

Like Petitioner’s arguments for limitation 8[a], Petitioner argues that Ross discloses a transmitting antenna in the form of a coil embedded in a roadway, and a receiving antenna in the form of a coil in a vehicle that receives power through inductive coupling. Pet. 51–52 (citing Ex. 1007, 7:57–8:64, 9:11–43, Figs. 1, 2; Ex. 1003 ¶¶ 200–205). Like its argument for limitation 8[b], Petitioner argues that the “guiding” limitation is met when the receiving antenna is guided while the vehicle is being driven or being parked over a roadway-embedded transmitting coil. Pet. 53 (citing Ex. 1007, 6:12–24, 7:11–13, 9:44–10:5, 12:30–62, Figs. 1–2, 4, 7; Ex. 1003 ¶¶ 203–205).

Patent Owner does not specifically contest Petitioner’s arguments about limitation 13[a]. *See* PO Resp. 64–66. We find the arguments persuasive.

(c) Limitation 13[b]

Once again, limitation 13[b] recites,
responsive to detecting a degree of coupling in the first alignment position between the receiving antenna and the transmitting antenna that is measured at the receiving antenna, moving one of the receiving antenna and the transmitting antenna from the first alignment position to a second alignment position to improve alignment of the receiving antenna with the transmitting antenna and improve the degree of coupling.

Ex. 1001, 10:49.

Limitation 13[b] is like limitation 8[d], and Petitioner’s arguments are similar. Petitioner argues that “[a]fter Ross’s vehicle is parked within ‘rough tolerance’ relative to the embedded coil (the claimed first alignment position), the onboard coil is moved to a position that provides better coupling and alignment with the embedded road coil (the claimed second

alignment position).” Pet. 54 (citing Ex. 1007, 9:44–10:5, 12:10–62, 13:15–32; Ex. 1003 ¶¶ 207–209). According to Petitioner, Ross’s vehicle coil is mounted on a movable assembly, and its horizontal and vertical positions are adjusted to maximize the coupling efficiency with the coil in the roadway. Pet. 54–55 (citing Ex. 1007, 9:44–10:5, 12:52–62; Ex. 1003 ¶¶ 208–209).

Petitioner contends that a person of ordinary skill in the art “would have understood that when Ross’s system moves the coil assembly from a first ‘rough’ alignment position to a second ‘more closely aligned’ position, it does so by detecting the degree of coupling in the initial position and then moving the coil to the better-coupled position.” Pet. 55 (citing Ex. 1007, 6:25–39, 9:44–10:5, 12:52–62; Ex. 1003 ¶¶ 210–212). According to Petitioner, Ross teaches that this optimal alignment for coupling is determined by “monitoring the change in the amplitude of the inductively received power signal as the [vehicle coil] is laterally moved in one direction or the other.” Pet. 56 (quoting Ex. 1007, 13:24–26) (citing Ex. 1007, 3:66–67, 9:15–46, 13:20–32; Ex. 1003 ¶¶ 211–212).

Patent Owner’s arguments for limitation 13[b] are substantively the same as its arguments for limitation 8[d]. PO Resp. 64–66; *see also* Pet. Reply 26 (arguing that Patent Owner’s arguments are “substantively the same as [Patent Owner]’s prior argument”); PO Sur-reply 21 (not contesting Petitioner’s assertion in the Reply).

For the same reasons given above in the context of limitation 8[d], we find Petitioner’s arguments persuasive. *See supra* Section III.F.2(d). For the same reasons, we determine that Petitioner has shown that the combination of Ross and Wang teaches limitation 13[b].

(d) Conclusion as to claim 13.

For the above reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that the combination of Ross and Wang teaches every limitation of claim 13 and that there would have been a motivation to combine the two references with a reasonable expectation of success. We conclude that claim 13 is unpatentable under § 103(a) as obvious over Ross and Wang.

5. *Claims 14 and 16*

Claims 14 and 16 depend from claim 13 and recite further limitations. Ex. 1001, 10:6–9, 10:15–19.

Petitioner argues that Ross, in combination with Wang, teaches each of the added limitations in these claims, relying on declaratory testimony of Dr. Allen. Pet. 56–58 (citing Ex. 1003 ¶¶ 213–219).

Patent Owner does not specifically contest Petitioner’s arguments for these claims, relying instead on its arguments for parent claim 13. *See* PO Resp. 66.

We find Petitioner’s arguments persuasive, for the reasons provided in the Petition. Thus, we determine that claims 14 and 16 are unpatentable under § 103(a) as obvious over Ross and Wang.

IV. CONCLUSION¹¹

For the reasons above, Petitioner has shown by a preponderance of the evidence that claims 1, 7–10, 12–16, 18, and 19 of the '654 patent are unpatentable under § 103(a). Petitioner has not shown that claims 4–6 are unpatentable.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
13, 15	102(a), (b), (e)	Odachi	13, 15	
1, 7, 18	103(a)	Odachi, Wang	1, 7, 18	
4–6	103(a)	Odachi, Wang, Partovi		4–6
8–10, 12– 14, 16, 19	103(a)	Ross, Wang	8–10, 12–14, 16, 19	
Overall Outcome			1, 7–10, 12– 14, 16, 18, 19	4–6

¹¹ Should Patent Owner wish to pursue amendment of claims in a reissue or reexamination proceeding after this decision, we draw 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).

V. ORDER

It is

ORDERED that claims 1, 7–10, 12–16, 18, and 19 of the '654 patent are unpatentable; and

FURTHER ORDERED that claims 4–6 of the '654 patent are not shown to be unpatentable; and

FURTHER ORDERED that parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2024-00140
Patent 8,466,654 B2

For PETITIONER:

David Zucker
Charles Sanders
Steven Peters
LATHAM & WATKINS LLP
david.zucker@lw.com
charles.sanders@lw.com
steven.peters@lw.com

For PATENT OWNER:

Lance Lawson
Andrew Spence
Ryan Corbett
BURR & FORMAN LLP
llawson@burr.com
aspence@burr.com
rcorbett@burr.com

Misha Hill
WITRICITY CORPORATION
misha.hill@witricity.com