UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.
Petitioner

v.

GARRITY POWER SERVICES LLC
Patent Owner

Patent No. 9,906,067

PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,906,067

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Ex-1004	Prosecution History of U.S. Patent No. 9,906,067
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I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") requests *inter partes* review of claims 1-3, 5, 7, 8, 10, 11, 15, and 16 ("the challenged claims") of U.S. Patent No. 9,906,067 ("the '067 patent") (Ex-1001), which, according to PTO records, is assigned to Garrity Power Services LLC ("Patent Owner" or "PO"). For the reasons discussed below, the challenged claims should be found unpatentable and canceled.

II. MANDATORY NOTICES

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

Related Matters: The '067 patent is at issue in *Garrity Power Servs. LLC v. Samsung Electronics Co. Ltd., et al*, Case No. 2:20-cv-00269-JRG (E.D. Tex.).

Counsel and Service Information: Lead counsel: Naveen Modi (Reg. No. 46,224), and Backup counsel are (1) Allan M. Soobert (Reg. No. 36,284), (2) Chetan R. Bansal (Limited Recognition No. L0667), (3) Ian G. Paquette (Reg. No. 79,244), (4) David M. Valente (Reg. No. 76,287); (5) Daniel Zeilberger (Reg. No. 65,349). Service information is Paul Hastings LLP, 2050 M St. N.W., Washington, D.C., 20036, Tel.: 202.551.1700, Fax: 202.551.1705, email: PH-Samsung-Garrity-IPR@paulhastings.com. Petitioner consents to electronic service.

III. PAYMENT OF FEES

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

IV. GROUNDS FOR STANDING

Petitioner certifies that the ’067 patent is available for review and Petitioner is not barred or estopped from requesting review on the grounds identified herein.

V. PRECISE RELIEF REQUESTED AND GROUNDS RAISED

Claims 1-3, 5, 7, 8, 10, 11, 15, and 16 should be canceled as unpatentable based on the following grounds:

Ground 1: Claims 1, 2, and 15 are unpatentable under AIA 35 U.S.C. § 102(a)(2) as being anticipated by U.S. Patent Publication No. 10,404,089 (“Kasar”);

Ground 2: Claims 3 and 5 are unpatentable under AIA 35 U.S.C. § 103 as being obvious over Kasar;

Ground 3: Claims 7, 8, 10, 11, and 16 are unpatentable under AIA 35 U.S.C. § 103 as being obvious over Kasar and U.S. Patent Publication No. 2011/0254377 (“Wildmer”);

Ground 4: Claims 7, 10, 11, and 16 are unpatentable under AIA 35 U.S.C. § 103 as being obvious over Kasar and Korean Patent Publication No. KR 20140121200A ("Jeong");[1] and

Ground 5: Claim 8 is unpatentable under AIA 35 U.S.C. § 103 as being obvious over Kasar, Jeong, and Japanese Patent Publication No. JP 2006238569A ("Sakaguchi").[2]

The '067 patent issued from U.S. Patent Application No. 14/754,863 filed June 30, 2015. (Ex-1001, Cover.) Because the '067 patent has an effective filing date after March 16, 2013, it is subject to the first-to-file provisions of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"). AIA § 3(n)(1)(A).

Kasar issued September 3, 2019 from U.S. Application No. 14/731,280 filed June 4, 2015, which claims the benefit of provisional application No. 62/056,827

[1] Exhibit 1007 is a compilation containing the English-language translation of Jeong (Ex-1007, 1-54), an affidavit as to the accuracy of the translation (*id.*, 55), and the Korean-language original version of Jeong (*id.*, 56-109).

[2] Exhibit 1008 is a compilation containing the English-language translation of Sakaguchi (Ex-1008, 1-9), an affidavit as to the accuracy of the translation (*id.*, 10), and the Japanese-language original version of Sakaguchi (*id.*, 11-19).

filed September 29, 2014. (Ex-1005, Cover.) Kasar is prior art under AIA 35 U.S.C. § 102(a)(2).

Wildmer published on October 20, 2011. (Ex-1006, Cover.) Wildmer is prior art under AIA 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Jeong published on October 15, 2014. (Ex-1007, Cover.) Jeong is prior art under AIA 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

Sakaguchi published on September 7, 2006. (Ex-1008, Cover.) Sakaguchi is prior art under AIA 35 U.S.C. §§ 102(a)(1) and 102(a)(2).

None of these references were considered by the USPTO during prosecution of the '067 patent. (*See*, *e.g.*, Ex-1001, Cover ("References Cited").)

VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art ("POSITA") as of the alleged invention of the '067 patent, which for purposes of this proceeding is the early-to-mid 2010s (including June 30, 2015) would have had a bachelor's degree in electrical engineering or a similar field, and at least two to three years of experience in integrated circuit design including power electronics. (Ex-1002, ¶20-21.) More education can supplement practical experience and vice versa. (*Id.*)[3]

[3] Petitioner submits the declaration of R. Jacob Baker, Ph.D., P.E. (Ex-1002), an expert in the field of the '067 patent. (Ex-1002, ¶21; *see also* Ex-1003.)

VII. OVERVIEW OF THE ’067 PATENT

A. The ’067 Patent

The ’067 patent relates to “wireless power transmission and, more specifically, to an apparatus, system, and method to wirelessly charge and/or discharge a battery.” (Ex-1001, 1:6-10; *see also id.*, Abstract (“an apparatus, system and method to wirelessly charge and/or discharge a battery”); Ex-1002, ¶25).

The ’067 patent states that “[i]n recent years, wireless power systems have been developed that allow recharging of the batteries without making a physical connection between the battery and the charger” through “resonant operation to transfer power” where the “battery itself is electrically/metallically tied to the load it will eventually power and charging is accomplished through a metallically isolated wireless interface.” (Ex-1001, 1:29-36.) According to the ’067 patent “standard wireless interfaces [are] set up to allow transfer of power in only one direction” and “[t]here are many advantages associated with a battery that can be wireless charged or discharged . . . over a metallically isolated path for both charging and discharging.” (*Id.*, 1:39-40, 1:57-60; *see also* Ex-1002, ¶26.)

Figure 1 of the ’067 patent “illustrates a block diagram of an embodiment of a power system with a wireless battery interface and a wireless battery.” (Ex-1001, 2:34-36.) According to the ’067 patent, the system includes “a wireless battery interface 120 and a wireless battery 130,” “power source/load 110 such as a utility grid power source," and "wireless battery 130 is docked into the wireless battery interface 120 by a coupler" that "links a magnetic field 140 induced by a metallic coil (or winding) 150 surrounding a wireless battery interface magnetic core piecepart in the wireless battery interface 120 with a wireless battery magnetic core piecepart in the wireless battery 130." (*Id.*, 4:57-67.) The wireless power transfer block diagram of Figure 1 of the '067 patent is shown below:

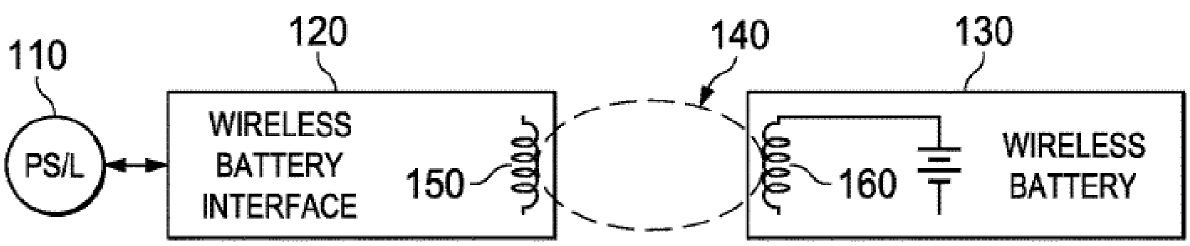

FIG. 1

(*Id.*, FIG. 1; *see also* Ex-1002, ¶27.)

To charge the wireless battery 130, "a voltage is induced in a metallic coil (or winding) 160 surrounding the wireless battery magnetic core piecepart in the wireless battery 120 by a voltage impressed across the terminals of the metallic coil 150 that surrounds the wireless battery interface magnetic core piecepart in the wireless battery interface 120," and to discharge the wireless battery 130, "a voltage is induced in the metallic coil (or winding) 150 surrounding the wireless battery interface magnetic core piecepart in the wireless battery interface 120 by a voltage impressed across the terminals of the metallic coil 160 that surrounds the wireless battery magnetic core piecepart in the wireless battery 130." (Ex-1001, 4:67-5:13.) The '067 patent further states with respect to Figure 1 that "[t]he power source/load 110 can be, for instance, a utility grid power source that is employed to charge the wireless battery 130, and also can be arranged to absorb energy from the wireless battery 130 for utility grid power source load-leveling purposes." (*Id.*, 5:13-17; *see also* Ex-1002, ¶28.)

Figure 2 of the '067 patent is "a schematic diagram of an embodiment of a power system with a wireless battery 200 and a wireless battery interface 250." (Ex-1001, 5:20-22, FIG. 2.)

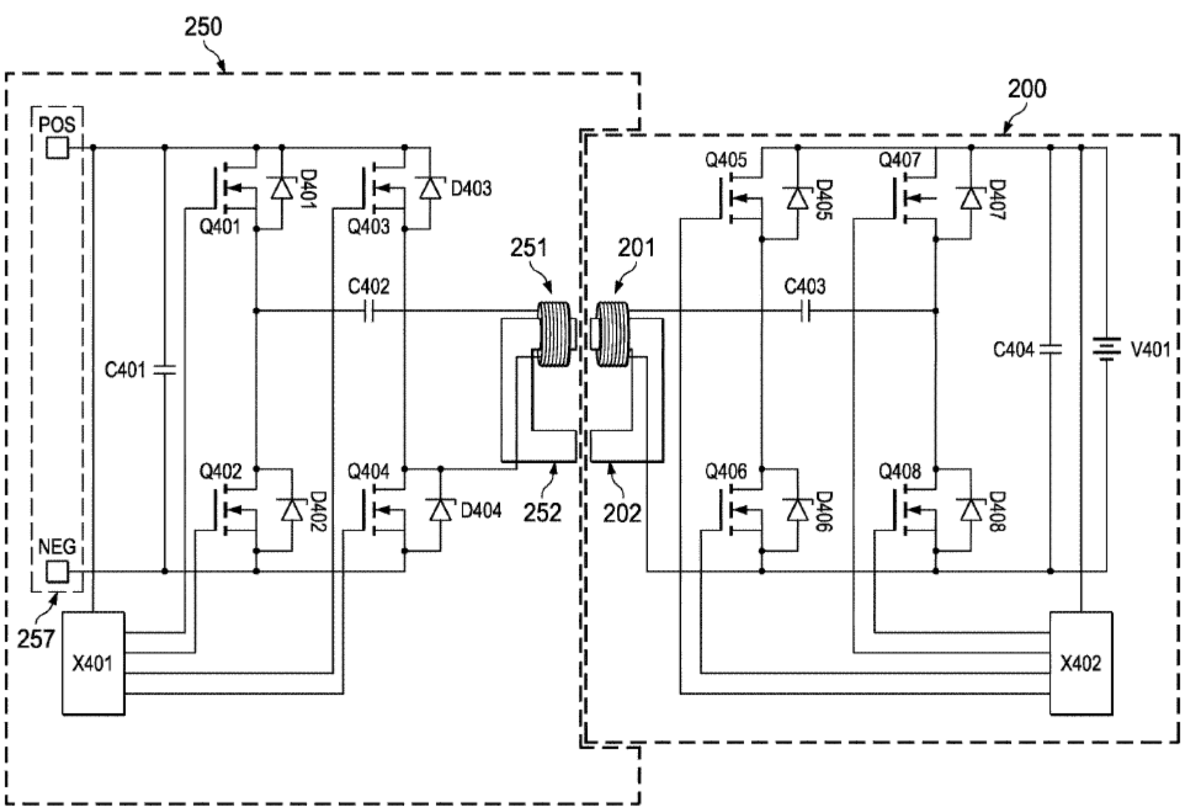

FIG. 2

(*Id.*, FIG. 2; *see also* Ex-1002, ¶29.)

According to the '067 patent, "wireless battery 200 is formed with a metallic coil 201 surrounding a wireless battery magnetic core piecepart 202 that can be used to both transmit and receive power," and "wireless battery interface 250 is formed with a metallic coil 251 surrounding a wireless battery interface magnetic core piecepart 252 that can be used to both transmit and receive power." (Ex-1001, 5:22-25, 5:56-58, FIG. 2.) Additionally, "[t]here is a small air gap in the magnetic path created by the magnetic core pieceparts 202, 252." (*Id.*, 5:64-65, FIG. 2.) As Figure 2 of the '067 patent shows, each metallic coil, 201 and 251, are coupled to full-bridge power trains formed by power switches Q405-408 and Q 401-404, respectively: "The metallic coil 201 is coupled to a resonant capacitor C403 and a full-bridge power train is formed with power switches (e.g., metal-oxide semiconductor field-effect transistors ("MOSFETs")) Q405, Q406, Q407, Q408 and diodes D405, D406, D407, D408," and "metallic coil 251 is coupled to a resonant capacitor C402 and a full-bridge power train is formed with power switches Q401, Q402, Q403, Q404 and diodes D401, D402, D403, D404." (*Id.*, 5:30-34, 6:12-15; *see also* Ex-1002, ¶30.)

The operation of Figure 2 is as follows:

> If transmitting power from the terminals 257 to the battery V401, the full-bridge power train formed with the power switches Q401, Q402, Q403, Q404 produces a pulsed voltage waveform to the resonant capacitor C402 and the metallic coil 251. The full-bridge power train

> is switched so that the power switches Q401, Q404 are simultaneously turned on and off with a duty cycle slightly less than about 50 percent (such as 45 to 49 percent). Also, the power switches Q402, Q403 are simultaneously turned on and off with a duty cycle slightly less than 50 percent and 180 degrees out-of-phase with respect to the power switches Q401, Q404. The duty cycle of each power switch is slightly less than 50 percent to decrease a possibility of simultaneous conduction with an opposing power switch and to allow enough time for a magnetizing current in the metallic coil 251 to resonate with the parasitic capacitance of the power switches Q401, Q402, Q403, Q404 to commutate a voltage thereacross. This process results in soft-switching, meaning the voltage across or the current through each power switch Q401, Q402, Q403, Q404 is naturally resonated to substantially zero just prior to turning that respective power switch on or off.

(Ex-1001, 6:54-7:8.) Additionally, the ’067 patent discloses that “[a] controller (e.g., a controller X401 of the power system of FIG. 2) of the apparatus may be configured to selectively cause at least a portion of the power train to switch between full-bridge and half-bridge operation in response to a sensed voltage level.” (*Id.*, 17:34-38; *see also* Ex-1002, ¶30.)

Figure 11 of the ’067 patent describes an embodiment for mechanically aligning the first and second magnetic core pieceparts with “a removable first magnetic core piecepart 1110 having a surrounding first metallic coil 1115, a second magnetic core piecepart 1120 having a surrounding second metallic coil 1125" with "[a] cavity 1160 in the wireless battery interface 1150 [being] configured to receive the wireless battery 1100 and consequentially the first magnetic core piecepart 1110." (Ex-1001, 14:30-33, 14:43-46.)

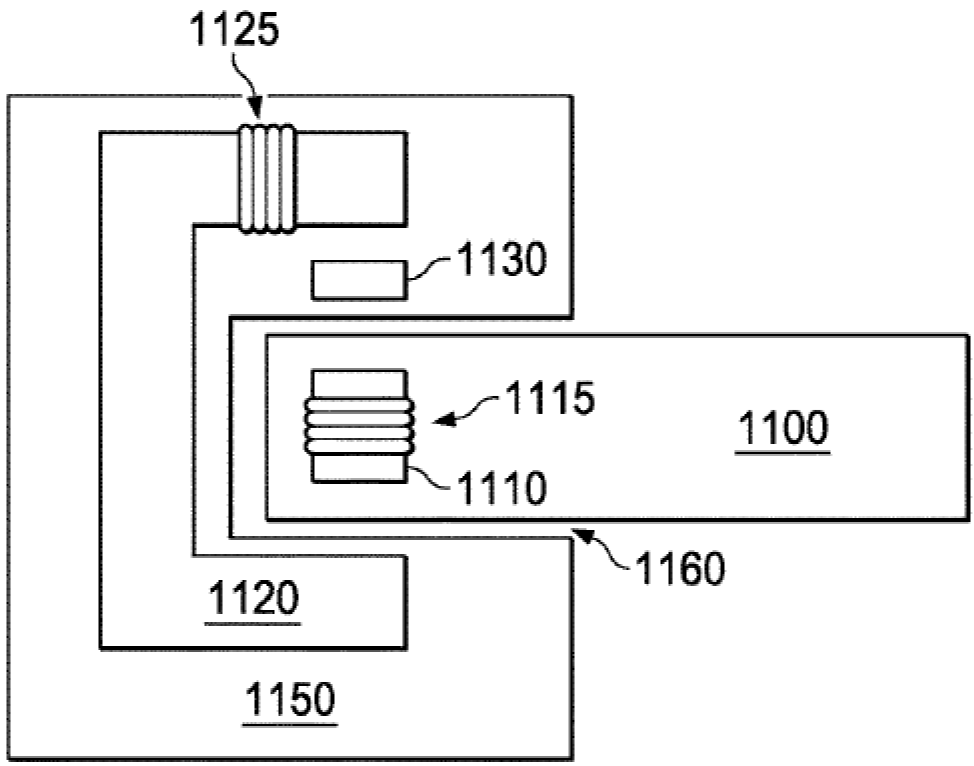

FIG. 11

(*Id.*, FIG. 11; *see also* Ex-1002, ¶32.)

Figures 12A and 12B show "an embodiment of a permanent magnet aligner." (Ex-1001, 14:64-66.) In this embodiment of the '067 patent, the "wireless battery interface enclosure 1290 houses a permanent magnet aligner including magnetic rings 1240, 1250" and the "wireless battery enclosure (not shown) has a very similar (if not identical) structure to that shown for the wireless battery interface enclosure 1290 except that the inner and outer magnetic rings are reversed in polarity" such that "the magnetic rings cause the magnetic couplers of the wireless battery interface enclosure 1290 and the wireless battery enclosure to align with each other." (*Id.*, 15:2-26.)

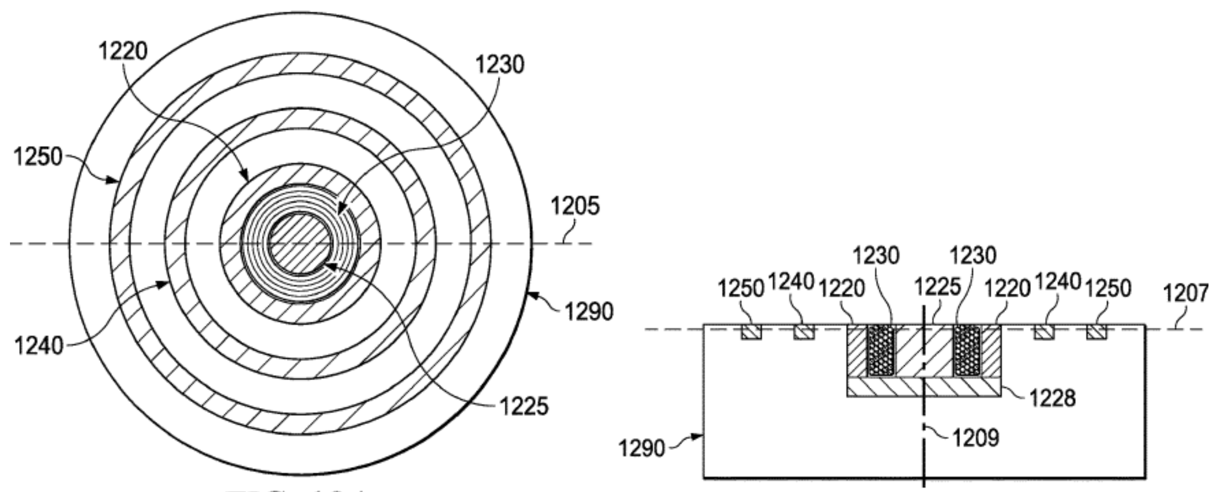

FIG. 12A FIG. 12B

(*Id.*, FIGs. 12A and 12B; *see also* Ex-1002, ¶33.)

VIII. CLAIM CONSTRUCTION

For IPR proceedings, the Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* 83 Fed. Reg. 51,340-51,359 (Oct. 11, 2018). Under *Phillips*, claim terms are typically given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention, having taken into consideration the language of the claims, the specification, and the prosecution history of record. *Phillips*, 415

F.3d at 1313; *see also id.* at 1312-16. The Board, however, only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper 11 at 16 (Aug. 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Petitioner believes that no express constructions of the claims are necessary to assess whether the challenged claims read on the prior art.[4] (Ex-1002, ¶34.)

[4] Petitioner reserves all rights to raise claim construction and other arguments in district court as relevant and necessary to those proceedings. For example, Petitioner has not raised all challenges to the '067 patent in this Petition, including invalidity under 35 U.S.C. § 112, and a comparison of the claims to any accused products in litigation may raise controversies that need to be resolved through claim construction that are not presented here.

IX. DETAILED EXPLANATION OF GROUNDS

As discussed below, claims 1-3, 5, 7, 8, 10, 11, 15, and 16 are unpatentable in view of the prior art. (Ex-1002, ¶35.)

A. Ground 1: Kasar Anticipates Claims 1, 2, and 15

1. Claim 1

a) "An apparatus, comprising: a first magnetic core piecepart having a first metallic coil encircling at least a portion thereof"

Kasar discloses these limitations. (Ex-1002, ¶¶36-40.) Specifically, Kasar discloses an electronic device 100 ("apparatus") comprising an alignment magnet 124 ("first magnetic core piecepart") having an inductive coil 112 ("first metallic coil") encircling at least a portion thereof. (Ex-1002, ¶36.)

For example, Kasar explains that its "electronic device 100 may . . . include at least one alignment magnet 124" (Ex-1005, 9:24-26), where "alignment magnet 124 may be positioned within the center of inductive coil 112, such that the wires of inductive coil 112 substantially surround alignment magnet 124 of first electronic device 100" (*id.*, 9:31-34). Kasar further explains that the "[a]lignment magnet[] 124 may be formed from any suitable material that has magnetic or electromagnetic properties" (*id.*, 9:40-42), which is consistent with the '067 patent's explanation that a "magnetic core piecepart" may have either a "high magnetic permeability" (Ex-1001, 5:25-29) or a "low relative permeability" (*id.*, 14:46-57), or anything in between (*id.*). (Ex-1002, ¶¶37-38.) And Kasar discloses that "inductive coil 112 may be formed from various conductive materials, for example metal" (Ex-1005, 8:31-33), and thus is disclosed as a "metallic coil." (Ex-1002, ¶39.)

An exemplary representation of alignment magnet 124 and inductive coil 112 is shown below in Figures 2 and 4A, with the inductive coil 112 encircling at least a portion of alignment magnet 124:

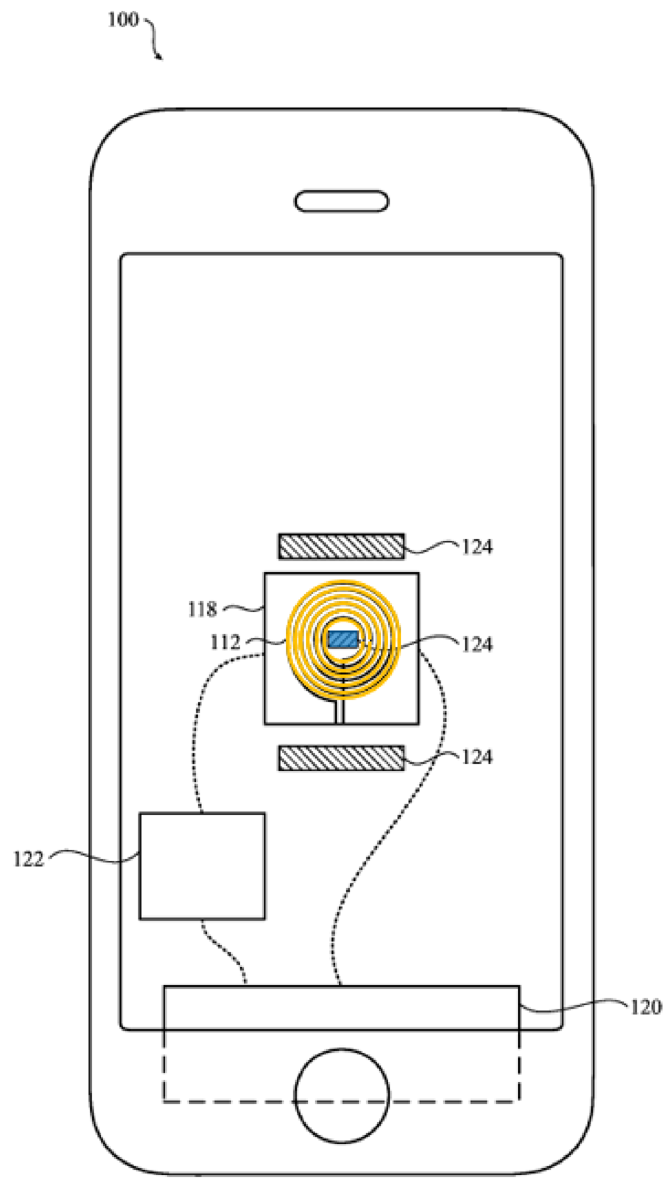

FIG. 2

(Ex-1005, FIG. 2 (annotated, with alignment magnet 124 in blue and inductive coil 112 in yellow).)

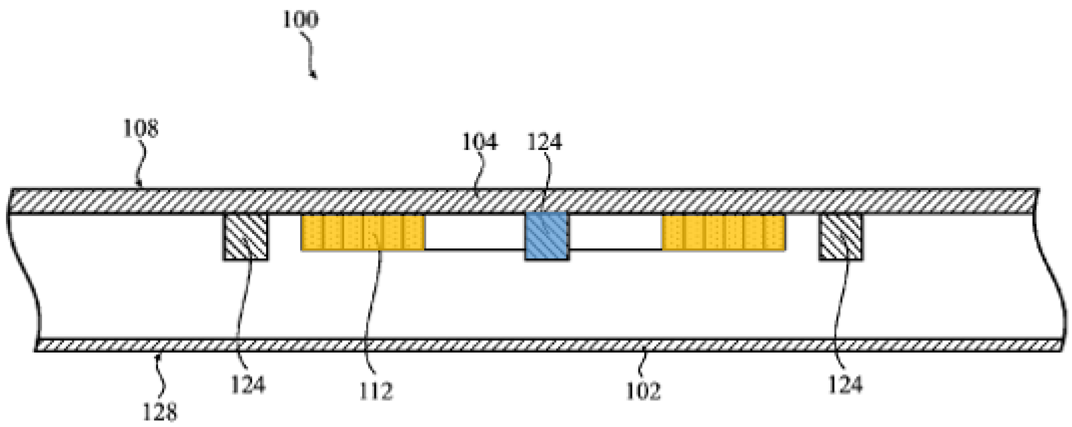

FIG. 4A

(Ex-1005, FIG. 4A (same annotations).)

Because the central alignment magnet 124 is within the coil 112, as shown in annotated Figures 2 and 4A above, and because it is made of a "material that has magnetic or electromagnetic properties," a POSITA would have understood that the alignment magnet 124 functions as a magnetic core piecepart. (Ex-1002, ¶40.) In fact, as a material with magnetic or electromagnetic properties within a coil, alignment magnet 124 will affect the magnetic flux (Ex-1005, 9:40-42; Ex-1002, ¶¶38, 40), which, while not a requirement of the claim, is consistent with the '067 patent's description of magnetic core pieceparts affecting magnetic flux. (*See, e.g.*, Ex-1001, 5:62-64, 6:2-6, 6:9-12; *see also* Ex. 1002, ¶¶38, 40.)

b) "[the first magnetic core piecepart] configured to be coupled to, aligned with and removable from a second magnetic core piecepart having a second metallic coil encircling at least a portion thereof to form a transformer; and"

Kasar discloses these limitations. (Ex-1002, ¶¶41-46.) Specifically, Kasar discloses that the alignment magnet 124 of electronic device 100 ("first magnetic core piecepart") is configured to be coupled to, aligned with and removable from a second alignment magnet 224 of a second electronic device 200 ("second magnetic core piecepart") having a second inductive coil 212 ("second metallic coil") encircling at least a portion thereof to form a transformer. (Ex-1002, ¶41.)

At the outset, Kasar discloses "a second magnetic core piecepart having a second metallic coil encircling at least a portion thereof," as claimed. For example, Kasar discloses a "[s]econd electronic device 200 [that] may include substantially similar components as first electronic device 100." (Ex-1005, 10:53-55; *see also id.* at 11:12-16 (disclosing "an alignment magnet 224 positioned within and/or surrounded by inductive coils 212a, 212c"); FIG. 5A (depicting the inductive coils 212a, 212b, 212c each encircling alignment magnets 224.) Indeed, the fact that the second electronic device 200 includes a second inductive coil 212 encircling at least a portion of the second alignment magnet 224—just like the electronic device 100 includes an inductive coil 112 encircling at least a portion of the alignment magnet 124—can be seen distinctly in Figures 10 and 11, below.

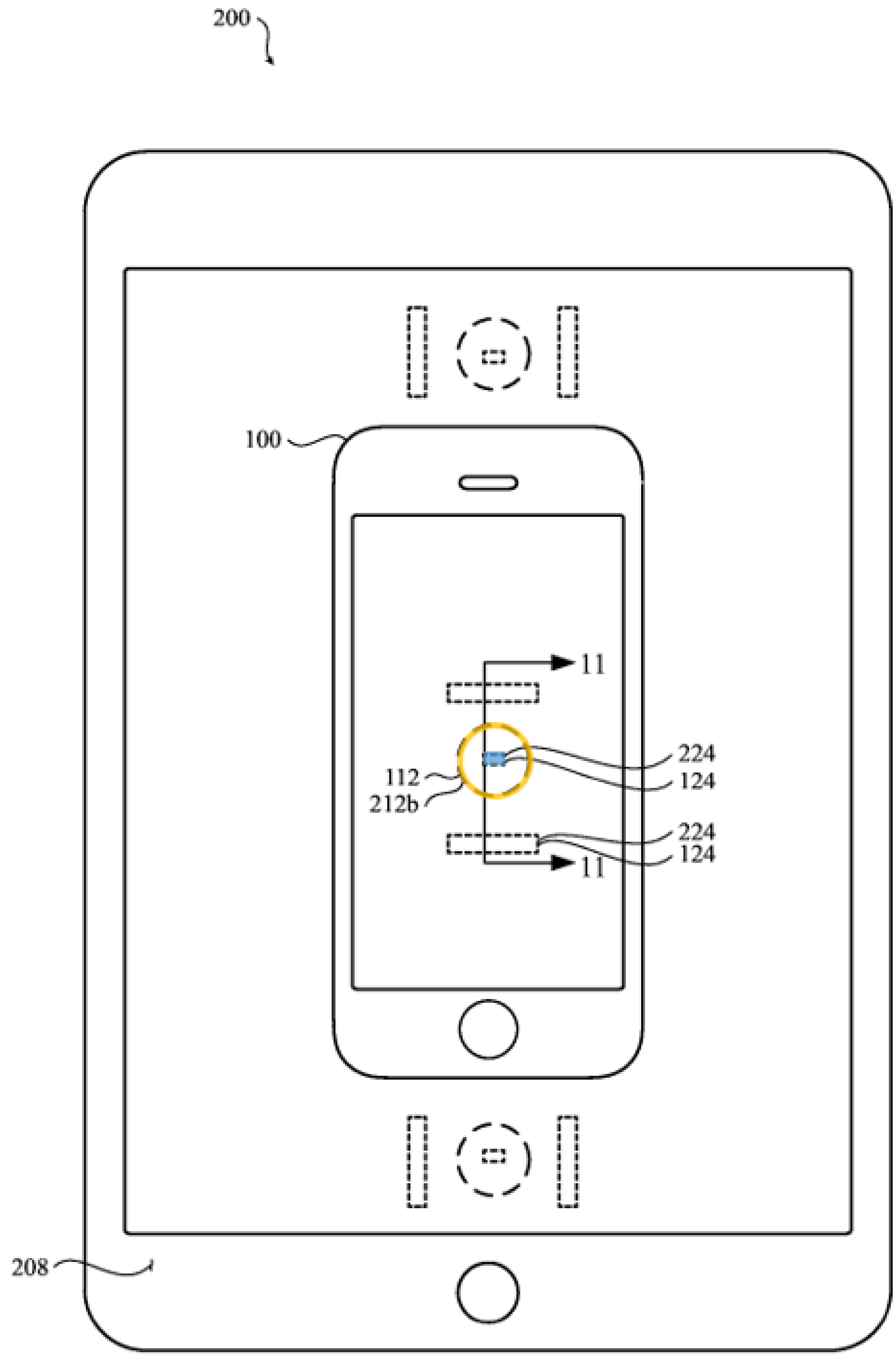

FIG. 10

(Ex-1005, FIG. 10 (annotated).)

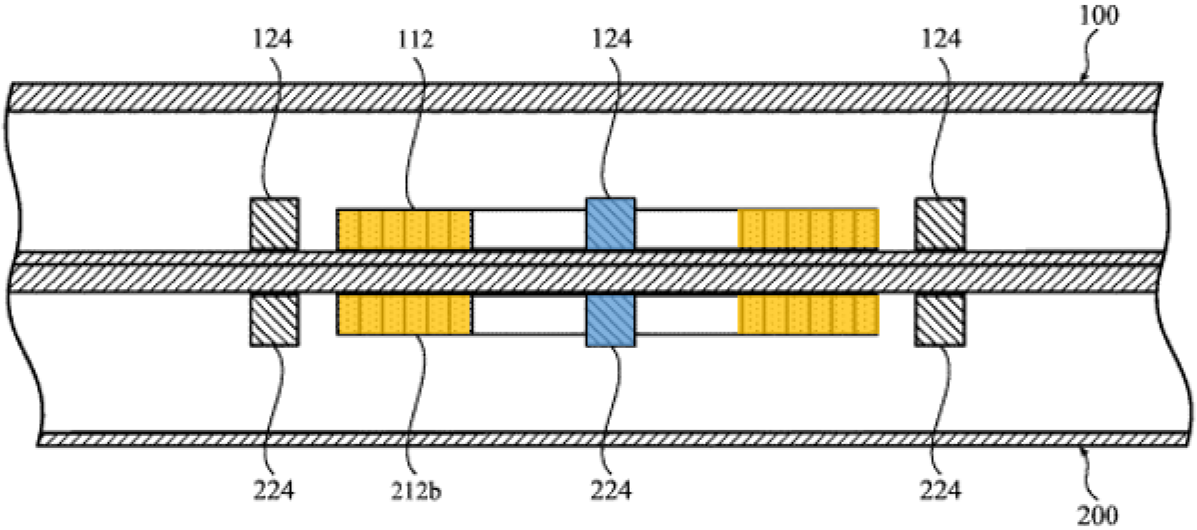

FIG. 11

(Ex-1005, FIG. 11 (annotated).) As Kasar explains, "[w]hen positioned on front surface 208 of second electronic device 200, inductive coils 112 of the first electronic device 100 may be aligned with and/or in electrical communication with inductive coil 212b of second electronic device 200." (*Id.*, 15:45-49; *see also id.*, 16:6-8 ("Prior to transmitting power between electronic devices 100, 200, the respective inductive coils 112, 212 b may be aligned using alignment magnets 124, 224."), 16:8-12 ("As shown in FIG. 11, alignment magnet 124 of first electronic device 100 may be magnetically attracted to and/or may be magnetically coupled to alignment magnets 224 positioned adjacent inductive coil 212 b of second electronic device 200.").) (*See also supra* Section IX.A.1.a (discussing how inductive coil 112 encircles at least a portion of alignment magnet 124); Ex-1002, ¶¶42-43.)

Kasar also discloses that the first magnetic core piecepart is configured to be "coupled to, aligned with and removable from" the second magnetic core piecepart having the second metallic coil encircling at least a portion thereof "to form a transformer," as claimed. Kasar discloses "various embodiments of at least two electronic devices in electrical communication for transmitting power between the electronic devices and/or for inductively charging one electronic device by another electronic device" including first device 100 configured to be coupled to second device 200. (Ex-1005, 14:45-49.) For example, Kasar discloses that first electronic device 100, having a first alignment magnet 124 and first inductive coil 112 as described above, "may be in electrical communication with second electronic device 200" thus forming a transformer. (*Id.*, 15:40-42) Kasar explains that "[w]hen positioned on front surface 208 of second electronic device 200, inductive coils 112 of first electronic device 100 may be aligned with and/or in electrical communication with inductive coil 212 b of second electronic device 200" and "[w]hen in electrical communication, the respective inductive coils 112, 212 b may transmit power between electronic devices 100, 200." (*Id.*, 15:45-51; *see also* Ex-1002, ¶44.)

Kasar further explains that "[p]rior to transmitting power between electronic devices 100, 200, the respective inductive coils 112, 212 b may be aligned using alignment magnets 124, 224." (Ex-1005, 16:6-8.) "As shown in FIG. 11," which is shown above, "alignment magnet 124 of first electronic device 100 may be magnetically attracted to and/or may be magnetically coupled to alignment magnets 224 positioned adjacent inductive coil 212 b of second electronic device 200." (*Id.*, 16:8-12.) "The magnetic coupling of the alignment magnets 124, 224 of respective electronic devices 100, 200 may provide a desired coupling and/or alignment for inductive coils 112, 212 b when transmitting power." (*Id.*, 16:12-16; *see also id.*, 23:59-64 ("the alignment magnets 124, 224 (*see* FIGS. 2 and 5A) of first and second electronic device 100, 200 may be magnetically attracted to each other, which may assist in positioning the first electronic device 100 such that inductive coil 112 may be aligned and/or in electrical communication with inductive coil 212*b*"), 25:56-5 ("aligning the first inductive coil of the first electronic device with the second inductive coil of the second electronic device"), 26:4-6 ("wirelessly receiving power which may be used to increase a charge of a battery of the first electronic device"), 26:7-9 ("a power transmitting operational mode . . . which may decrease the charge of the battery").)

A POSITA would have understood Kasar to teach that the first magnetic core piecepart is configured to be "coupled to, aligned with and removable from" the second magnetic core piecepart having the second metallic coil encircling at least a portion thereof because (1) coil 112/core 124 is placed in alignment with coil 212b/core 224 such that each are in electrical communication for transmitting power between the electronic devices and/or for inductively charging one electronic device by the other electronic device, and (2) coil 112/core 124 and coil 212b/core 224 may be removable from one another by being brought out of alignment. (Ex-1002,¶¶45-46.) Moreover, a POSITA would have understood this arrangement to form a "transformer" because the coil 112/core 124 and coil 212b/core 224 are in electrical communication such that the inductive coils 112 and 212 b transmit power between electronic devices 100 and 200. (Ex-1002, ¶¶45-46.) (*See also* Ex-1005, 23:49-56, FIG. 23C.)

c) "a battery metallically coupled to said first metallic coil and configured to be charged and discharged through an electrically isolating path of said transformer."

Kasar discloses this limitation. (Ex-1002, ¶¶47-51.) Specifically, Kasar discloses that the battery 120 of electronic device 100 ("battery") is metallically coupled to the coil 112 ("first metallic coil") and configured to be charged and discharged through an air gap between the coil 112 and the coil 212 ("electrically isolating path of said transformer"). (Ex-1002, ¶47.)

For instance, as shown in Figure 2 (annotated below), Kasar discloses a battery 120 of the first electronic device 100 that is metallically coupled to said first inductive coil 112. (Ex-1005, 2:14-17 ("a battery within the enclosure and an inductive coil within the enclosure and coupled to the battery"), 24:44-46 ("first electronic device 100 increases the charge of battery 120 (FIG. 2) by receiving power from second electronic device 200"), FIG. 2.) A POSITA would have understood that the battery 120 being "coupled" to the coil would mean "metallically coupled" especially because the wire forming the coil 112 may be metal and because the wires and an electrical substrate (e.g. a circuit board) may be used to "electrically couple and/or connect the inductive coil 112 to other distinct components of first electronic device 100." (Ex-1005, 8:24-33; Ex-1002, ¶48.)

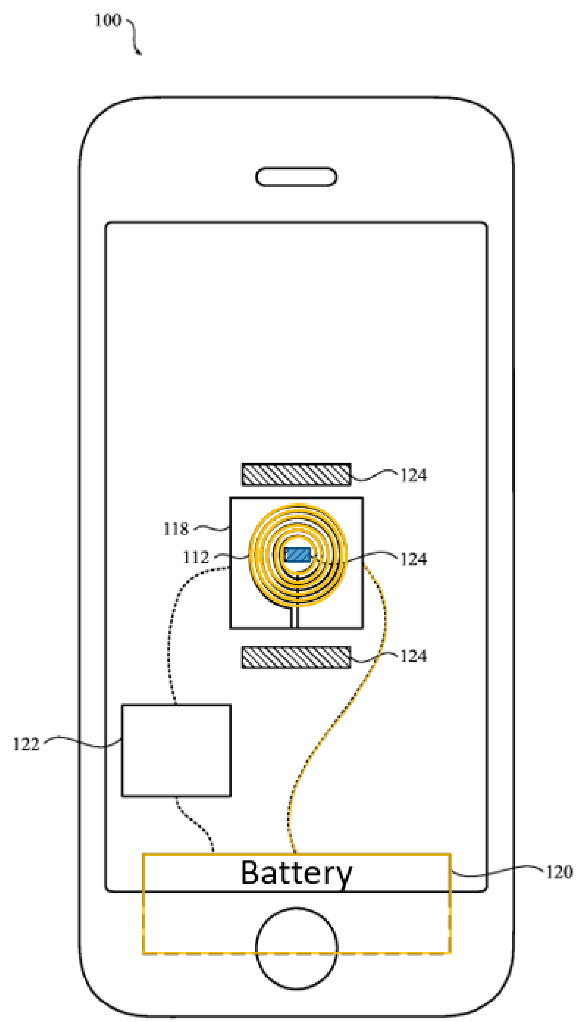

FIG. 2

(Ex-1005, FIG. 2 (annotated to show connection between battery 120 and metallic coil 112 in yellow).)

Kasar also discloses that the battery 120 is configured to be charged and discharged bidirectionally through an electrically isolating path (the air gap between the coil 112 and coil 212b) of the transformer (wireless coupling of coil 112 and piecepart 124 with coil 212b and piecepart 224). (Ex-1005, 19:33-35 ("each of the inductive coils 112, 212 b, 312, and 412 may be configured to transmit and/or receive power from an external electronic device"), 6:33-37 ("transmission of power may increase a charge of a battery of a first electronic device that is receiving the power, while simultaneously decreasing the charge of a battery of a second device that is transmitting the power"), 8:51-56 ("inductive coil 112 may be in electrical communication with battery 120 to transmit power to or from battery 120 to increase the charge of battery 120 or to decrease the charge of battery 120 in order to increase the charge in an external battery of an external electronic device in communication with first electronic device 100"); Ex-1002, ¶49).

Regarding the electrically isolating path of the transformer, Kasar discloses an air gap, created by the enclosures of first device 100 and second device 200, as an electrically isolating path for bidirectionally transferring power between coils 112 and 212. (Ex-1005, FIG. 11.)

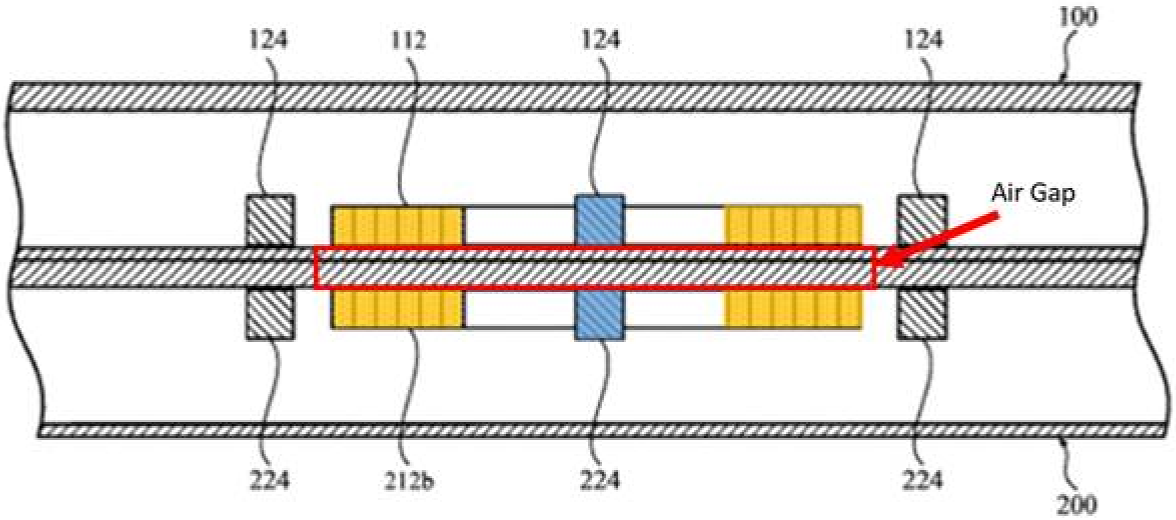

FIG. 11

(Ex-1005, FIG. 11 (annotated, air gap shown in red rectangle).) Kasar's disclosure of an air gap for the wireless power transfer between coil 112 and 212b is the same as the '067 patent's description of wirelessly transferring power across an air gap. (Ex-1001, 5:64-67 ("There is a small air gap in the magnetic path created by the magnetic core pieceparts . . . typically due to the enclosures of the wireless battery 200 and the wireless battery interface 250.").) The '067 patent goes on to describe power transfer across this air gap as power transfer across a "metallically isolated path for both charging and discharging" (Ex-1001, 1:58-60), and "charg[ing] and discharge[ing] through an electrically isolating path of the transformer" (*id.*, 12:30-31). Thus, wirelessly charging and discharging across the air gap between magnetic coils and magnetic core pieceparts of the first and second devices (100 and 200) in Kasar as described above meets the limitation requiring an apparatus configured to be charged and discharged through electrically isolating path of the transformer. (Ex-1002, ¶¶50-51.).

2. Claim 2

a) The apparatus as recited in claim 1 wherein said first magnetic core piecepart and said second magnetic core piecepart are configured to be aligned with a permanent magnet.

Kasar discloses these limitations. (Ex-1002, ¶¶52-53.) Specifically, Kasar discloses that magnet 124 within coil 112 of the first device 100 ("first magnetic core piecepart") and magnet 224 within coil 212b of the second device 200 ("second magnetic core piecepart") are configured to be aligned with permanent magnets 124 outside of coil 112 on the first device 100 and permanent magnets 224 outside of coil 212b on the second device 200 ("permanent magnet").

For example, as discussed above for limitation 1(b), Kasar discloses aligning a first magnetic core piecepart 124 in a first electronic device 100 with a second magnetic core piecepart 224 in a second electronic device 200. As shown in annotated Figures 10 and 11 below, Kasar discloses outer (annotated in red) permanent magnets 124 and 224 disposed outside of, and adjacent to, coils 112 and 212b for aligning the coil 112 and magnetic core piecepart 124 with coil 212b and magnetic core 224. (Ex-1005, 9:24-42, 16:6-16.)

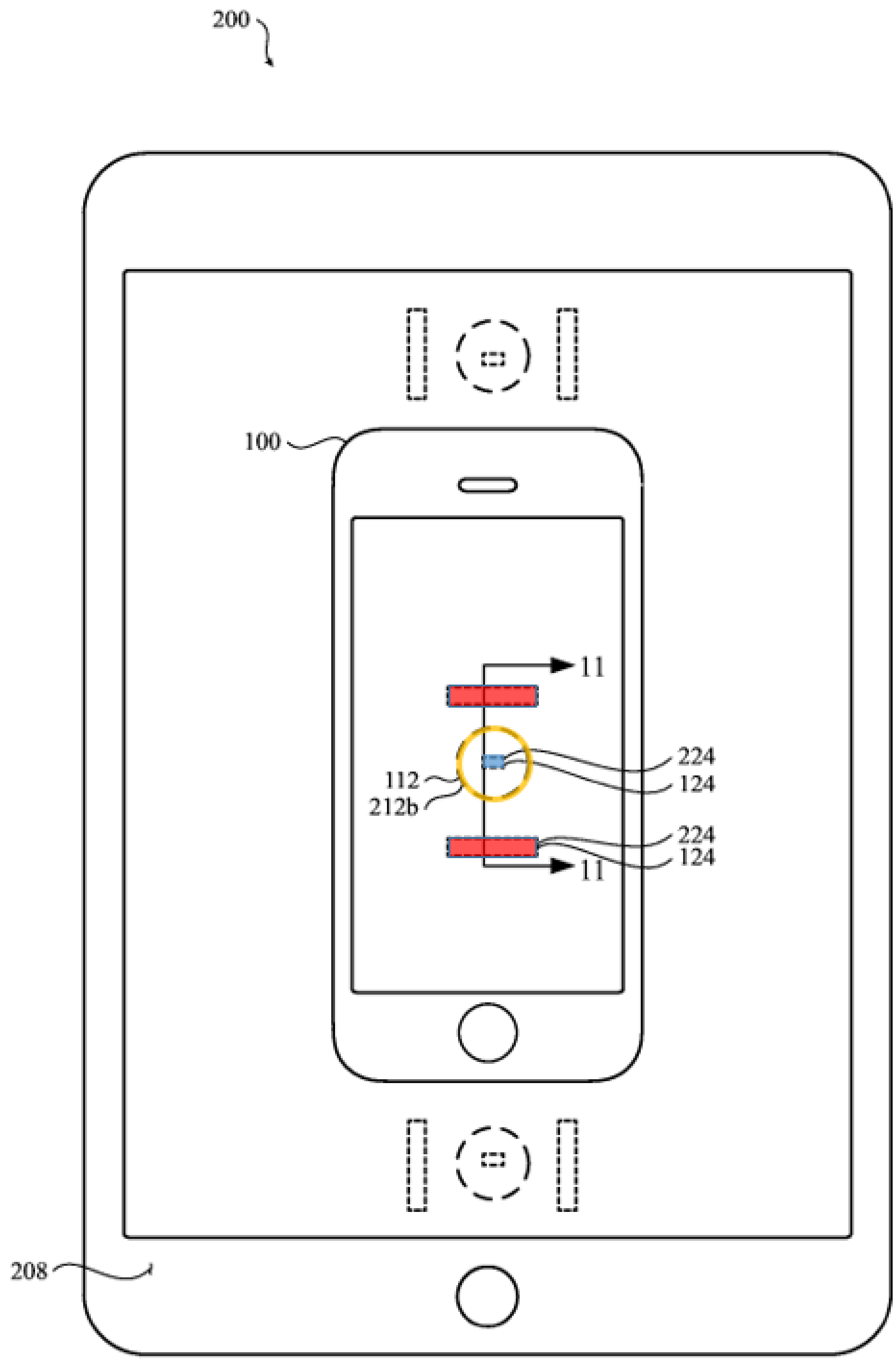

FIG. 10

(Ex-1005, FIG. 10 (annotated, aligned magnetic core pieceparts in blue and permanent magnets for alignment in red).)

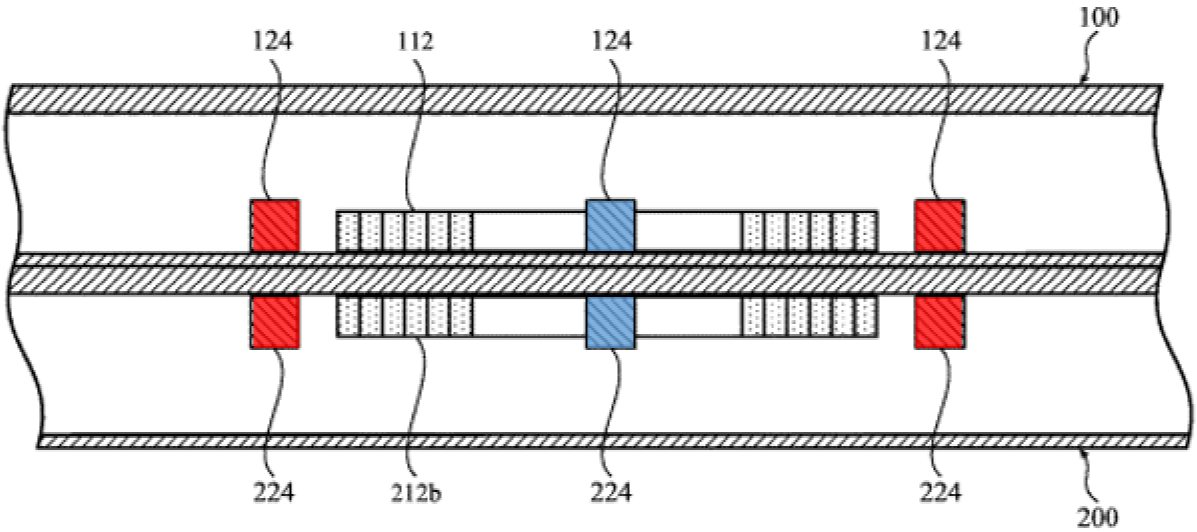

FIG. 11

(Ex-1005, FIG. 11 (same annotations); *see also* Ex-1002, ¶53; Ex-1005, 23:54-64 ("[I]nductive coil 112 of first electronic device 100 may be aligned and/or in electrical communication with inductive coil 212b of second electronic device 200 . . . the alignment magnets 124, 224 (*see* FIGS. 2 and 5A) of first and second electronic device 100, 200 may be magnetically attracted to each other, which may assist in positioning the first electronic device 100 such that inductive coil 112 may be aligned and/or in electrical communication with inductive coil 212*b*.").)

3. Claim 15

a) A system, comprising: a wireless battery interface including a wireless battery interface magnetic core piecepart; and

Kasar discloses these limitations. (Ex-1002, ¶¶54-55; *see also supra* Section IX.A.1.a, b.) Specifically, Kasar discloses a first device 100 and a second device

200 ("system"), comprising second device 200 ("a wireless battery interface") including a magnet 224 within a coil 212b of second device 200 ("a wireless battery interface magnetic core piecepart").

For example, as shown in annotated Figures 10 and 11 below, Kasar discloses a wireless battery interface 200 including a wireless battery interface magnetic core piecepart 224 within a metallic coil 212b. (Ex-1005, 15:40-16:15, 11:12-16 ("an alignment magnet 224 positions within and/or surrounded by inductive coils 212[]").) The alignment magnet within the coil is made of a "material that has magnetic or electromagnetic properties" (Ex-1005, 9:40-42), which is consistent with the '067 patent's explanation that a "magnetic core piecepart" may have either a "high magnetic permeability" (Ex-1001, 5:25-29) or a "low relative permeability" (*id.*, 14:46-57), or anything in between (*id.*). (Ex-1002, ¶55; *see also supra* Section IX.A.1.a, b.)

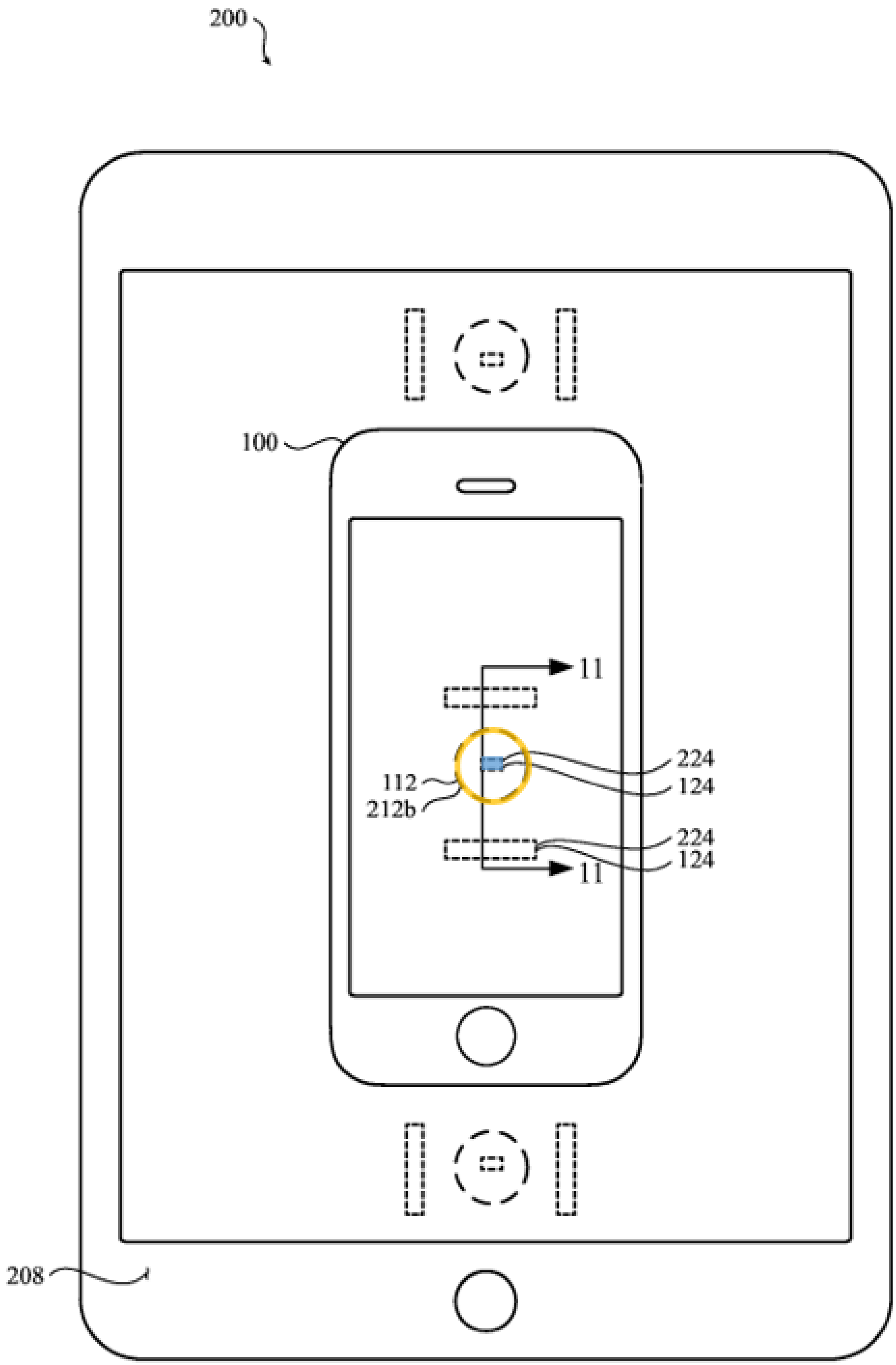

FIG. 10

(Ex-1005, FIG. 10 (annotated).)

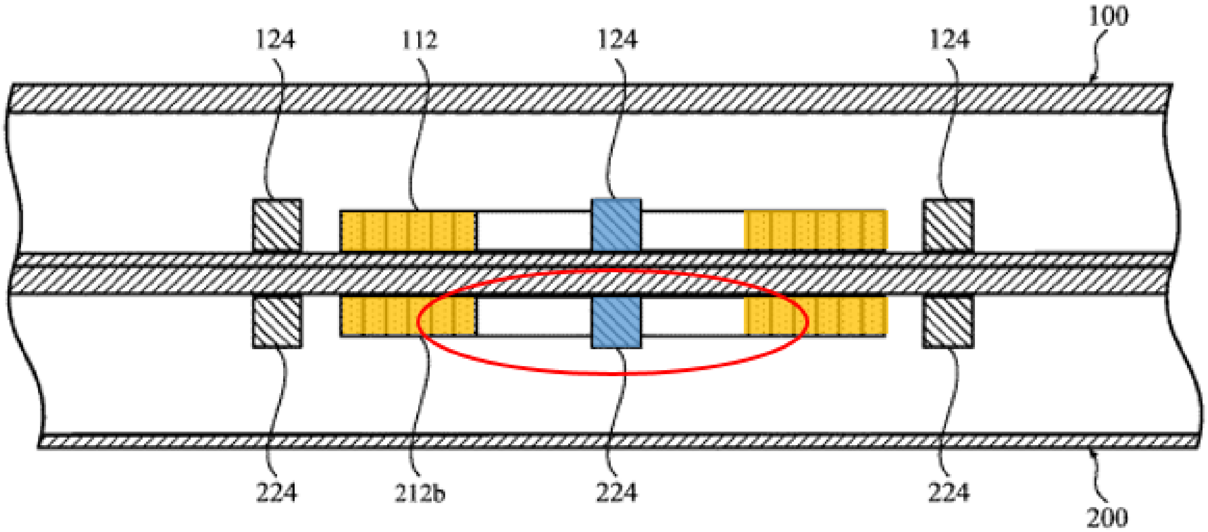

FIG. 11

(Ex-1005, FIG. 11 (annotated, wireless battery interface magnetic core piecepart circled).)

b) a wireless battery, including: a wireless battery magnetic core piecepart configured to be coupled to, aligned with and removable from said wireless battery interface magnetic core piecepart to form a transformer; and

Kasar discloses these limitations. (Ex-1002, ¶¶56-61; *see also supra* Section IX.A.1.b.) Specifically, Kasar discloses a first device 100 having a battery 120 ("wireless battery") including an alignment magnet 124 within coil 112 ("wireless battery magnetic core piecepart") configured to be coupled to, aligned with and removable from device 200 containing alignment magnet 224 within coil 112 ("wireless battery interface magnetic core piecepart") to form a transformer. (Ex-1002, ¶56.)

At the outset, Kasar discloses a wireless battery in device 100 including a wireless battery magnetic core piecepart 124 (within coil 112). (Ex-1002, ¶57; Ex-1005, 2:14-17 ("a battery within the enclosure and an inductive coil within the enclosure and coupled to the battery"), FIG. 2.) Kasar explains that its "electronic device 100 may . . . include at least one alignment magnet 124" (Ex-1005, 9:24-26), where "alignment magnet 124 may be positioned within the center of inductive coil 112, such that the wires of inductive coil 112 substantially surround alignment magnet 124 of first electronic device 100" (*id.*, 9:31-34). Kasar further explains that the "[a]lignment magnet[] 124 may be formed from any suitable material that has magnetic or electromagnetic properties" (*id.*, 9:40-42), which is consistent with the '067 patent's explanation that a "magnetic core piecepart" may have either a "high magnetic permeability" (Ex-1001, 5:25-29) or a "low relative permeability" (*id.*, 14:46-57), or anything in between (*id.*). (Ex-1002, ¶57.) And Kasar discloses that "inductive coil 112 may be formed from various conductive materials, for example metal" (Ex. 1005, 8:31-33), and thus is disclosed as a "metallic coil." (Ex-1002, ¶57.)

An exemplary representation of alignment magnet 124 and inductive coil 112 is shown below in Figures 2 and 4A, with the inductive coil 112 encircling at least a portion of alignment magnet 124:

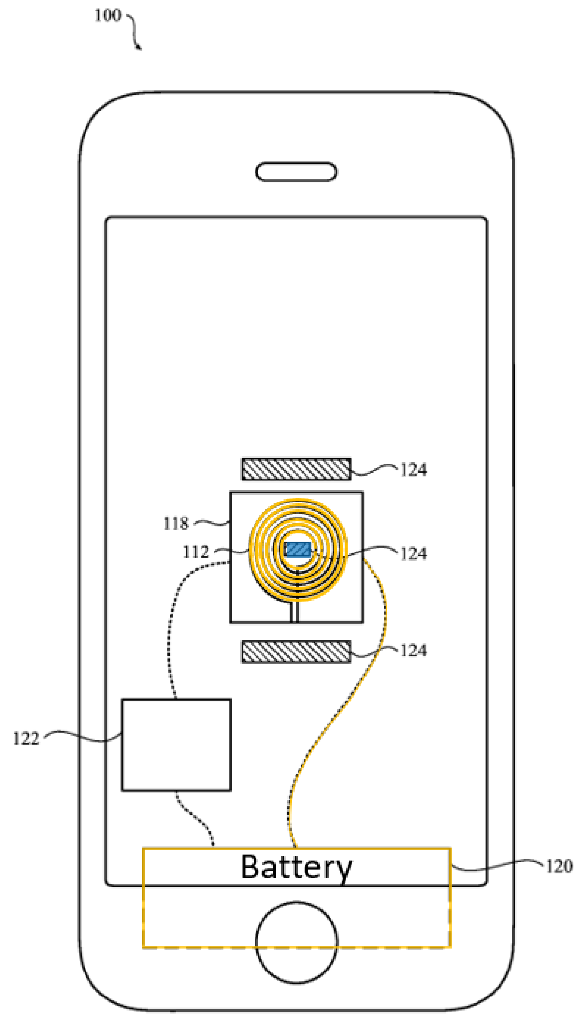

FIG. 2

(Ex-1005, FIG. 2 (annotated, with alignment magnet 124 in blue and inductive coil 112 in yellow).)

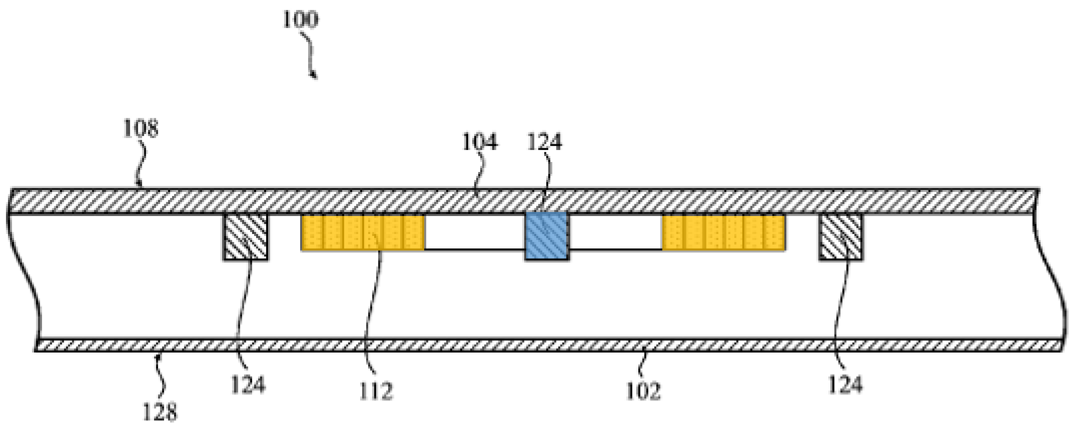

FIG. 4A

(Ex-1005, FIG. 4A (same annotations).)

Kasar also discloses that the wireless battery magnetic core piecepart is configured to be "coupled to, aligned with and removable from" the wireless battery interface magnetic core piecepart "to form a transformer," as claimed. Kasar discloses "various embodiments of at least two electronic devices in electrical communication for transmitting power between the electronic devices and/or for inductively charging one electronic device by another electronic device" including first device 100 configured to be coupled to second device 200. (Ex-1005, 14:45-49.) For example, Kasar discloses that first electronic device 100, having a first alignment magnet 124 and first inductive coil 112 as described above, "may be in electrical communication with second electronic device 200" thus forming a transformer. (Ex-1005, 15:40-42) Kasar explains that "[w]hen positioned on front surface 208 of second electronic device 200, inductive coils 112 of first electronic device 100 may be aligned with and/or in electrical communication with inductive coil 212 b of second electronic device 200" and "[w]hen in electrical communication, the respective inductive coils 112, 212 b may transmit power between electronic devices 100, 200." (*Id.*, 15:45-51.)

Kasar further explains "[p]rior to transmitting power between electronic devices 100, 200, the respective inductive coils 112, 212 b may be aligned using alignment magnets 124, 224." (*Id.*, 16:6-8.) "As shown in FIG. 11," which is reproduced above, "alignment magnet 124 of first electronic device 100 may be magnetically attracted to and/or may be magnetically coupled to alignment magnets 224 positioned adjacent inductive coil 212 b of second electronic device 200." (*Id.*, 16:8-12.) "The magnetic coupling of the alignment magnets 124, 224 of respective electronic devices 100, 200 may provide a desired coupling and/or alignment for inductive coils 112, 212 b when transmitting power." (*Id.*, 16:12-16; *see also id.*, 23:59-64 ("the alignment magnets 124, 224 (*see* FIGS. 2 and 5A) of first and second electronic device 100, 200 may be magnetically attracted to each other, which may assist in positioning the first electronic device 100 such that inductive coil 112 may be aligned and/or in electrical communication with inductive coil 212*b*"); 25:56-5 ("aligning the first inductive coil of the first electronic device with the second inductive coil of the second electronic device"), 26:4-6 ("wirelessly receiving power which may be used to increase a charge of a battery of the first electronic device"), 26:7-9 ("a power transmitting operational mode . . . which may decrease the charge of the battery").)

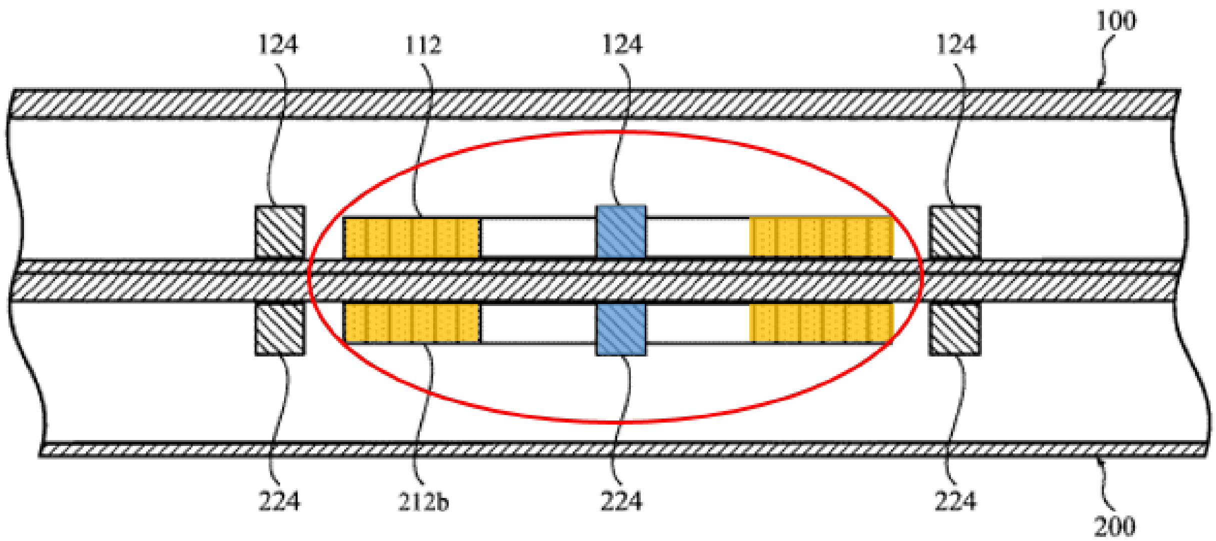

FIG. 11

(Ex-1005, FIG. 11 (annotated, coils 112 and 212b in yellow and magnetic core pieceparts 124 and 224 in blue).)

A POSITA would have understood Kasar to teach that the wireless battery magnetic core piecepart is configured to be "coupled to, aligned with and removable from" the wireless battery interface magnetic core piecepart because (1) coil 112/core 124 is placed in alignment with coil 212b/core 224 such that each are in electrical communication for transmitting power between the electronic devices and/or for inductively charging one electronic device by the other electronic device, and (2) coil 112/core 124 and coil 212b/core 224 may be removable from one another by being brought out of alignment. (Ex-1002, ¶¶58-61.) Moreover, a POSITA would have understood this arrangement to form a "transformer" because the coil 112/core 124 and coil 212b/core 224 are in electrical communication such that the inductive coils 112 and 212b transmit power between electronic devices 100 and 200. (Ex-1002, ¶61.) (*See also* Ex-1005, 23:49-56, FIG. 23C.)

c) a battery metallically coupled to a first metallic coil encircling at least a portion of said wireless battery magnetic core piecepart and configured to be charged and discharged through an electrically isolating path of said transformer.

Kasar discloses these limitations. (Ex-1002, ¶¶62-64; *see also* supra Section IX.A.1.c.) Specifically, Kasar discloses a battery 120 ("battery") metallically coupled to a coil 112 ("first metallic coil") encircling at least a portion of the alignment magnet 124 ("wireless battery magnetic core piecepart") and configured to be charged and discharged through an air gap between the coils 112 and 212 and cores 124 and 224 ("electrically isolating path of said transformer"). (Ex-1002, ¶62.)

At the outset, as shown in annotated Figure 2 below and as discussed above with respect to limitation 15(b), Kasar discloses a battery 120 metallically coupled to a first metallic coil 112 encircling at least a portion of said wireless battery magnetic core piecepart 124. (Ex-1005, 2:14-17 ("a battery within the enclosure and an inductive coil within the enclosure and coupled to the battery"), 24:44-46 ("first electronic device 100 increases the charge of battery 120 (FIG. 2) by receiving power from second electronic device 200"), FIG. 2.) A POSITA would have understood that the battery 120 being "coupled" to the coil would mean "metallically coupled" especially because the wire forming the coil 112 may be metal and because the wires and an electrical substrate (e.g. a circuit board) may be used to "electrically couple and/or connect the inductive coil 112 to other distinct components of first electronic device 100." (Ex-1005, 8:24-33; Ex-1002, ¶63.)

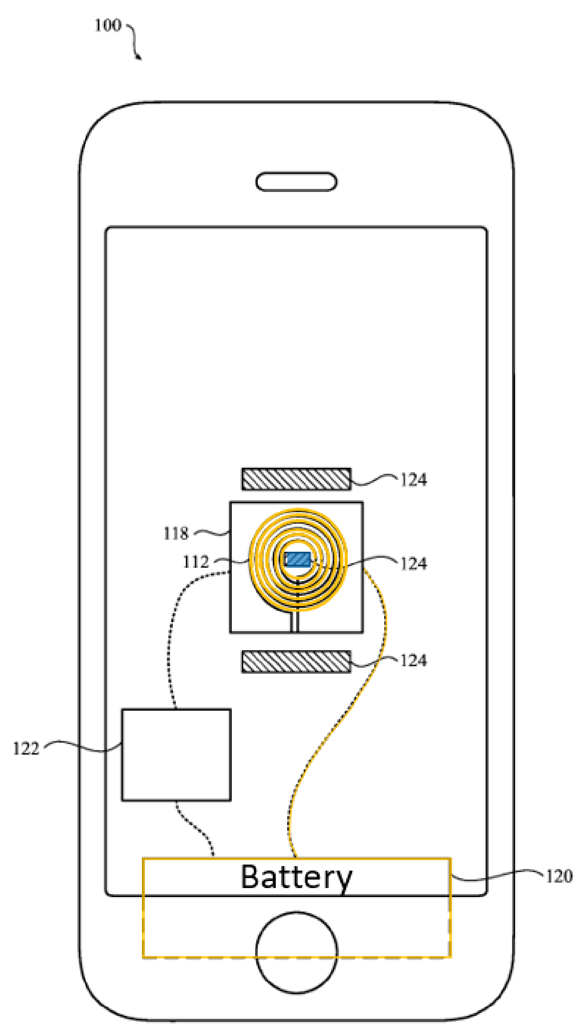

FIG. 2

(Ex-1005, FIG. 2 (annotated, magnetic core piecepart in blue, metallic coil connected to battery 120 in yellow).)

Kasar also discloses that the battery 120 is configured to be charged and discharged through an electrically isolating path (the air gap between the coil 112 and coil 212b) of the transformer (wireless coupling of coil 112 and piecepart 124 with coil 212b and piecepart 224). (Ex-1005, 19:33-35 ("each of the inductive coils 112, 212 b, 312, and 412 may be configured to transmit and/or receive power from an external electronic device"); Ex-1002, ¶64; *see also supra* Section IX.A.1.c.) For instance, Kasar's disclosure of an air gap for the wireless power transfer between coil 112 and 212b is the same as the '067 patent's description of wirelessly transferring power across an air gap. (Ex-1001, 5:64-65 ("There is a small air gap in the magnetic path created by the magnetic core pieceparts").) The '067 patent goes on to describe power transfer across this air gap as power transfer across a "metallically isolated path for both charging and discharging" (Ex-1001, 1:58-60), and "charg[ing] and discharge[ing[through an electrically isolating path of the transformer" (*id.*, 12:30-31). Thus, wirelessly charging and discharging across the air gap between magnetic coils and magnetic core pieceparts of the first and second device in Kasar as described above meets the limitation requiring an apparatus configured to be charged and discharged through electrically isolating path of the transformer. (Ex-1002, ¶64.).

B. Ground 2: Kasar Renders Obvious Claims 3 and 5

1. Claim 3

a) The apparatus as recited in claim 1 further comprising an aligner configured to mechanically align said first magnetic core piecepart to said second magnetic core piecepart.

Kasar renders obvious these limitations. (Ex-1002, ¶¶66-68.) As discussed above for claim 1, Kasar discloses a "first magnetic core piecepart" of a first device 100 that is configured to be aligned with a "second magnetic core piecepart" of a second device 200. (*Supra* Section IX.A.1.b.) Kasar does not specifically disclose "an aligner configured to mechanically align" the "first magnetic core piecepart" and "second magnetic core piecepart," but discloses such an aligner in the context of first device 100 and another device 500 and, in view of such teachings.

Specifically, similar to the arrangement between devices 100 and 200, Kasar explains that "first electronic device 100 and fifth electronic device 500 . . . may be coupled to wirelessly exchange power with each other using a pair of inductive coils." (Ex-1005, 14:61-64; Ex-1002, ¶67.) Kasar specifically explains that "fifth electronic device 500 may form a protective cover or case for a separate device, such as first electronic device 100." (Ex-1005, 14:64-67; Ex-1002, ¶67.) Fifth electronic device 500 may have "coupling features 504" that "secure the two devices together as well as provide alignment between the devices." (Ex-1005, 15:1-6; Ex-1002, ¶67.) Thus, the fifth electronic device 500 includes an aligner configured to mechanically align the two devices. As a POSITA would have recognized, such an arrangement not only aids in aligning the two devices, but also protects the device received within device 500 from "physical impact, abrasive contact, exposure to water, and/or other potentially damaging events." (Ex-1005, 13:47-52; Ex-1002, ¶67.)

Thus, a POSITA would have been motivated to apply the concepts of fifth electronic device 500 to second electronic device 200. (Ex-1002, ¶68.) Specifically, a POSITA would have been motivated to modify second electronic device 200 to include an aligner like coupling features 504 in order to help align device 100 with second electronic device 200. (Ex-1002, ¶68.) A POSITA would have been motivated to do so since, as discussed above, such an arrangement not only aids in aligning the two devices, but also protects the device received within device 500 from "physical impact, abrasive contact, exposure to water, and/or other potentially damaging events." (Ex-1005, 13:47-52; Ex-1002, ¶68.) A POSITA would have recognized that by aligning electronic device 100 and second electronic device 200, their respective magnetic core pieceparts would also have been aligned. (Ex-1002, ¶68.) As such, it would have been obvious to a POSITA to modify second electronic device 200 to include an "an aligner configured to mechanically align" the "first magnetic core piecepart" and "second magnetic core piecepart," as claimed. (Ex-1002, ¶68.)

2. Claim 5

a) The apparatus as recited in claim 1 further comprising a cavity configured to receive said first magnetic core piecepart.

Kasar renders obvious these limitations. (Ex-1002, ¶¶69-70.) As discussed above with respect to claim 3, it would have been obvious to modify second electronic device 200 to include an aligner like coupling features 504 in order to help align device 100 with second electronic device 200. (*Supra* Section IX.B.1.) As can be seen in Figures 8 and 9A, coupling features 504 form an enclosure 502 ("cavity") within which device 100 may be received (including its first magnetic core piecepart).

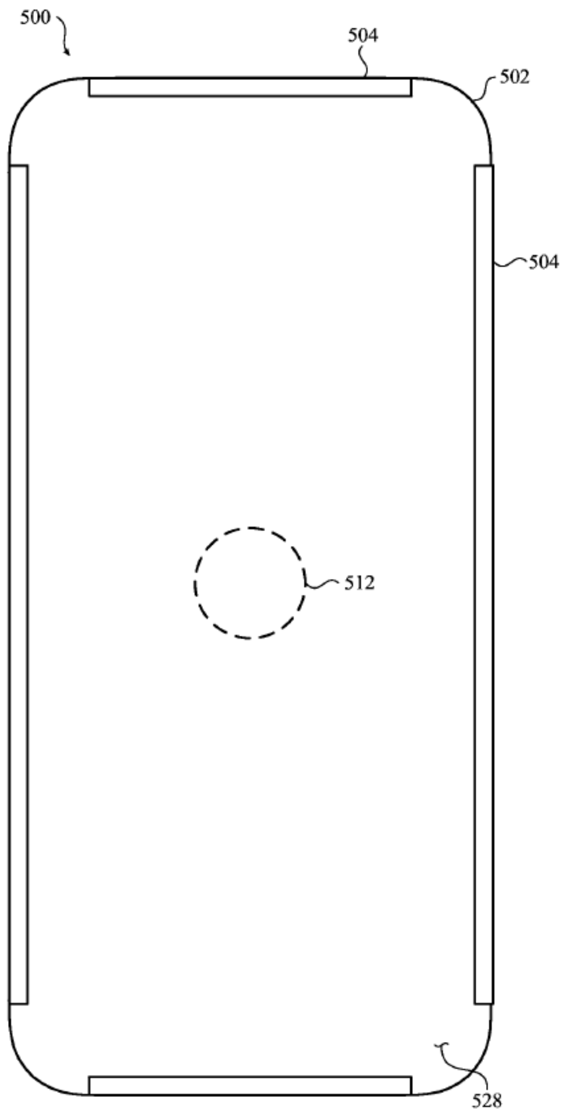

FIG. 8

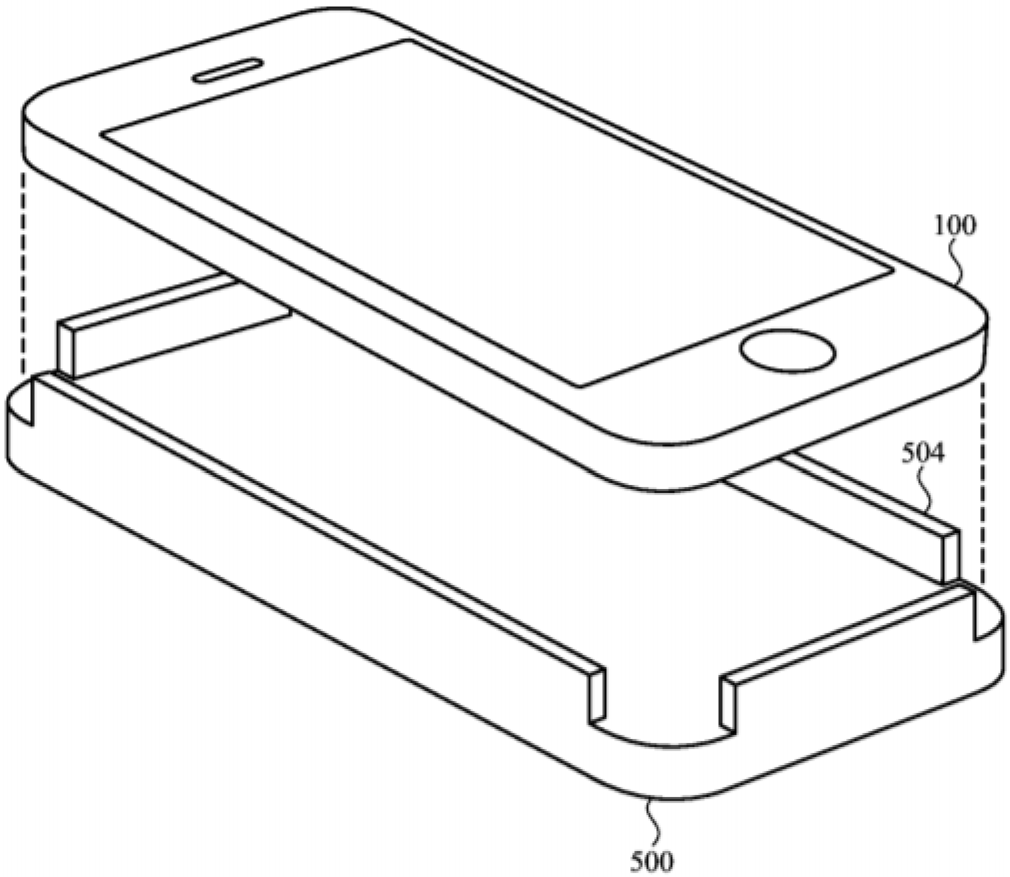

FIG. 9A

(Ex-1005, FIGs. 8, 9A; *see also id.*, 15:2-4 ("first electronic device 100 may be installed by pressing the first electronic device 100 into the coupling features 504 of fifth electronic device 500"), 13:61-64 ("The enclosure 502 may include one or more coupling features 504 that are configured to engage with the separate portable device that is installed or positioned within fifth electronic device 500"); Ex-1002, ¶¶69-70.)

As such, for the same reasons discussed above with respect to claim 3, it would have been obvious to a POSITA to modify second electronic device 200 to include "a cavity configured to receive said first magnetic core piecepart," as claimed.

C. Ground 3: Kasar in view of Wildmer Renders Obvious Claims 7, 8, 10, 11, and 16

1. Claim 7

a) The apparatus as recited in claim 1 further comprising a power train including a first switching circuit coupled to said first metallic coil configured to form a portion of a resonant topology with a second switching circuit coupled to said second metallic coil.

Kasar discloses the limitations of claim 1 as described above including the first inductive coil 112 ("first metallic coil") and second inductive coil 212b ("second metallic coil") being "metallic." Kasar does not expressly disclose "a power train including a first switching circuit coupled to said first metallic coil configured to form a portion of a resonant topology with a second switching circuit coupled to said second metallic coil." (Ex-1002, ¶72.) However, it would have been obvious to a POSITA to modify Kasar to include this limitation in view of the teachings of Wildmer. (*Id.*, ¶¶72-76.)

Wildmer is generally directed to "bidirectional wireless power transfer using magnetic resonance coupling." (Ex-1006, Abstract.) Thus, like Kasar, Wildmer relates to transferring power wirelessly between devices, and a POSITA would have been interested in considering the teachings of Wildmer when implementing Kasar.

Wildmer teaches using a wireless power system 860 ("power train") including full-bridge switching circuit Q_{13}, $Q_{13'}$, Q_{14}, $Q_{14'}$ ("first switching circuit") coupled to inductor L1 ("first metallic coil") configured to form a portion of a resonant topology with a full-bridge switching circuit Q_{21}, $Q_{21'}$, Q_{22}, $Q_{22'}$ ("second switching circuit") coupled to inductor L2 ("second metallic coil"). (Ex-1002, ¶74.) For example, Wildmer teaches in Figure 37 "a simplified diagram of wireless power system 860" that "illustrat[es] a symmetric topology for bidirectional wireless power transfer." (Ex-1006, ¶170.) This topology comprises full-bridge PWM modules on both sides of the inductors that may either act as "LF/DC (rectifiers) or DC/LF converters (inverters)." (*Id.*) In other words, when each full-bridge PWM module is receiving power transfer it acts as a rectifier and when it is transmitting power it acts as an inverter. (Ex-1006, ¶¶170-71; Ex-1002, ¶74.) Wildmer teaches that full-bridge switching circuits including Q_{13}, $Q_{13'}$, Q_{14}, $Q_{14'}$ and Q_{21}, $Q_{21'}$, Q_{22}, $Q_{22'}$ in Figure 37 operate "in both directions" and "may bring the additional advantage of lower switching losses thus higher efficiency" because they operate in a "synchronous mode" with "active switches." (Ex-1006, ¶171; Ex-1002, ¶74.)

In view of the above disclosure of Wildmer, it would have been obvious, and a POSITA would have been motivated, to use a bidirectional resonant topology with full-bridge active switching circuitry connected to, and on both sides of, the inductor coils 112 (first metallic coil") and 212b ("second metallic coil") in Kasar to implement wireless bidirectional power transfer (Ex-1002, ¶75.) As Wildmer explains, such a configuration may provide the "additional advantage of lower switching losses thus higher efficiency" because it operates in a "synchronous mode" with "active switches." (Ex-1006, ¶171; Ex-1002, ¶75.) Additionally, a POSITA would have recognized that using full-bridge active switching circuitry with inductive coils 112 and 212b of Kasar would be combining known prior art elements according to known methods to yield the predictable result of wirelessly transferring power across the inductive coils. (Ex-1002, ¶75.) Further, a POSITA would have recognized that using full-bridge active switching circuitry with inductive coils 112 and 212b of Kasar would be choosing from a finite number of identified, predictable solutions, (i.e. full-bridge circuitry, half-bridge circuitry, active or passive switching, and rectifiers) with a reasonable expectation of success of wirelessly transferring power across the inductive coils. (Ex-1002, ¶75.)

A POSITA would have had a reasonable expectation of success in implementing the resonant topology taught by Wildmer with the bidirectional wireless power transfer disclosure of Kasar. (Ex-1002, ¶76.) Wildmer discloses an efficient way to bidirectionally transfer power wirelessly that would be applicable across a wide range of technologies that transferred power wirelessly using inductor coils. (Ex-1002, ¶76; Ex-1006, ¶205 ("Those of skill in the art would understand that information and signals may be represented using any of a variety of different technologies and techniques.").) Additionally, a POSITA would look to different applications of wirelessly transferring power across devices with batteries, including for battery electric vehicles like in Wildmer, because the principle and components required for wirelessly transferring power are the same regardless of what type of device contains a battery—such as whether it is a portable device like a mobile phone or a larger vehicle. (Ex-1002, ¶76.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Wildmer with the disclosure of Kasar to arrive at the claimed invention. (Ex-1002, ¶76.)

2. Claim 8

a) The apparatus as recited in claim 7 further comprising a controller configured to selectively cause at least a portion of said power train to switch between full-bridge and half-bridge operation in response to a sensed voltage level.

The combination of Kasar and Wildmer teaches or suggests these limitations. (Ex-1002, ¶¶77-80.) Specifically, while Kasar does disclose a controller 122 ("controller"), Kasar does not explicitly disclose that the "controller [is] configured to selectively cause at least a portion of said power train to switch between full-bridge and half-bridge operation in response to a sensed voltage level." It would have been obvious to a POSITA to modify Kasar to implement such features in view of Wildmer. (Ex-1002, ¶77.)

Wildmer teaches a processor ("controller") configured to selectively cause at least a portion of the full-bridge circuitry topology ("power train") to switch between full-bridge and half-bridge operation in response to a voltage V_s dropping below a threshold V_{min} ("sensed voltage level"). (Ex-1002, ¶78.) For instance, Wildmer teaches "reconfigure[ing] from a full-bridge rectifier to a half-bridge rectifier when power has to be reduced or vice versa when maximum power needs to be restored." (Ex-1006, ¶154.) Wildmer further teaches that the various implementations, including switching from a full-bridge to a half-bridge rectifier, "may be implemented or performed with a general purpose processor." (Ex-1006, ¶207.) Wildmer also teaches that switching from full-bridge rectification to half-bridge rectification may be implemented when a reverse power flow occurs and "[i]f V_s drops below V_{min} then the reverse power control may decrease power transmission until V_s rises above the threshold again." (*Id.*, ¶¶181-83.) A POSITA would have understood this to teach switching from a full-bridge rectification to half-bridge rectification in response to a sensed voltage. (Ex-1002, ¶78.)

A POSITA would have been motivated to use a bidirectional resonant topology with full-bridge active switching circuitry on both sides of the inductor coils 112 and 212b in Kasar, as described above with respect to claim 7, and to further use a processor to switch the resonant topology from a full-bridge rectification to a half-bridge rectification to adjust the power output as necessary. (Ex-1002, ¶79.) Additionally, a POSITA would have been motivated to include the ability to switch from full-bridge to half-bridge as taught by Wildmer as part of the resonant topology to effect bidirectional wireless power transfer in Kasar because the benefit of such a configuration is "[t]his method comes almost for free as it does not require additional circuitry and can be accomplished solely by changing the PWM driving waveforms" as taught by Wildmer. (Ex-1006, ¶154; *see also* Ex-1002, ¶79.)

A POSITA would also have had a reasonable expectation of success in implementing the resonant topology of Wildmer, including a processor that can switch the topology from full-bridge to half-bridge in response to a sensed voltage, with the bidirectional wireless power transfer disclosure of Kasar. (Ex-1002, ¶80.) Wildmer discloses an efficient way to bidirectionally transfer power wirelessly and effectively control the power output level without additional circuitry that would be applicable across a wide range of technologies that transferred power wirelessly using inductor coils. (Ex-1002, ¶80; Ex-1006, ¶205 ("Those of skill in the art would understand that information and signals may be represented using any of a variety of different technologies and techniques.").) Additionally, a POSITA would look to different applications of wirelessly transferring power across devices with batteries, including for battery electric vehicles like in Wildmer, because the principle and components required for wirelessly transferring power is the same regardless of what type of device contains a battery—such as whether it is a portable device like a mobile phone or a larger vehicle. (Ex-1002, ¶80.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Wildmer with the disclosure of Kasar to arrive at the claimed invention and would have a reasonable expectation of success. (*Id*.)

3. Claim 10

a) The apparatus as recited in claim 7 further comprising a capacitor selected to produce substantially zero-current switching of said first switching circuit in said power train in conjunction with an inductor.

The combination of Kasar and Wildmer teaches or suggests these limitations. (Ex-1002, ¶¶81-84.) Kasar discloses first metallic inductive coil 112, which a POSITA would have understood to be an "inductor" because it is a wire coil that stores energy in the form of a magnetic field. (Ex-1002, ¶81.) While Kasar does not explicitly disclose "a capacitor selected to produce substantially zero-current switching of said first switching circuit in said power train in conjunction with an inductor," it would have been obvious to a POSITA to modify Kasar to implement such features in view of Wildmer. (Ex-1002, ¶81.)

Wildmer teaches a capacitor CDC_1 or CDC_2 ("capacitor") selected to produce substantially zero-current switching of full-bridge switching circuit Q_{13}, $Q_{13'}$, Q_{14}, $Q_{14'}$ ("first switching circuit") in said power train in conjunction with L_1 or L_2 ("inductor"). For example, as described above with respect to claim 7, Wildmer teaches that full-bridge switching circuits including Q_{13}, $Q_{13'}$, Q_{14}, $Q_{14'}$ and Q_{21}, $Q_{21'}$, Q_{22}, $Q_{22'}$ in Figure 37 operate "in both directions" and "may bring the additional advantage of lower switching losses thus higher efficiency" because they operate in a "synchronous mode" with "active switches." (Ex-1006, ¶171; Ex-1002, ¶82.) Wildmer further teaches that higher efficiency and lower losses in this mode of operation may be achieved through a 50% duty cycle of "zero current switching." (Ex-1006, ¶150.) Wildmer also teaches that it is the capacitors such as CDC_1 or CDC_2 that provide "light smoothing" in combination with the inductors and allow for zero-current switching. (Ex-1006, ¶¶153, 167.)

In view of the above disclosure of Wildmer, it would have been obvious, and a POSITA would have been motivated, to use a bidirectional resonant topology with full-bridge active switching circuitry on both sides of the inductor coils 112 and 212b in Kasar, for the same reasons as described above with respect to claim 7, and to further use a bidirectional resonant topology including a smoothing capacitor in combination with the inductor coil 112 in Kasar effecting zero-current switching to yield higher efficiency because "50% duty cycle . . . ensure[s] that there is switching only when resonant antenna current I1(t) passes zero" (*id.*, ¶147) and because "[a] duty cycle other than 50% may compromise overall efficiency somewhat, because Zero current Switching cannot be maintained" (*id.*, ¶151; Ex-1002, ¶83.)

Moreover, a POSITA would have had a reasonable expectation of success in implementing the zero current switching taught by Wildmer because Wildmer discloses an efficient way to bidirectionally transfer power wirelessly and also notes that "[t]hose of skill in the art would understand that information and signals may be represented using any of a variety of different technologies and techniques." (Ex-1006, ¶205; Ex-1002, ¶84.) Additionally, a POSITA would look to different applications of wirelessly transferring power across devices with batteries, including for battery electric vehicles like in Wildmer, because the principle and components required for wirelessly transferring power is the same regardless of what type of device contains a battery—such as whether it is a portable device like a mobile phone or a larger vehicle. (Ex-1002, ¶84.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Wildmer with the disclosure of Kasar to arrive at the claimed invention. (*Id.*)

4. Claim 11

a) The apparatus as recited in claim 10 wherein said inductor is formed at least in part with said first metallic coil.

As discussed above with respect to claim 1, inductive coil 112 is a "first metallic coil." (*Supra* Section IX.A.1.a.) For example, Kasar discloses that "the wire forming inductive coil 112 may be formed from . . . metal." (Ex-1005, 8:31-33; Ex-1002, ¶85.) Further, as described above with respect to claim 10, inductive coil 112 is an inductor. (*Supra* Section IX.C.3.) As such, the "inductor" discussed above for claim 10 is formed at least in part with said first metallic coil. (Ex-1002, ¶85.)

5. Claim 16

a) The system as recited in claim 15 further comprising a power train including a first switching circuit of said wireless battery configured to form a portion of a resonant topology with a second switching circuit of said wireless battery interface.

Kasar discloses the limitations of claim 15 as described above including a battery 120 in first device 100 ("wireless battery") and second device 200 ("wireless battery interface"), but does not expressly disclose "a power train including a first switching circuit of said wireless battery configured to form a portion of a resonant topology with a second switching circuit of said wireless battery interface." (Ex-

1002, ¶¶86-92.) However, it would have been obvious to a POSITA to modify Kasar to include this limitation in view of the teachings of Wildmer. (Ex-1002, ¶86.)

As described above with respect to claim 7, Wildmer is generally directed to "bidirectional wireless power transfer using magnetic resonance coupling." (Ex-1006, Abstract.) Thus, like Kasar, Wildmer relates to transferring power wirelessly between devices and a POSITA would have been interested in considering the teaching in Wildmer when implementing Kasar.

Wildmer teaches using a wireless power system 860 ("power train") including full-bridge switching circuit Q_{13}, $Q_{13'}$, Q_{14}, $Q_{14'}$ ("first switching circuit") configured to form a portion of a resonant topology with a full-bridge switching circuit Q_{21}, $Q_{21'}$, Q_{22}, $Q_{22'}$ ("second switching circuit") to bidirectionally transfer power across inductors L1 and L2 ("transformer"). (Ex-1002, ¶¶87-88.)

For example, Wildmer teaches in Figure 37 "a simplified diagram of wireless power system 860" that "illustrat[es] a symmetric topology for bidirectional wireless power transfer." (Ex-1006, ¶170.) This topology comprises full-bridge PWM modules on both sides of the inductors that may either act as "LF/DC (rectifiers) or DC/LF converters (inverters)." (*Id.*) In other words, when each full-bridge PWM module is receiving power it acts as a rectifier and when it is transmitting power it acts as an inverter. (Ex-1006, ¶¶170-71; Ex-1002, ¶89.) Wildmer teaches that full-bridge switching circuits including Q_{13}, $Q_{13'}$, Q_{14}, $Q_{14'}$ and Q_{21}, $Q_{21'}$, Q_{22}, $Q_{22'}$ in

Figure 37 operate "in both directions" and "may bring the additional advantage of lower switching losses thus higher efficiency" because they operate in a "synchronous mode" with "active switches." (Ex-1006, ¶171; Ex-1002, ¶89.)

In view of the above disclosure of Wildmer, it would have been obvious, and a POSITA would have been motivated, to use a bidirectional resonant topology with full-bridge active switching circuitry on both sides of the inductor coils 112 and 212b in Kasar to implement wireless bidirectional power transfer. (Ex-1002, ¶90.)

As Wildmer explains, such a configuration may provide the "additional advantage of lower switching losses thus higher efficiency" because it operates in a "synchronous mode" with "active switches." (Ex-1006, ¶171; Ex-1002, ¶91.) Additionally, a POSITA would have recognized that using full-bridge active switching circuitry with inductive coils 112 and 212b of Kasar would be combining known prior art elements according to known methods to yield the predictable result of wirelessly transferring power across the inductive coils. Further, a POSITA would have recognized that using full-bridge active switching circuitry with inductive coils 112 and 212b of Kasar choosing from a finite number of identified, predictable solutions, (i.e. full-bridge circuitry, half-bridge circuitry, active or passive switching, and rectifiers) with a reasonable expectation of success of wirelessly transferring power across the inductive coils. (Ex-1002, ¶91.)

Moreover, a POSITA would have had a reasonable expectation of success in implementing the resonant topology taught by Wildmer with the bidirectional wireless power transfer disclosure of Kasar because Wildmer discloses an efficient way to bidirectionally transfer power wirelessly that would be applicable across a wide range of technologies that transferred power wirelessly using inductor coils. (Ex-1002, ¶92; Ex-1006, ¶205 ("Those of skill in the art would understand that information and signals may be represented using any of a variety of different technologies and techniques.").) Additionally, a POSITA would look to different applications of wirelessly transferring power across devices with batteries, including for battery electric vehicles like in Wildmer, because the principle and components required for wirelessly transferring power is the same regardless of what type of device contains a battery—such as whether it is a portable device like a mobile phone or a larger vehicle. (Ex-1002, ¶92.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Wildmer with the disclosure of Kasar to arrive at the claimed invention. (*Id*.)

D. Ground 4: Kasar in view of Jeong Renders Obvious Claims 7, 10, 11, and 16

1. Claim 7

a) The apparatus as recited in claim 1 further comprising a power train including a first switching circuit coupled to said first metallic coil configured to

form a portion of a resonant topology with a second switching circuit coupled to said second metallic coil.

Kasar discloses the limitations of claim 1 as described above including the first inductive coil 112 and second inductive coil 212b being "metallic." Kasar does not expressly disclose "a power train including a first switching circuit coupled to said first metallic coil configured to form a portion of a resonant topology with a second switching circuit coupled to said second metallic coil." (Ex-1002, ¶94.) However, it would have been obvious to a POSITA to modify Kasar to include this limitation in view of the teachings of Jeong. (*Id.*)

Jeong is generally directed to "a wireless power transmission system, which is capable of bi-directionally transmitting wireless power via a wireless transmission system configured with a pair of wireless power transceivers in identical structures." (Ex-1007, ¶6.) Thus, like Kasar, Jeong relates to transferring power wirelessly between devices—including mobile phones (Ex-1007, ¶42)—and a POSITA would have been interested in considering the teachings in Jeong when implementing Kasar. (Ex-1002, ¶95.)

Jeong teaches using a wireless power transceiver with bidirectional transmission circuit unit 420 ("power train") including full-bridge switching circuit M1, M2, M3, M4 ("first switching circuit") coupled to inductor in coil unit 410 ("first metallic coil") configured to form a portion of a resonant topology with an identical other full-bridge switching circuit M1, M2, M3, M4 of identical transmission circuit 420 ("second switching circuit") coupled to identical coil unit 410 ("second metallic coil"). (Ex-1002, ¶96.)

For example, Jeong teaches in Figure 26 "a conceptual diagram of a wireless power transmission system capable of bidirectional wireless power transmission" and in Figure 27 "a circuit diagram of the wireless power transceiver shown in Fig. 26." (Ex-1007, ¶356.) This topology comprises full-bridge switching circuit for bidirectional transmission comprising MOSFET switches M1, M2, M3, M4 connected to a control unit 440. (Ex-1007, ¶¶359-366; Ex-1002, ¶97.) More specifically, Jeong "can perform rectification to convert AC voltage to DC voltage in charge mode" and "bidirectional transmission circuit unit (420) can be formed to function as a rectifier as well as a DC/DC converter in charge mode." (Ex-1007, ¶360.)

In view of the above disclosure of Jeong, it would have been obvious, and a POSITA would have been motivated, to use a bidirectional resonant topology with full-bridge active switching circuitry on both sides of the inductor coils 112 and 212b in Kasar to implement wireless bidirectional power transfer. (Ex-1002, ¶98.) As Jeong teaches, "control unit (440) may perform soft switching such as ZVS (Zero Voltage Switching) or ZCS (Zero Current Switching) by sensing the current or voltage received from the Rx coil and changing the state of the third or fourth switch (M3, M4)," which a POSITA would have recognized as a beneficial arrangement because it provides a high efficiency power transfer that would "minimize switching losses." (Ex-1007, ¶¶334, 370-71; Ex-1002, ¶98.) Additionally, a POSITA would have recognized that using full-bridge active switching circuitry as taught by Jeong with inductive coils 112 and 212b of Kasar would be combining known prior art elements according to known methods to yield the predictable result of wirelessly transferring power across the inductive coils. (Ex-1002, ¶98.) Further, a POSITA would have recognized that using full-bridge active switching circuitry taught by Jeong with inductive coils 112 and 212b of Kasar would be choosing from a finite number of identified, predictable solutions, (i.e. full-bridge circuitry, half-bridge circuitry, active or passive switching, and rectifiers) with a reasonable expectation of success of wirelessly transferring power across the inductive coils. (Ex-1002, ¶98.)

A POSITA would have had a reasonable expectation of success in implementing the resonant topology taught by Jeong with the bidirectional wireless power transfer disclosure of Kasar. (Ex-1002, ¶99.) Jeong discloses an efficient way to bidirectionally transfer power wirelessly between mobile devices like smart phones—the same application as Kasar. (Ex-1002, ¶99.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Jeong with the disclosure of Kasar to arrive at the claimed invention. (Ex-1002, ¶99.)

2. Claim 10

a) The apparatus as recited in claim 7 further comprising a capacitor selected to produce substantially zero-current switching of said first switching circuit in said power train in conjunction with an inductor.

The combination of Kasar and Jeong teaches or suggests these limitations. (Ex-1002, ¶¶100-02.) Kasar discloses first metallic inductive coil 112, which a POSITA would have understood to be an "inductor" because it is a wire coil that stores energy in the form of a magnetic field. (Ex-1002, ¶100.) While Kasar does not explicitly disclose "a capacitor selected to produce substantially zero-current switching of said first switching circuit in said power train in conjunction with an inductor," it would have been obvious to a POSITA to modify Kasar to implement such features in view of Jeong. (*Id.*)

As described above regarding claim 7, Jeong teaches that transmission circuit unit 420 has "at least one capacitor connected to the output terminal of the bridge circuit for smoothing operation" (Ex-1007, ¶362), and that control unit 440 operates the switching circuit as "Zero Voltage Switching" or "Zero Current Switching" in order to minimize switching losses (*id.*, ¶¶334, 370-71.)

In view of the above disclosure of Jeong, it would have been obvious, and a POSITA would have been motivated, to use a bidirectional resonant topology with full-bridge active switching circuitry on both sides of the inductor coils 112 and 212b in Kasar to implement wireless bidirectional power transfer, as described above with respect to claim 7, and further to use zero-current switching with a capacitor because it yields higher efficiency that would "minimize switching losses." (Ex-1007, ¶370-71; Ex-1002, ¶101.) Additionally, a POSITA would have recognized that using full-bridge active switching circuitry as taught by Jeong with inductive coils 112 and 212b of Kasar would be combining known prior art elements according to known methods to yield the predictable result of wirelessly transferring power across the inductive coils. (Ex-1002, ¶101.) Further, a POSITA would have recognized that using full-bridge active switching circuitry taught by Jeong with inductive coils 112 and 212b of Kasar would be choosing from a finite number of identified, predictable solutions, (i.e. full-bridge circuitry, half-bridge circuitry, active or passive switching, and rectifiers) with a reasonable expectation of success of wirelessly transferring power across the inductive coils. (Ex-1002, ¶101.)

A POSITA would have had a reasonable expectation of success in implementing the resonant topology taught by Jeong with the bidirectional wireless power transfer disclosure of Kasar. (Ex-1002, ¶102.) Jeong discloses an efficient way to bidirectionally transfer power wirelessly between mobile devices like smart phones—the same application as Kasar. (Ex-1002, ¶102.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Jeong with the disclosure of Kasar to arrive at the claimed invention. (*Id.*)

3. Claim 11

a) The apparatus as recited in claim 10 wherein said inductor is formed at least in part with said first metallic coil.

As discussed above with respect to claim 1, inductive coil 112 is a "first metallic coil." (*Supra* Section IX.A.1.a.) For example, Kasar discloses that "the wire forming inductive coil 112 may be formed from . . . metal." (Ex-1005, 8:31-33; Ex-1002, ¶103.) Further, as described above with respect to claim 10, inductive coil 112 is an inductor. (*Supra* Section IX.D.2.) As such, the "inductor" discussed above for claim 10 is formed at least in part with said first metallic coil. (Ex-1002, ¶103.)

4. Claim 16

a) The system as recited in claim 15 further comprising a power train including a first switching circuit of said wireless battery configured to form a portion of a resonant topology with a second switching circuit of said wireless battery interface.

Kasar discloses the limitations of claim 15 as described above including a battery 120 in first device 100 ("wireless battery") and second device 200 ("wireless battery interface"). Kasar does not expressly disclose "a power train including a first switching circuit of said wireless battery configured to form a portion of a resonant topology with a second switching circuit of said wireless battery interface." (Ex-

1002, ¶104.) However, it would have been obvious to a POSITA to modify Kasar to include this limitation in view of the teachings of Jeong. (*Id.*)

As described above with respect to claim 7, Jeong is generally directed to "a wireless power transmission system, which is capable of bi-directionally transmitting wireless power via a wireless transmission system configured with a pair of wireless power transceivers in identical structures." (Ex-1007, ¶6.) Thus, like Kasar, Jeong relates to transferring power wirelessly between devices—including mobile phones (*Id.*, ¶42)—and a POSITA would have been interested in considering the teachings in Jeong when implementing Kasar.

Jeong teaches using a wireless power transceiver with bidirectional transmission circuit unit 420 ("power train") including full-bridge switching circuit M1, M2, M3, M4 ("first switching circuit") coupled to inductor in coil unit 410 configured to form a portion of a resonant topology with an identical other full-bridge switching circuit M1, M2, M3, M4 of identical transmission circuit 420 ("second switching circuit") coupled to identical coil unit 410. (Ex-1002, ¶¶105-06.)

For example, Jeong teaches in Figure 26 "a conceptual diagram of a wireless power transmission system capable of bidirectional wireless power transmission" and in Figure 27 "a circuit diagram of the wireless power transceiver shown in Fig. 26." (Ex-1007, ¶356.) This topology comprises full-bridge switching circuit for bidirectional transmission comprising MOSFET switches M1, M2, M3, M4 connected to a control unit 440. (Ex-1007, ¶¶359-366; Ex-1002, ¶106.) More specifically, Jeong "can perform rectification to convert AC voltage to DC voltage in charge mode" and "bidirectional transmission circuit unit (420) can be formed to function as a rectifier as well as a DC/DC converter in charge mode." (Ex-1007, ¶360.)

In view of the above disclosure of Jeong, it would have been obvious, and a POSITA would have been motivated, to use a bidirectional resonant topology with full-bridge active switching circuitry on both sides of the inductor coils 112 and 212b in Kasar to implement wireless bidirectional power transfer. (Ex-1002, ¶107.) As Jeong teaches, "control unit (440) may perform soft switching such as ZVS (Zero Voltage Switching) or ZCS (Zero Current Switching) by sensing the current or voltage received from the Rx coil and changing the state of the third or fourth switch (M3, M4)," which a POSITA would have recognized as a beneficial arrangement because it provides a high efficiency power transfer that would "minimize switching losses." (Ex-1007, ¶¶334, 370-71; Ex-1002, ¶107.) Additionally, a POSITA would have recognized that using full-bridge active switching circuitry as taught by Jeong with inductive coils 112 and 212b of Kasar would be combining known prior art elements according to known methods to yield the predictable result of wirelessly transferring power across the inductive coils. (Ex-1002, ¶107.) Further, a POSITA would have recognized that using full-bridge active switching circuitry taught by Jeong with inductive coils 112 and 212b of Kasar would be choosing from a finite number of identified, predictable solutions, (i.e. full-bridge circuitry, half-bridge circuitry, active or passive switching, and rectifiers) with a reasonable expectation of success of wirelessly transferring power across the inductive coils. (Ex-1002, ¶107.)

A POSITA would have had a reasonable expectation of success in implementing the resonant topology taught by Jeong with the bidirectional wireless power transfer disclosure of Kasar. (Ex-1002, ¶108.) Jeong discloses an efficient way to bidirectionally transfer power wirelessly between mobile devices like smart phones—the same application as Kasar. (*Id.*) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Jeong with the disclosure of Kasar to arrive at the claimed invention. (*Id.*)

E. Ground 5: Kasar in view of Jeong and Sakaguchi Renders Obvious Claim 8

1. Claim 8

a) The apparatus as recited in claim 7 further comprising a controller configured to selectively cause at least a portion of said power train to switch between full-bridge and half-bridge operation in response to a sensed voltage level.

Kasar in combination with Jeong discloses the limitations of claim 7 as described above including a control unit 440 ("controller"). Kasar does not expressly disclose "a controller configured to selectively cause at least a portion of said power train to switch between full-bridge and half-bridge operation in response to a sensed voltage level." However, it would have been obvious to a POSITA to modify the combined Kasar-Jeong apparatus to include this limitation in view of the teachings of Sakaguchi. (Ex-1002, ¶¶110-14.)

Sakaguchi is generally directed to a resonant power supply device with resonant circuit. (Ex-1008, Abstract.) Thus, like Kasar and Jeong, Sakaguchi relates to wireless power transfer through magnetic resonance, and a POSITA would have been interested in considering the teachings on Sakaguchi when implementing Kasar and Jeong.

Sakaguchi teaches a controller 35 with switching circuit 45 ("controller") configured to selectively cause at least a portion of the full-bridge switching circuitry Q1 to Q4 ("power train") to switch between full-bridge and half-bridge operation in response to a detected voltage V_{in} being lower than a prescribed voltage ("sensed voltage level"). (Ex-1002, ¶¶111-12.) For instance, Sakaguchi teaches "controller (35) . . . performs control so that the resonant power supply device operates in a full-bridge mode; and a mode switching circuit (45) that . . . switch[es] operation of the resonant power supply device between the full bridge mode and the half bridge mode." (Ex-1008, ¶21, *see also id.* FIG. 3.) "[T]he resonant power supply device performs a normal (original) full bridge operation" where "controller 35 performs control so that diagonally opposing switches . . . are turned on at the same time" then if "supply voltage V_{in} is higher than the reference voltage V_{ref} . . . the controller 35 drives the resonant circuit by controlling first and second transistors Q1 and Q2 to be turned on and off alternately" in "half bridge mode." (Ex-1008, ¶¶38-41.) In other words, "when the input power supply voltage is lower than a prescribed voltage the full bridge resonant power supply device is operated in full bridge mode, and when the input power supply voltage is higher than the prescribed voltage, the full bridge resonant power supply device is operated in half bridge mode." (Ex-1008, ¶¶23, 25 ("automatically switch between full bridge operation and half bridge operation in accordance with the input power supply voltage V_{in}.").)

In view of the above disclosure of Sakaguchi, it would have been obvious, and a POSITA would have been motivated, to use a controller to switch from a full-bridge to a half-bridge circuitry in response to a sensed voltage in the circuitry of Kasar in order to provide the benefit that "even when the input power supply voltage fluctuates over a wide range, sufficient performance can be achieved, and malfunction does not occur." (Ex-1008, ¶23; Ex-1002, ¶113.) Additionally, a POSITA would have recognized that using a controller to switch from full-bridge to half-bridge, as taught by Sakaguchi, in the circuitry of Kasar with inductive coils 112 and 212b would be combining known prior art elements according to known methods to yield the predictable result of controlling the transferring of power across the inductive coils in response to the input voltage fluctuating. (Ex-1002, ¶113.) Further, a POSITA would have recognized that using a controller to switch from full-bridge to half-bridge, as taught by Sakaguchi, in the circuitry of Kasar with inductive coils 112 and 212b would be choosing from a finite number of identified, predictable solutions to control power, (i.e. adjusting the pulses, switching from full-bridge to half-bridge) with a reasonable expectation of success of controlling the power wirelessly transferred across the inductive coils. (Ex-1002, ¶113.)

A POSITA would have had a reasonable expectation of success in implementing the controlled switching from full-bridge to half-bridge with the bidirectional wireless power transfer disclosure of Kasar. (Ex-1002, ¶114.) Sakaguchi teaches a means to "respond to fluctuation in the input power supply voltage without adding a special circuit to the previous stage or replacing parts" by simply adjusting the already existing full-bridge circuit—as taught by Jeong for Kasar in claim 7 above. (Ex-1008, ¶17; Ex-1002, ¶114.) Thus, it would have been obvious and a POSITA would have been motivated to combine the teachings of Sakaguchi with the disclosure of Kasar and teachings of Jeong to arrive at the claimed invention. (Ex-1002, ¶114.)

X. DISCRETIONARY DENIAL IS NOT APPROPRIATE

A. The Prior Art Relied on Herein Is Not the Same or Substantially Similar to Any Art the Examiner Considered

None of the prior art references relied upon in this Petition—Kasar, Wildmer, Jeong, and Sakaguchi—was considered during prosecution of the '067 patent, nor is any of the prior art cumulative to any prior art the Examiner considered. For example, the Examiner allowed the claims of the '067 patent because the prior art allegedly failed to disclose the bidirectional transfer feature and only discloses "charging" not "discharging." (Ex-1004, 13-14 ("the prior art doesn't teach . . . configured to be discharged through an electrically isolating path of said transformer").) Kasar, Jeong, and Wildmer all teach this feature as described above. Accordingly, Petitioner requests that the Board institute review.

B. The Related Litigation Provides No Basis For Discretionary Denial

There is no basis for the Board to exercise its discretion to deny institution under 35 U.S.C. § 314(a). *NHK Spring Co., Ltd. v. Intri-Plex Techs, Inc.*, IPR2018-00752, Paper 8 (Sept. 12, 2018) does not apply here. *See Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 3 (Mar. 20, 2020) (precedential). The six-factor test addressed in *Fintiv* favors institution ("*Fintiv* factor(s)"). *See id.*, 5–6.

For the first factor (stay), there is no stay at this time, but Petitioner will seek a stay in the parallel proceeding *Garrity Power Servs. LLC v. Samsung Electronics*

Co. Ltd., et al, Case No. 2:20-cv-00269-JRG (E.D. Tex.) and, if necessary, a renewed motion to stay after the Board institutes.

The second (proximity of trial dates) and third (investment in parallel proceedings) factors weigh in favor of institution. The district court has not yet set a trial date. *See Resideo Techs., Inc. v. Innovation Sciences, LLC*, IPR2019-01306, Paper 19 at 11 (Jan. 27, 2020) ("That the district court has not yet set a trial date is a significant factor distinguishing this case from *NHK Spring* . . . because there is no trial date set in the parallel litigation, and the schedule continues to change, the schedule of the parallel litigation does not weigh in favor of denying institution under § 314(a)."); *Oticon Med. AB v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 24 (Oct. 16, 2019) (designated precedential on March 24, 2020) (finding the lack of a trial date to weigh against the Board exercising its discretion, even though discovery was apparently "well underway"). Moreover, even if an early trial date is ultimately set, "an early trial date" is "non-dispositive" and simply means that "the decision whether to institute will likely implicate other factors," which, as explained, favor institution. *Fintiv*, IPR2020-00019, Paper 11 at 5, 9; *see also Intuitive Surgical, Inc. v. Ethicon LLC*, IPR2018-01703, Paper 7 at 12 (Feb. 19, 2019) (recognizing that, even if a trial will come before a final decision, institution is appropriate to "give[] the district court the opportunity, at its discretion, to conserve judicial resources by staying the litigation until the review is complete," which helps "satisfy[] the AIA's objective").

Furthermore, the district court case is in its infancy and the Parties' have made little investment into the parallel proceeding. PO filed its complaint in the Eastern District of Texas on August 17, 2020 and Petitioner filed its answer on December 22, 2020—only nine days ago. (2:20-cv-00269 Dkt. 17.) Petitioner's diligence in pursuing this petition just slightly more than four months after PO's Complaint and about one week after Petitioner's Answer weighs in favor of institution under the second *Fintiv* factor. Additionally, the *Markman* hearing, fact discovery, expert discovery, and dispositive motion deadlines are unlikely to be completed before the expected time of the Board's institution decision. *See Precision Planting, LLC. v. Deere & Co.*, IPR2019-01044, Paper 17 at 14-15 (Dec. 2, 2019) (where the district court has not issued a claim construction ruling, fact discovery and expert discovery are not closed, and dispositive motion briefing has not yet occurred, that weighs against finding that case is at "an advanced stage"); *Abbott Vascular, Inc. v. FlexStent, LLC*, IPR2019-00882, Paper 11 at 30 (Oct. 7, 2019) (same).

The fourth *Fintiv* factor (overlap) also weighs in favor of institution. There is no overlap between the grounds here and any invalidity positions to be pursued in the district court because ***Petitioner stipulates that it will not pursue invalidity in the district court litigation based on any instituted IPR ground in this proceeding***.

Thus, "[i]nstituting trial here serves overall system efficiency and integrity goals by not duplicating efforts and by resolving materially different patentability issues." *Apple, Inc. v. SEVEN Networks, LLC*, IPR2020-00156, Paper 10 at 19 (June 15, 2020) (finding the fourth factor "strongly favored" institution even though there was no stipulation and a significant dispute about the extent of overlap); *see also Sand Revolution II, LLC v. Continental Intermodal Group-Trucking LLC*, IPR2019-01393, Paper 24 at 12 (June 16, 2020) (finding the fourth factor weighs in favor of institution due, in part, to petitioner's stipulation that it will not pursue the same grounds in district court).

The Board should give little weight to the fact that Petitioner and PO are the same parties in the district court litigation (fifth factor) to support exercise of its discretion to deny institution. Petitioner has no control over whom PO targets in its litigation and in a majority of IPR proceedings involving a parallel litigation, the petitioner is the same party.

The sixth *Fintiv* factor (other circumstances) weighs heavily in favor of institution given the undeniable similarity between Petitioner's references and the '067 patent. (*See supra* Section IX.) As the Supreme Court recently explained, there is a significant public interest against "leaving bad patents enforceable." *Thryv, Inc v. Click-To-Call Techs., LP*, 140 S. Ct. 1367, 1374 (2020). Petitioner's IPR challenging the '067 patent is the only challenge to the '067 patent before the Board.

No challenge has been filed before. Additionally, the prior art at issue here has not previously been considered by the Office. (*See supra* Section X.A.) Instituting here could save district courts, future parties, and the Board—if a future defendant files an IPR because this one was not considered—significant resources.

XI. CONCLUSION

For the reasons given above, Petitioner requests institution of IPR for claims 1-3, 5, 7, 8, 10, 11, 15, and 16 of the '067 patent based on each of the grounds specified in this petition.

Respectfully submitted,

Dated: December 31, 2020

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

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,906,067 contains, as measured by the word-processing system used to prepare this paper, 13,221 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: December 31, 2020

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

CERTIFICATE OF SERVICE

I hereby certify that on December 31, 2020, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,906,067 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on PAIR:

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A courtesy copy was also sent via electronic mail to Patent Owner's litigation counsel at the following addresses:

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