

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INDUCTEV, INC.
Petitioner,

v.

WITRICITY CORPORATION,
Patent Owner.

Case IPR2023-01182
Patent 8,461,719

PATENT OWNER'S RESPONSE

TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
TABLE OF AUTHORITIES.....	iii
EXHIBIT LIST.....	iv
I. INTRODUCTION.....	1
II. STATEMENT OF MATERIAL FACTS IN DISPUTE.....	4
III. STATEMENT OF RELIEF REQUESTED	4
IV. OVERVIEW OF THE '719 PATENT AND ITS PROSECUTION HISTORY	4
V. CLAIM CONSTRUCTION	11
A. Claim Terms Are to Be Given Ordinary Meaning in Light of the Specification and Prosecution History	11
B. The Term “Network of Capacitors” Should Be Construed To Mean “a Circuit Topology of Passive Components Including One or More Capacitors That Provides Two or More Degrees of Freedom”	12
C. Person of Ordinary Skill in the Art	14
VI. PETITIONER FAILS TO MEET ITS BURDEN OF SHOWING THE CHALLENGED CLAIMS ARE OBVIOUS.....	14
A. Scope and Content of the Prior Art.....	16
1. U.S. Pat. No. 8,855,554) (“Cook-554”).....	16
2. Int’l Pat. Pub. No. WO 2007/101902 (“Pohjonen”)	21
3. U.S. Pat. No. 8,378,523 (“Cook-523”)	22
4. U.S. Pat. Pub. No. 2007/0145830 (“Lee”).....	28
B. Petitioner Fails to Demonstrate Cook-554 Constitutes Prior Art	31
C. Independent Claim 16 Is Patentable Over Cook-554, Alone or With Pohjonen (Ground 1)	35
1. Cook-554 Does Not Disclose “Wherein at Least One of the Resonators is Enclosed in a ... Material,” and Petitioner Relies on Non-Prior Art from Cook-554 to Establish Otherwise	35

2.	Petitioner Fails to Provide a Sufficient Motivation for a POSA to Enclose Cook-554’s Resonant Magnetic Antenna in a Low Loss Tangent Material	39
3.	A POSA Considering Cook-554 Would Not Look to the Teachings of Pohjonen	47
D.	Independent Claim 17 Is Patentable Over Cook-554 (Ground 2).....	49
1.	Cook-554 Does Not Disclose “at Least One of the Resonators Includes a Coil of a Plurality of Turns of a Conducting Material Connected to a Network of Capacitors”	49
E.	Independent Claim 16 Is Patentable Over Cook-523 and Pohjonen (Ground 3).....	55
1.	Petitioner Fails to Provide a Sufficient Motivation for a POSA to Enclose Cook-523’s Non-Radiative Antenna in a Low Loss Tangent Material	55
2.	A POSA Considering Cook-523 Would Not Look to the Teachings of Pohjonen	58
F.	Independent Claim 17 Is Patentable Over Lee and Cook-523 (Ground 4).....	59
VII.	CONCLUSION.....	65

TABLE OF AUTHORITIES

Page(s)

CASES

<i>Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.</i> , 800 F.3d 1375, 1380 (Fed. Cir. 2015)	31-32, 36
<i>In re Giacomini</i> , 612 F.3d 1380, 1383 (Fed. Cir. 2010)	32, 36
<i>In re Magnum Oil Tools Int’l, Ltd.</i> , 829 F.3d 1364, 1380 (Fed. Cir. 2016)	46
<i>In re Mraz</i> , 455 F.2d 1069, 1072 (CCPA 1972)	37
<i>In re NuVasive, Inc.</i> , 842 F.3d 1376, 1383 (Fed. Cir. 2016)	45
<i>In re Wilson</i> , 312 F.2d 449, 454 (CCPA 1963)	37
<i>KSR Int’l. Co. v. Teleflex, Inc.</i> , 550 U.S. 398 (2007)	45, 57
<i>Netflix Inc. v. Divx, LLC</i> , IPR2020-00646, Paper 66 (Apr. 17, 2024)	11
<i>Phillips v. AWH Corp.</i> , 415 F.3d 1303 (Fed. Cir. 2005) (en banc)	11

RULES

37 C.F.R. §42.23(a)	4
37 C.F.R. § 42.100(b)	11

EXHIBIT LIST

Ex.	Description
2001	U.S. Patent Application Publication No. 2012/0001492A9 (“Cook-492”)
2002	Non-Final Office Action Issued June 28, 2012 in file history of U.S. Patent No. 8,461,719
2003	U.S. Patent Application Publication No. 2009/0127937A1 (“Widmer”)
2004	U.S. Patent Application Publication No. 2009/0079268A1 (“Cook-268”)
2005	U.S. Patent Application Publication No. 2009/0015075A1 (“Cook-075”)
2006	U.S. Patent Application Publication No. 2009/0033564A1 (“Cook-564”)
2007	U.S. Patent Application Publication No. 2009/0072628A1 (“Cook-628”)
2008	U.S. Patent Application Publication No. 2010/0117454A1 (“Cook-454”)
2009	U.S. Patent Application Publication No. 2010/0210233A1 (“Cook-233”)
2010	U.S. Patent Application Publication No. 2009/0134712A1 (“Cook-712”)
2011	Declaration of Mark Horenstein, Ph.D. (“Horenstein Decl.”)
2012	Curriculum Vitae of Mark Horenstein, Ph.D.
2013	Frederick Emmons Terman, <i>Radio Engineers’ Handbook</i> (1st ed. 1943) (“Terman-1943”)
2014	Zoom Deposition of Mark Allen, Ph.D. (“Allen Depo.”)
2015	Wiley Electrical and Electronics Engineering Dictionary, IEEE Press, 2004 (“Wiley”)

I. INTRODUCTION

In its Petition (Paper 2, “Pet.”) for *inter partes* review of U.S. Patent No. 8,461,719 (Ex. 1001, “the ’719 patent”), Petitioner asserts that claims 16 and 17 (“the challenged claims”) are unpatentable under pre-Leahy-Smith America Invents Act (pre-AIA) 35 U.S.C. § 103(a) as being obvious over the prior art, including U.S. Pat. No. 8,855,554 (Ex. 1005, “Cook-554”), Int’l Pat. Pub. No. WO 2007/101902 to Pohjonen (Ex. 1009, “Pohjonen”), U.S. Pat. No. 8,378,523 (Ex. 1007, “Cook-523”), and U.S. Pat. Pub. No. 2007/0145830 (Ex. 1008, “Lee”).

In particular, Petitioner asserts that claim 16 is unpatentable as being obvious over Cook-554, alone or in view of Pohjonen (Ground 1), and Petitioner asserts that claim 17 is unpatentable as being obvious over Cook-554 (Ground 2). Petitioner also asserts that claim 16 is unpatentable as being obvious over Cook-523 and Pohjonen (Ground 3). Petitioner further asserts that claim 17 is unpatentable as being obvious over Lee and Cook-523 (Ground 4). However, Petitioner fails to demonstrate that the claims are unpatentable as being obvious over the prior art.

First, Grounds I and II fail because the Petition fails to demonstrate that Cook-554 constitutes prior art. Cook-554 does not pre-date the earliest claimed priority date of the ’719 patent, i.e., September 27, 2008. Cook-554 was filed on March 4, 2009, and issued on October 7, 2014. The Petition contends that Cook-

554 qualifies as prior art pre-AIA 35 U.S.C. § 102(e) because Cook-554 is entitled to the earlier March 5, 2008 date of an earlier-filed provisional application that the Petition refers to as the “Cook Provisional” (Ex. 1006). Pet. 10.

It is well settled that Petitioner must demonstrate that Cook-554 is entitled to the benefit of the Cook Provisional, which requires that the Cook Provisional provides sufficient support for at least one claim in Cook-554. The Petition cites the Cook Provisional for alleged support of claim 17 of Cook-554, but the Petition fails to demonstrate that the Cook Provisional provides sufficient support for at least one element of the claim. Cook-554 therefore does not constitute prior art.

Second, even if Cook-554 constitutes prior art, Ground 1 related to claim 16 fails because Cook-554 does not disclose “wherein at least one of the resonators is enclosed in a ... material,” as required by claim 16. Cook-554 in fact discloses integration of a resonant magnetic antenna into a portable device, which a person of skill in the art (“POSA”) would at best understand to mean that the resonant magnetic antenna is included as a part of the portable device instead of separately provided.

Ground 1 also fails because the Petition does not provide a sufficient motivation for a POSA to enclose Cook-554’s resonant magnetic antenna in a low loss tangent material, based on the general knowledge of a POSA or Pohjonen.

Likewise, Ground 3 fails because the Petition does not provide a sufficient motivation for a POSA to enclose Cook-523's non-radiative antenna in a low loss tangent material, based on Pohjonen. A POSA would readily understand that Cook – a design incorporating a resonant magnetic antenna into a portable device – requires complicated tradeoffs that take into account a number of design constraints. And many of these designs are just as likely, if not more likely, to not enclose a magnetic resonant / non-radiative antenna in a low loss tangent material.

Moreover, Grounds I and III fail because a POSA considering Cook-554 or Cook-523 would not look to the teachings of Pohjonen. Cook-554 and Cook-523 are both directed to magnetic field or non-radiative antennas that are designed to output mostly a magnetic field that is stationary in the near field. Pohjonen on the other hand is directed to a cover for a radiating antenna designed to radiate electromagnetic energy in the far field. A POSA would understand that the antennas are subject to different design constraints; and accordingly, the POSA would not have looked to Pohjonen in designing a portable device incorporating the magnetic field / non-radiative antenna of either Cook-554 or Cook-523.

Third, Grounds II and IV related to claim 17 fail because neither Cook-554, nor Lee and Cook-523, teaches or suggests all of the features of the claim. In particular, the cited references do not teach or suggest “at least one of the

resonators includes a coil of a plurality of turns of a conducting material connected to a network of capacitors.” The Petition cites to each of Cook-554 and Lee as teaching a switched capacitor bank. But Cook-554 and Lee do not teach or suggest that a resonator includes their switched capacitor bank, or that their switched capacitor bank is a network of capacitors.

For at least these reasons, the Board should enter a final decision affirming the validity of the challenged claims.

II. STATEMENT OF MATERIAL FACTS IN DISPUTE

Petitioner did not submit a statement of material facts in its IPR petition. As such, no response is due pursuant to 37 C.F.R. §42.23(a), and no facts are admitted.

III. STATEMENT OF RELIEF REQUESTED

Patent Owner respectfully requests that the Board confirm patentability of the challenged claims.

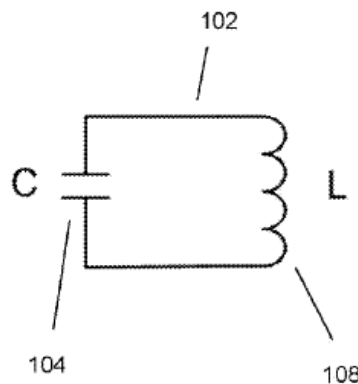
IV. OVERVIEW OF THE ’719 PATENT AND ITS PROSECUTION HISTORY

The ’719 patent issued on June 11, 2013, from an application filed on September 25, 2009, and claiming priority to a number of provisional patent applications that date back to September 27, 2008. The ’719 patent describes improved capabilities for a source resonator and a second resonator “coupled to

exchange energy wirelessly among the source resonator and the second resonator.

'719 patent Abstract. The focus of the patent is on resonators that have quality factors (Q-factors) greater than 100. *Id.*

As described in the '719 patent, a resonator is a system that may store energy that oscillates in at least two different forms. *Id.* 11:37-39. As illustrated in FIG. 6(a) (reproduced below), a resonator may include an inductive element (inductor) having an inductance L , and a capacitive element (capacitor) having a capacitance C . '719 patent 18:63 – 19:3; Horenstein Decl. ¶ 19.



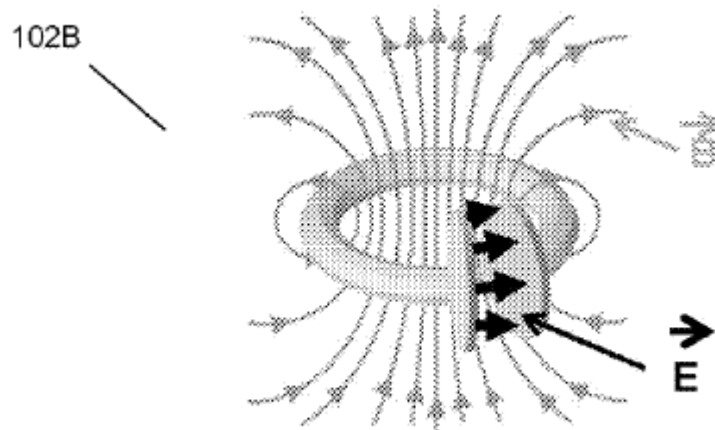
The resonator will oscillate between an electric field energy stored in the capacitor and a magnetic field energy stored in the capacitor. '719 patent 19:3-8; Horenstein Decl. ¶ 20. In this regard, as the capacitor discharges, the electric field energy stored in the capacitor is transferred into magnetic field energy stored in the inductor, which is then transferred back into electric field energy stored in the

capacitor, and so forth. '719 patent 19:3-8. The resonant frequency of a resonator may be given by ω ,

$$\omega = 2\pi f = \sqrt{\frac{1}{LC}}$$

'719 patent 20:40-49; Horenstein Decl. ¶ 20.

In a magnetic resonator in particular, the inductive element may be a loop or coil of a conducting material connected to a capacitor, as shown in FIG. 6(d) (reproduced below). '719 patent 19:21-26; Horenstein Decl. ¶ 28. As shown, the energy stored by the electric field $\vec{E}$ is primarily confined within the resonator, and the energy stored by the magnetic field $\vec{B}$ is primarily in a resonant near-field region surrounding the resonator. '719 patent 18:43-46, 19:26-29; Horenstein Decl. ¶ 23-24, 30-32. In wireless power transfer using magnetic resonators, the energy exchange is primarily through the resonant near-field surrounding the transmitting resonator. '719 patent 18:46-48; Horenstein Decl. ¶ 23-24, 30-32.

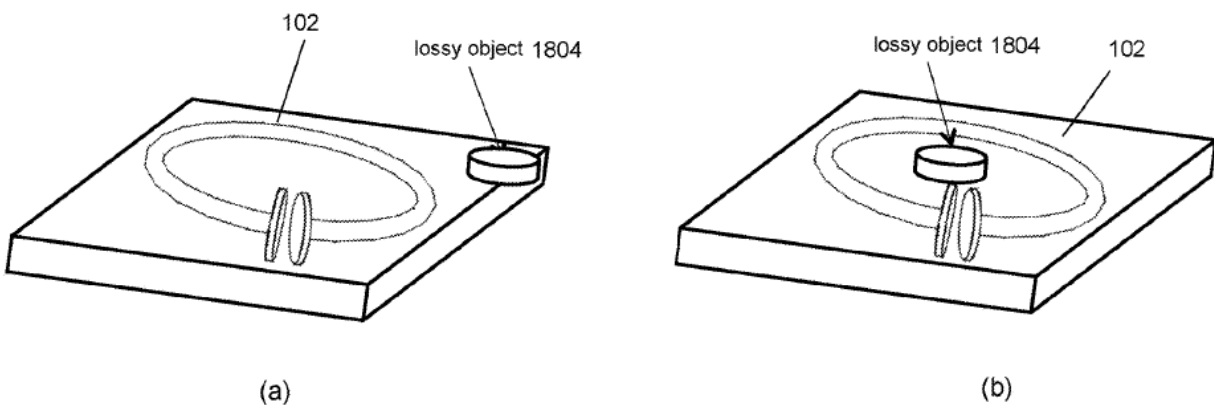


Intrinsic loss mechanisms cause the energy stored by the resonator (oscillating between the electric field and the magnetic field) to decay. '719 patent 11:45-63. The quality factor (Q-factor) of the resonator characterizes this energy decay, and a high-Q resonator is characterized as a resonator with “relatively low intrinsic losses and can store energy for a relatively long time.” '719 patent 11:64 – 12:2; Horenstein Decl. ¶ 21-22. A high-Q resonator “may be desirable for non-radiative wireless energy transfer schemes,” where resonator designs are chosen to reduce or minimize radiation losses. *Id.* 21:48-65.

As also disclosed, “[t]he magnetic resonators may be free standing or they may be enclosed in an enclosure, container, sleeve or housing.” '719 patent 26:16-17, 59:40-42; Horenstein Decl. ¶ 27. In some applications, the enclosure may be composed of a low loss material such as “Teflon, REXOLITE, styrene, and the

like.” ’719 patent 26:20-22, 59:43-45; Horenstein Decl. ¶¶ 27, 34-35. FIG. 24 (reproduced below) illustrates a magnetic resonator and its enclosure, along with a lossy object placed in the corner or center of the outer surface of the enclosure.

’719 patent 8:36-42.



Further, as disclosed, a magnetic resonator includes an inductive element, such as a coil or loop of conducting material, that provides primarily the reactive (imaginary) component of a complex impedance. *Id.* 43:65 – 44:6. The magnetic resonator also includes a capacitance that may be realized using a network, and used to control or regulate the complex impedance. *Id.* 20:12-17. The network therefore requires two or more degrees of freedom to control or regulate both the real and imaginary components of the complex impedance. *Id.* 44:3-6, 42-46, 45:58-61, 69:56-60.

The magnetic resonator may be connected to an external circuit, such as a driving circuit, driven load or transmission line. *Id.* 44:7-9. The inductive element and external circuit may have respective impedances (the impedance of the external circuit referred to as its characteristic impedance) that are different from one another. *Id.* 44:3-6, 20-46. The network by which the capacitance is realized may therefore regulate the impedance of the magnetic resonator (combined impedance of the inductive element and the network) to match the characteristic impedance of the external circuit. *Id.* 44:51-55.

In a number of examples given in the '719 patent, the network is referred to as an impedance-matching network. A number of topologies of impedance-matching networks are provided that include multiple variable capacitors, or networks of variable capacitors. '719 patent 45:64-66, 46:6-13; Horenstein Decl. ¶ 40. The '719 patent also provides several examples of impedance-matching networks that include reactive elements, namely inductors and capacitors, and in particular multiple capacitors, connected to an inductive element to create a magnetic resonator. '719 patent FIGS. 30-35, 51:45 – 57:33; Horenstein Decl. ¶ 41.

The application that issued as the '719 patent was filed with twenty-three original claims, including claims 22 and 23 that correspond to claims 16 and 17,

respectively. *See* File History for U.S. Patent No. 8,461,719 (Ex. 1002) 151-144.

During prosecution of the application, the USPTO issued a first Office Action in which the Examiner rejected a number of the claims, but allowed claims 22 and 23.

Id. 573-584. The Examiner provided the following explanation of the reasons for allowance of claims 22 and 23:

Claim 22 is allowed because none of the prior art of record discloses or suggests the square root of the product of the first and second Q-factors being greater than 100, and at least one of the resonators being enclosed in a low loss tangent material, in combination with the remaining claimed features.

Claim 23 is allowed because none of the prior art of record discloses or suggests at least one of the resonators including a coil of a plurality of turns of a conducting material connected to a network of capacitors, wherein the plurality of turns are in a common plane, and wherein a characteristic thickness of the at least one of the resonators is much less than a characteristic size of the at least one of the resonators, in combination with the remaining claimed features.

Id. 581.

Following an amendment in response to the first Office Action, the USPTO issued a Notice of Allowance on February 14, 2013. *Id.* 750-757. In the Notice of Allowance, the Examiner again repeated the same explanation for allowance of claims 22 and 23 (now claims 16 and 17). *Id.* 755.

V. CLAIM CONSTRUCTION

Petitioner and its declarant, Dr. Mark Allen, contend that the elements of the challenged claims should be construed according to their plain meaning, and provide a construction for the terms “characteristic size” and “characteristic thickness.” *See* Pet. 8-9; Allen Decl. (Ex. 1003) ¶¶ 67-71. Patent Owner respectfully submits that the term “network of capacitors” should also be construed to determine whether the challenged claims are valid over the cited prior art.

A. Claim Terms Are to Be Given Ordinary Meaning in Light of the Specification and Prosecution History

In an IPR proceeding, claim terms are given their ordinary and customary meaning as understood by one of ordinary skill in the art in view of the specification and the prosecution history of the patent. *See* 37 C.F.R. § 42.100(b); *Netflix Inc. v. Divx, LLC*, IPR2020-00646, Paper 66 at 11 (Apr. 17, 2024) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc)).

B. The Term “Network of Capacitors” Should Be Construed To Mean “a Circuit Topology of Passive Components Including One or More Capacitors That Provides Two or More Degrees of Freedom”

Starting with the claim language itself, claim 17 recites that “at least one of the resonators includes a coil of a plurality of turns of a conducting material connected to **a network of capacitors.**” ’719 patent 99:13-15. In circuit theory, a “network” is defined as an interconnection of “resistances, inductances, capacities [capacitors], and mutual inductances” Terman-1943 (Ex. 2013) 197; Horenstein Decl. ¶ 37. In the ’719 patent, a network of capacitors is generally referred to as “a circuit topology including one or more capacitors.” ’719 patent 52:32-38; Horenstein Decl. ¶¶ 38-40.

In context, as described in the specification, a resonator may include an inductive element, such as a coil or loop of a conducting material, connected to a capacitance that may be realized by a network. ’719 patent 20:12-17, 43:65 – 44:6. The inductive element provides primarily the reactive (imaginary) component of a complex impedance. Horenstein Decl. ¶ 41. The capacitance realized by the network may control the complex impedance, which requires that the network includes two or more degrees of freedom to control or regulate both the real and imaginary components of the complex impedance. ’719 patent 44:3-6, 42-46, 45:58-61, 69:56-60, Horenstein Decl. ¶¶ 41-42.

In more specific examples, the '719 patent describes matching the resonator to an external circuit by a network of capacitors. '719 patent 5:38-43, 37:65 – 38:1, 44:51-55. In this regard, the '719 patent explains the inductive element may be matched by topologies including multiple variable capacitors, or networks of variable capacitors. '719 patent 45:64-66, 46:6-13; Horenstein Decl. ¶ 40. The '719 patent also provides several examples of impedance-matching networks that include reactive elements, namely inductors and capacitors, connected to an inductive element to create a magnetic resonator. '719 patent FIGS. 30-35, 51:45 – 57:33; Horenstein Decl. ¶¶ 41-49.

Moreover, as recognized by Petitioner's declarant, Dr. Allen, the '719 patent explains that where the inductive element or external circuit are subject to environmental variations, the impedance-matching circuit may need to be tuned to match the inductive element to the external circuit impedance (characteristic impedance) to preserve the high Q of the resonator. Allen Decl. ¶ 56 (citing '719 patent 45:54-63). This tuning to match the inductive element to match the external circuit impedance "can be accomplished by connecting the inductive component to a 'network[] of variable capacitors.'" *Id.* (citing '719 patent 45:64 – 46:5, 46:37-44); and *see* Pet. 6.

The Board should therefore construe the term “network of capacitors” as “a circuit topology of passive components including one or more capacitors that provides two or more degrees of freedom.”

C. Person of Ordinary Skill in the Art

For purposes of this response only, Patent Owner does not disagree with Petitioner’s definition of the level of ordinary skill in the art, which is a bachelor’s degree in electrical engineering (or equivalent) and at least two years of industry or equivalent research experience in the field of wireless energy transfer. Patent Owner does not believe that resolution of the Petition depends on the precise definition of the level of ordinary skill.

VI. PETITIONER FAILS TO MEET ITS BURDEN OF SHOWING THE CHALLENGED CLAIMS ARE OBVIOUS

Petitioner’s obviousness analysis fails for multiple reasons. First, Grounds 1 and 2 fail because the Petition does not show that Cook-554 constitutes prior art, as it was filed after the ’719 patent’s earliest priority date of September 27, 2008. Cook-554, filed on March 4, 2009, claims an earlier date from the Cook Provisional, but the Petition does not demonstrate that Cook-554 is entitled to the earlier date of the Cook Provisional. Cook-554 therefore does not constitute prior art.

Second, even if Cook-554 were prior art, Ground 1 related to claim 16 fails because Cook-554 does not disclose enclosing a resonator in material. The Petition lacks motivation for a POSA to enclose Cook-554's resonant magnetic antenna in a low-loss tangent material. Similarly, Ground 3 fails because the Petition does not provide sufficient motivation for a POSA to enclose Cook-523's non-radiative antenna in such material. Additionally, a POSA would not combine teachings from Pohjonen with Cook-554 or Cook-523 due to differing design constraints between magnetic/non-radiative and radiating antennas.

Third, Grounds 2 and 4 related to claim 17 fail because Cook-554 (Ground 2), and Lee and Cook-523 (Ground 4), do not teach or suggest all the features of the claim. That is, the cited references do not teach or suggest a resonator including a coil connected to a network of capacitors. The Petition relies on a switched capacitor bank in each of Cook-554 and Lee for the network of capacitors, but the references do not teach or suggest that a resonator includes the switched capacitor bank. Likewise the references do not teach or suggest that the switched capacitor bank constitutes a network of capacitors as in the claim.

Thus, for at least these reasons, which are explained in detail below, the prior art does not render the challenged claims unpatentable for obviousness.

A. Scope and Content of the Prior Art

1. U.S. Pat. No. 8,855,554 (“Cook-554”)

Cook-554 is a U.S. patent that issued on October 7, 2014. The application that issued as Cook-554 was filed on March 4, 2009, and claims priority to provisional application U.S. Ser. No. 61/034,116, filed on March 5, 2008 (Ex. 1006, “Cook Provisional”). Cook-554 describes a wireless power system including a wireless power source and receiver, which may be used to charge a portable electronic device. Cook-554, 2:53 – 3:20, 3:21-22, 6:13-15; Horenstein Decl. ¶¶ 69, 71.

In Cook-554, each of the wireless power source and the receiver includes a resonant antenna. Cook-554 4:26, 6:16-17. As disclosed, “[a] preferred technique for wireless energy transfer is based on coupled magnetic resonance using magnetic-field antennas, e.g., a loop or coil” Cook-554 8:54-57; Horenstein Decl. ¶ 70. Thus, in a magnetically coupled system, the resonant antenna may be a multi-turn loop (coil), also referred to in Cook-554 as a magnetic-field antenna or a magnetic antenna. Cook-554 4:26-28, 6:20-23, 7:35-37, 16:30-32; Horenstein Decl. ¶ 70.

As disclosed, the wireless power receiver and its magnetic-field antenna (loop/coil antenna or ferrite rod antenna) may be integrated into a portable

electronic device, such as a mobile phone or a cordless phone. *Id.* FIGS. 6, 7, 22A-22D, 8:58 – 9:6.

Cook-554 describes an embodiment in which a charging base for a cordless phone includes a parasitic antenna to relay wireless power from a power base station to a cordless phone including a magnetic-field antenna. *Id.* 9:16-28. FIG. 7 (reproduced below) illustrates a portable device including a ferrite rod antenna, on a charging station with a coil/loop antenna.

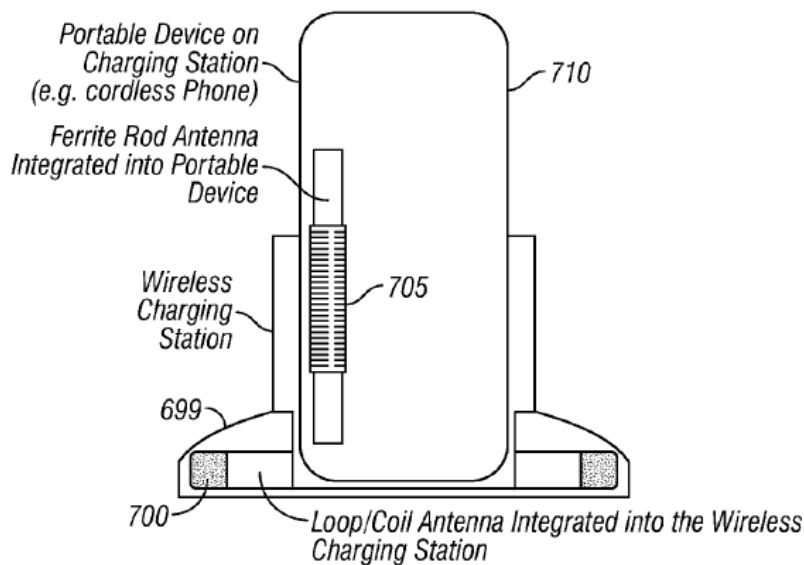


FIG. 7

FIG. 8 (reproduced below) illustrates the magnetic field coupling between the portable device, charging station and a power base station. *See also id.* 9:35-46.

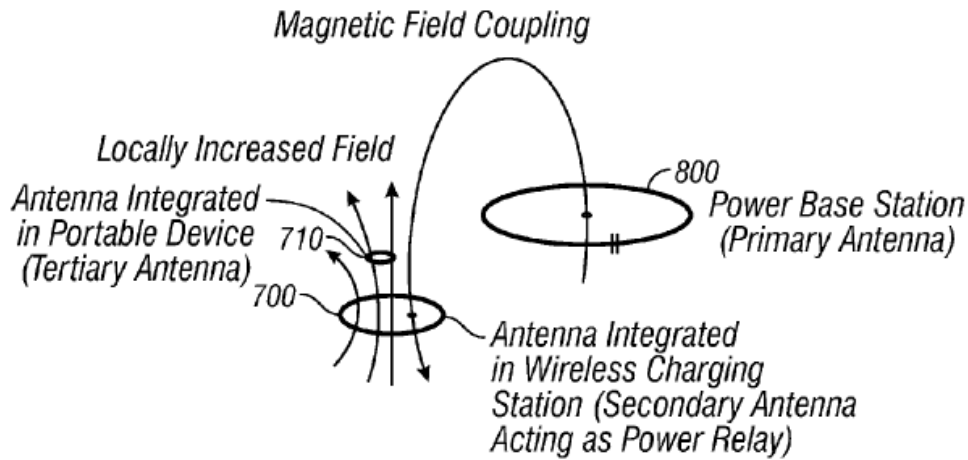


FIG. 8

In another particular embodiment, Cook-554 describes a wireless power device including a transmit subsystem and a receive subsystem. *Id.* 2:40-41. As shown in FIG. 13 (reproduced below), the transmit subsystem includes a transmit antenna unit and a transmit power converter unit. *Id.* 11:20-24. The transmit antenna unit includes a multi-turn loop (coil) and a capacitor that form a series tank circuit, and the transmit antenna unit is connected to the transmit power converter unit by an antenna feeder cable. *Id.* 13:7-14.

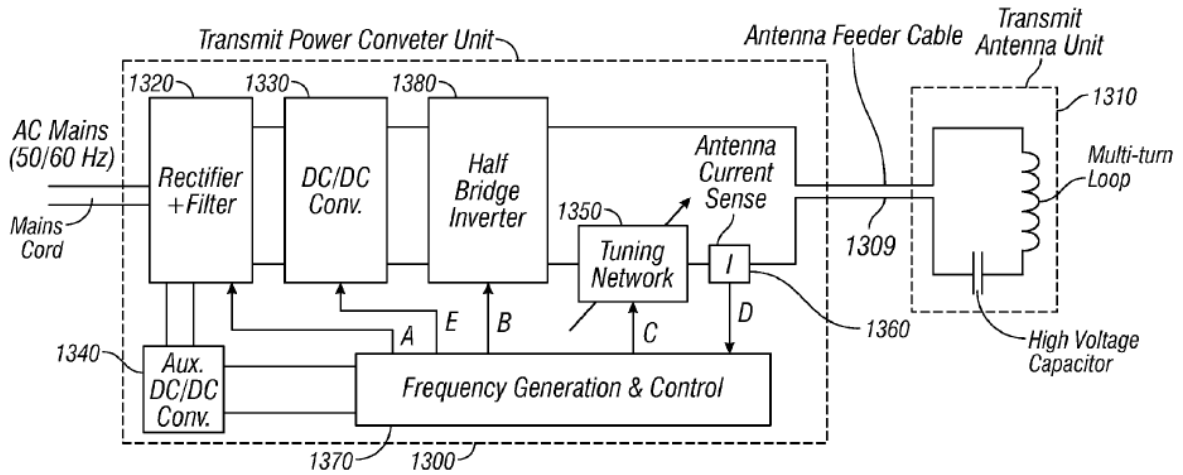


FIG. 13

The transmit power converter unit includes a tuning network to tune the resonant frequency of the transmit antenna unit, and compensate for detuning effects caused by the receive subsystem, extraneous objects, and tolerances (ageing) of the transmit antenna unit and the antenna feeder cable. *Id.* 11:31-33, 12:19-35.

As shown in FIG. 15 (reproduced below), like the transmit subsystem, the receive subsystem includes a receive antenna unit and a receive power converter unit. *Id.* 13:46-49. The receive antenna unit includes a multi-turn loop (coil) and a capacitor that form a series tank circuit, and the receive antenna unit is connected to the receive power converter unit by an antenna feeder cable. *Id.* 13:7-14, 50-51, 55-57.

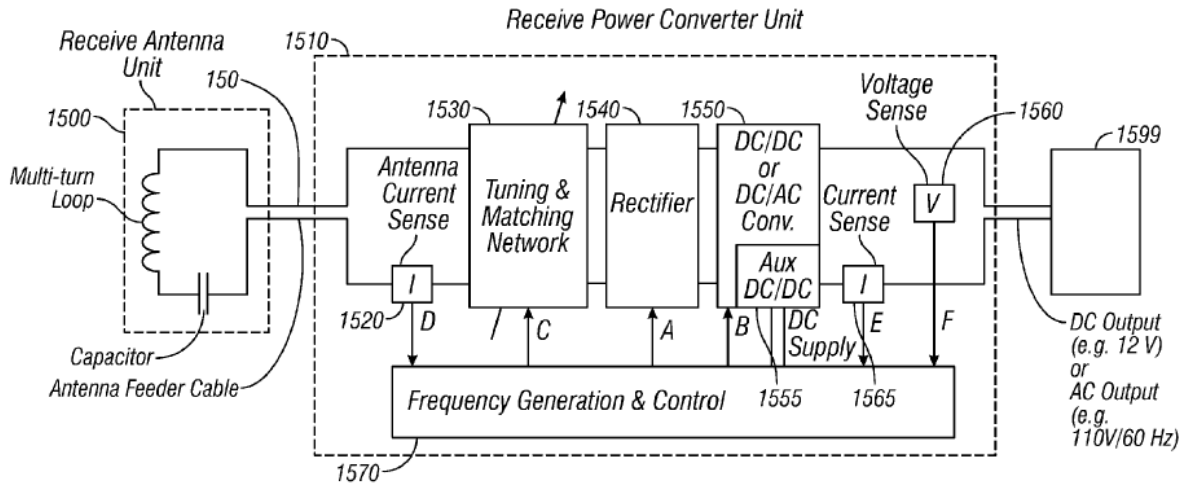


FIG. 15

The receive power converter unit includes a tuning and matching network to tune the resonant frequency of the receive antenna unit, and match a rectifier (of the receiver power converter unit) to the receive antenna unit. *Id.* 13:58-63, 14:26-30. Similar to the tuning network of the transmit power converter unit, the tuning and matching network tunes the resonant frequency of the receive antenna unit, and compensates for detuning effects caused by the transmit subsystem, extraneous objects, and tolerances (ageing) of the receive antenna unit and the antenna feeder cable. *Id.* 14:31-36.

Cook-554 discloses that the resonant frequency may be tuned using electrically tunable reactors, such as tunable capacitors and/or tunable inductors. Cook-554 17:33-37; Horenstein Decl. ¶¶ 72-73. As shown in FIG. 16 (reproduced below), capacitive tuning can use a switched capacitor bank that includes a set of

capacitors with RF switches that are opened or closed to adjust the effective capacitance of the switched capacitor bank. Cook-554 17:41-61; Horenstein Decl.

¶¶ 72-73.

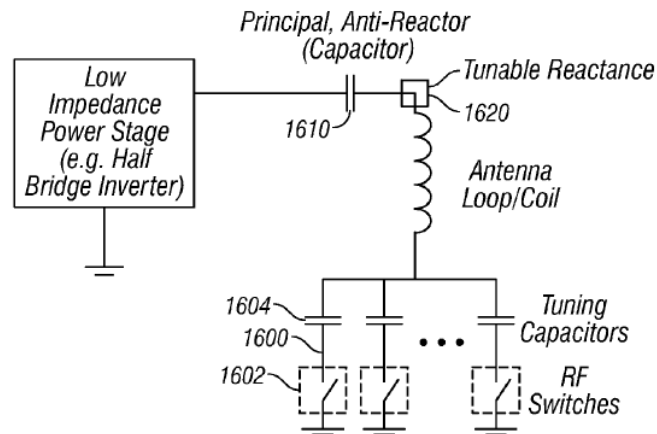


FIG. 16

2. Int'l Pat. Pub. No. WO 2007/101902 ("Pohjonen")

Pohjonen is a PCT patent application publication that published on September 13, 2007. Pohjonen relates to "the technology of antennas for portable radio devices." Pohjonen 1. As disclosed, a portable radio device includes an outer cover and an internal radiating antenna element to receive and transmit radio frequency transmissions / waves. Pohjonen Abstract, 1, 2, 3, 6, 7; Horenstein Decl.

¶ 83.

A problem of prior art radiating antennas is "the effect of radio frequency losses in the cover materials," which have typically been selected on grounds other

than radio frequency losses. Pohjonen 2; Horenstein Decl. ¶ 84. A number of outer covers for portable radio devices are manufactured by injection molding of materials, such as polycarbonate (PC), polystyrene (PS) or polyvinyl chloride (PVC), which are in many cases mixed with reinforcement materials to achieve suitable mechanical properties. Pohjonen 2-3.

Losses of dielectric materials are customarily characterized by their dielectric constant, but a better measure of actual losses is the dielectric loss tangent. *Id.* 2. Pohjonen therefore discloses a portable radio device having an outer cover and a radiating antenna element. *Id.* 3-4. At a location of the radiating antenna element, the outer cover is made from a thermoplastic material having a dielectric loss tangent less than 0.005, such as PC, PS or PVC as components in a mixed thermoplastic. *Id.* 3-4, 7. The outer cover also includes a diamond or diamond-like coating to increase the thermoplastic material's durability, strength and heat conducting properties. *Id.* 5, 9-10.

3. U.S. Pat. No. 8,378,523 ("Cook-523")

Cook-523 is a U.S. patent that issued on February 13, 2013, from an application filed on September 16, 2008. Cook-523 describes techniques for wireless power transmission including a power transmitter assembly and a receiver. Cook-523 Abstract, 1:49-50, 2:32-34, 55-56.

As illustrated in FIG. 1 (reproduced below), the power transmitter assembly includes a high Q resonant coil antenna with a number of coil loops in series with a capacitance. *Id.* 2:34-41. As described, “[t]he antenna 100 is non-radiative, in the sense that much of the output of the antenna is not electromagnetic radiating energy, but is rather a magnetic field which is more stationary. Of course, part of the output from the antenna will in fact radiate.” Cook-523 2:49-53; Horenstein Decl. ¶¶ 75-76.

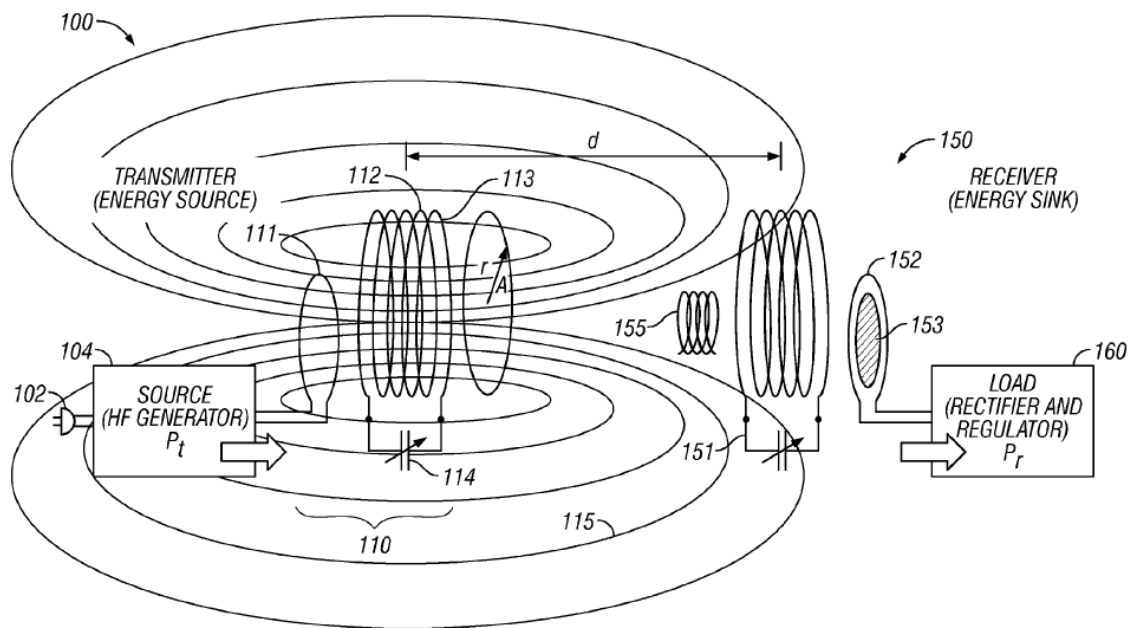


FIG. 1

The receiver is likewise a high Q resonant coil antenna that includes a coil in series with a capacitance. Cook-523 2:56-58.

As disclosed, the power transmitter assembly and the receiver may transfer energy through magnetic field coupling, which is more advantageous than electric field coupling due to its relatively weak influence from external objects. Cook-523 2:66 – 3:8, 3:24-39; Horenstein Decl. ¶¶ 76-77. FIGS. 2A and 2B illustrate “near field” conditions for non-radiative energy transfer, which Cook-523 as “[a]n efficient power transfer [that] may be carried out between two antennas by storing energy in the near field of the transmitting antenna, rather than sending the energy into free space in the form of a travelling electromagnetic wave.” Cook-523 2:36-40, 3:40-41; Horenstein Decl. ¶¶ 76-77.

Cook-523, similar to Cook-554, also describes integration of its non-radiative antenna into a portable device. Cook-523 FIGS. 12A-12C, 13A and 13B, 2:13-16, 13:16-17, 32-34; Horenstein Decl. ¶ 78. FIG. 12A (reproduced below) illustrates an embodiment in which the non-radiative antenna is a loop antenna that surrounds the perimeter of a portable device having a non-metallic case (a non-electrically conductive housing). Cook-523 13:18-20.

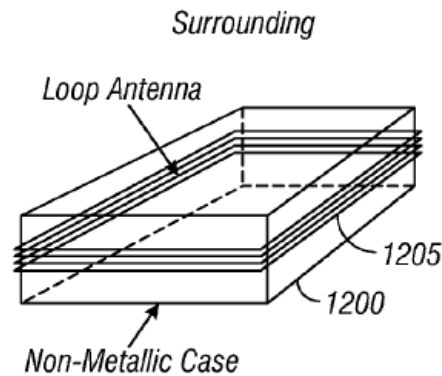
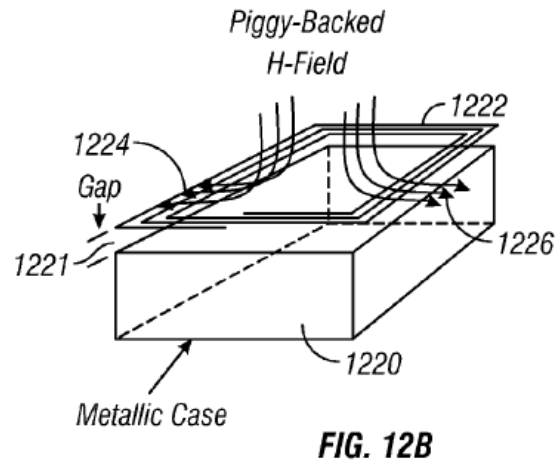
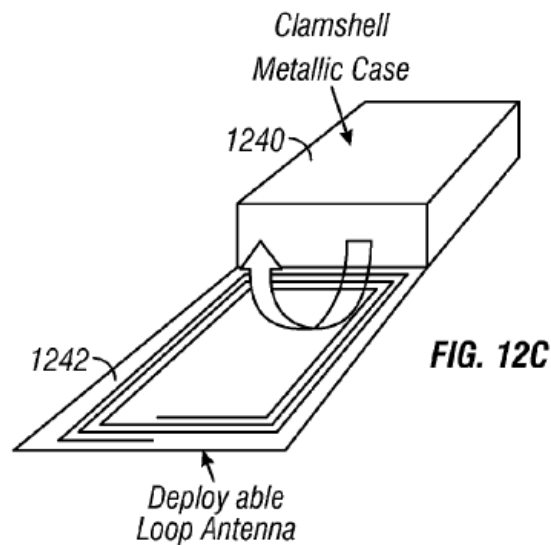


FIG. 12A

In FIGS. 12B, 12C, 13A and 13B (each of which is also reproduced below), the non-radiative antenna is integrated into a portable device having a metallic case. Cook-523 13:23-25, 29-31, 34-35, 40-42; Horenstein Decl. ¶ 79. In the embodiment shown in FIG. 12B, the non-radiative antenna is a loop antenna that is formed on an insulator that is separated from the metallic case by a gap. Cook-523 13:23-28. In this embodiment, “the magnetic field created by the antenna passes through that gap ..., in order to escape.” Cook-523 13:23-25, 29-31, 34-35, 40-42; Horenstein Decl. ¶ 79.



In the embodiment shown in FIG. 12C, the non-radiative antenna is a loop antenna that is deployable. Cook-523 13:29-31; Horenstein Decl. ¶ 80. The loop antenna rotates, slides or folds away from the metallic case. Cook-523 13:29-31; Horenstein Decl. ¶ 80.



In the embodiment shown in FIG. 13A, the metallic case is covered by a high permeability ferrite sheet on which a loop antenna is formed. Cook-523 13:34-39; Horenstein Decl. ¶ 80.

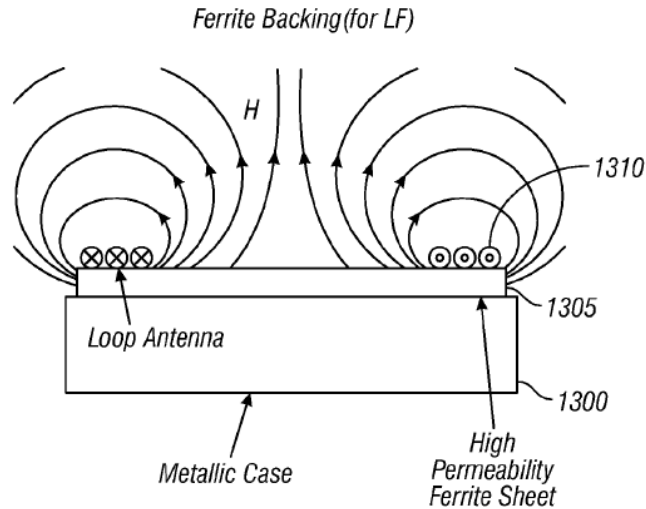
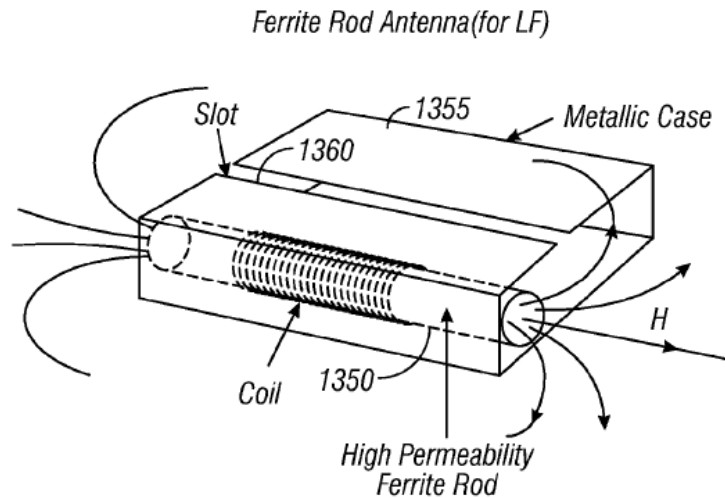


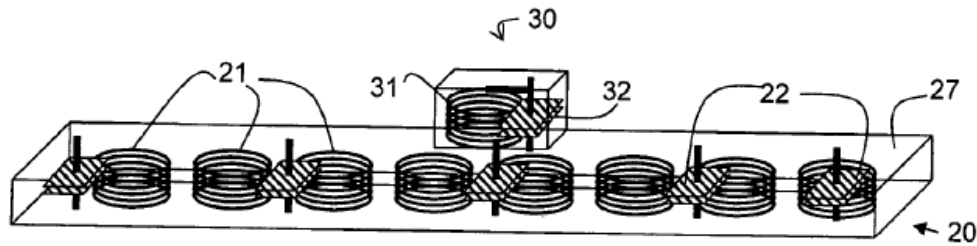
FIG. 13A

In the embodiment shown in FIG. 13B, the non-radiative antenna is a high permeability ferrite rod with a wound-coil that is within the metallic case of the portable device. Cook-523 13:40-42; Horenstein Decl. ¶ 81. In this embodiment, the metallic case includes openings at its ends, and an open slot / slotted area, through which the magnetic field is received. Cook-523 FIG. 13B, 13:43-44; Horenstein Decl. ¶ 81.



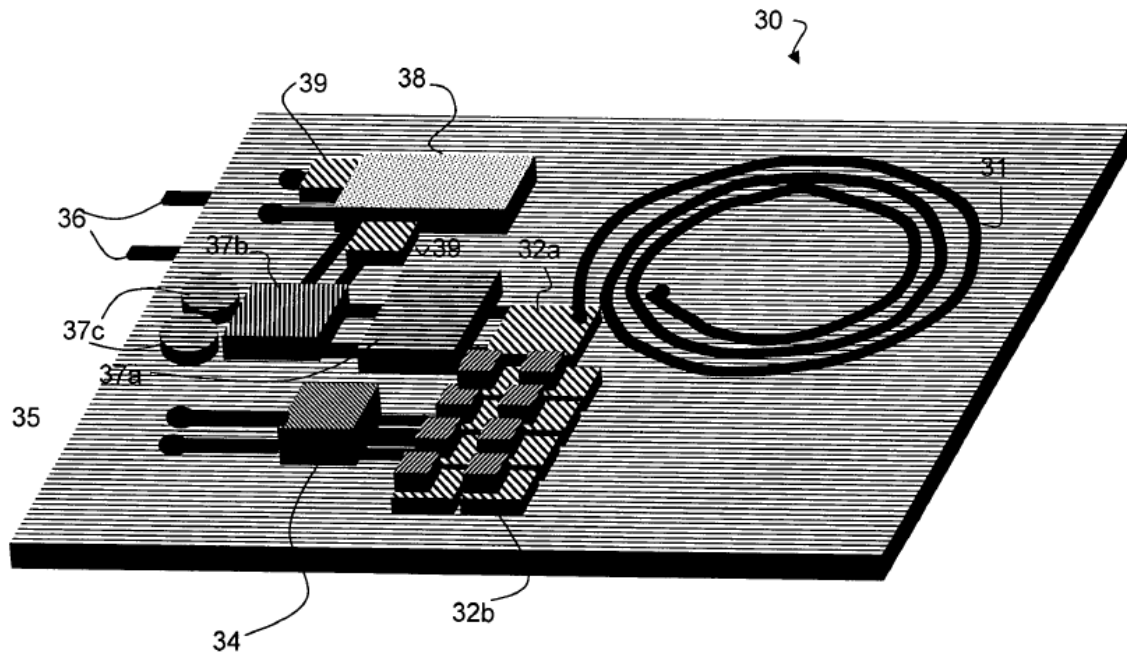
4. U.S. Pat. Pub. No. 2007/0145830 (“Lee”)

Lee is a U.S. pre-grant publication that published on June 28, 2007. Lee relates to a “system and method ... for the inductive transfer of electric power between a substantially flat primary surface and a multitude of secondary devices.” Lee Abstract; Horenstein Decl. ¶ 87. As shown in FIG. 2 (a portion of which is reproduced below), Lee discloses a system including a primary unit and secondary unit that are magnetically (inductively) coupled to transfer power from the primary unit to the secondary unit. Lee Abstract, ¶¶ 3, 19, 54-57; Horenstein Decl. ¶ 88.



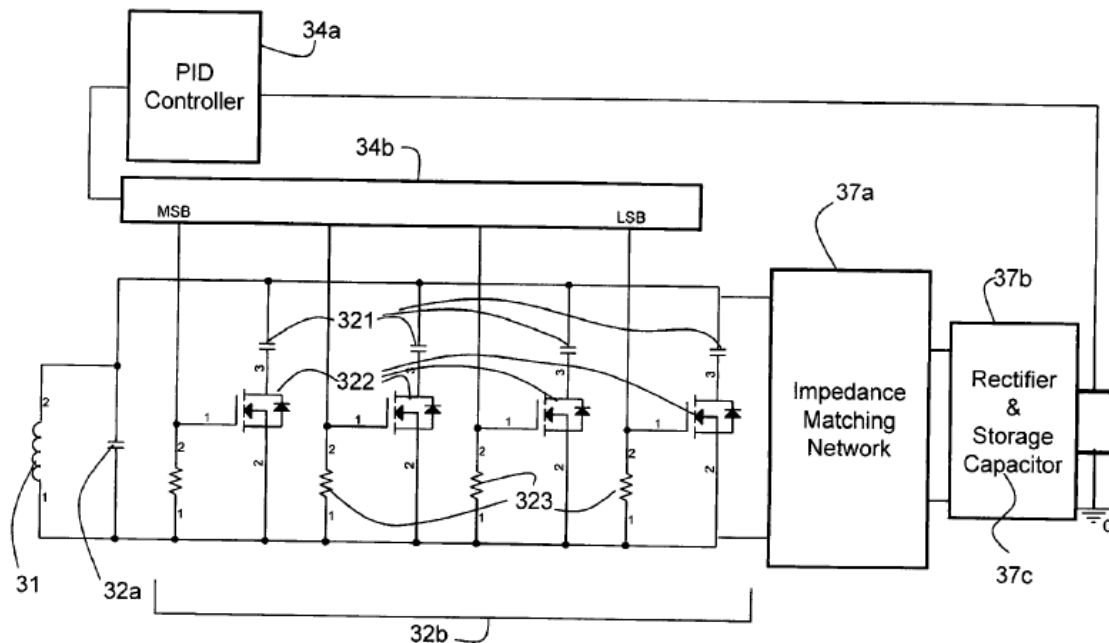
The primary unit includes an array of inductive field coils (L) and matching capacitors (C) that form parallel LC networks. Lee ¶¶ 54-55; Horenstein Decl. ¶ 88. Likewise, the secondary unit includes an inductive field coil and a matching capacitor. Lee 54-55, 57; Horenstein Decl. ¶ 88.

FIG. 12 (reproduced below) illustrates a secondary unit according to one embodiment. Lee ¶ 47. As shown, the secondary unit includes a receiving coil and a main capacitor that form an LC network that has a resonant frequency at a primary driving frequency in the absence of magnetic coupling of the secondary unit with a primary unit. *Id.* ¶¶ 75, 78.



The magnetic coupling of the secondary unit with a primary unit raises the resonant frequency, and the secondary unit includes a switched capacitor bank to tune and thereby restore the resonant frequency to match the driving frequency.

Lee ¶ 78; Horenstein Decl. ¶¶ 88-89. As shown more particularly in FIG. 13 (reproduced below), the switched capacitor bank includes capacitors in series with respective switches that are turned on/off to enable/disable respective ones of the capacitors to control a capacitance of the switched capacitor bank. Lee ¶ 78; Horenstein Decl. ¶ 90.



B. Petitioner Fails to Demonstrate Cook-554 Constitutes Prior Art

Grounds I and II rely on Cook-554 as a primary reference. Petitioner identifies September 27, 2008 as the earliest claimed priority date of the '719 patent. Pet. 6. As indicated above, Cook-554 was filed on March 4, 2009, and issued on October 7, 2014. Cook-554 therefore does not on its face qualify as prior art to the '719 patent. Instead, the Petition relies on the filing date of the Cook Provisional (i.e., March 5, 2008) to establish Cook-554 as prior art under pre-AIA 102(e). *Id.* 10.

The Petitioner bears the burden of demonstrating that Cook-554 is prior art and entitled to the priority date of the Cook Provisional. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1380 (Fed. Cir. 2015) (“placing the burden

on Dynamic, the petitioner in the *inter partes* review, to prove that the prior art [] patent was entitled to the filing date of its provisional application”). Specifically, Petitioner bears the burden to demonstrate, within the Petition itself, that the relied upon disclosure in Cook-554 qualified as prior art under § 102(e) based on the filing date of the Cook Provisional.

As recognized in the Petition, a U.S. patent has an effective prior art date under pre-AIA § 102(e) as of the underlying provisional application filing date on two conditions. First, the provisional application must provide written description support at least one claim in the U.S. patent. *See Dynamic Drinkware*, 800 F.3d at 1382. Second, the provisional application must provide written description support for the subject matter relied on for prior art purposes in the U.S. patent. *See In re Giacomini*, 612 F.3d 1380, 1383 (Fed. Cir. 2010); *Dynamic Drinkware*, 800 F.3d at 1377, 1381–82. This two-prong, so-called *Dynamic Drinkware* test, is also expressed in MPEP § 2136(I)(B).

Petitioner attempts to address the second prong of the *Dynamic Drinkware* test by providing parallel citations to Cook-554 and the Cook Provisional in mapping Cook-554 to claims 16 and 17 of the ’719 patent. *See* Pet. 15. As explained below, however, Petitioner fails to demonstrate written description

support in the Cook Provisional for at least some of the subject matter relied on in Cook-554.

For the first prong of the *Dynamic Drinkware* test, the Petition attempts to describe how the Cook Provisional supports claim 17 of Cook-554. *Id.* 13-15. Claim 17 of Cook-554 is directed to a method including, *inter alia*, varying the impedance value of the power converting circuit to tune the resonant frequency of the resonant circuit based on the received power level. Cook-554 30:8-10; Horenstein Decl. ¶¶ 94-95.

Petitioner alleges that the Cook Provisional supports this feature by disclosing tuning the resonant frequency. Pet. 15. In particular, the Petitioner alleges that this feature is supported by the Cook Provisional disclosing “readjusting (tuning) of the resonance frequency,” and that “[t]he resonance frequency can be tuned using variable capacitance, variable inductance, or a combination, to ‘create antenna load impedance that can be varied.’” *Id.* (citing Cook Provisional 44, 51, 55, 57). This is insufficient. Horenstein Decl. ¶¶ 95-96.

In particular, Petitioner fails to demonstrate that the Cook Provisional provides written description support for varying the impedance value of the power converting circuit to tune the resonant frequency of the resonant circuit **based on the received power level**, as required by claim 17 of Cook-554. Horenstein Decl.

¶¶ 62, 96-97. On the cited pages, the Cook Provisional discloses tuning and matching to compensate for “possible detuning effects caused by the transmit subsystem and/or extraneous objects in proximity of the receive antenna, and by the rectifiers load impedance,” and “tolerances (aging) of components of the receive antenna unit and its feeder cable.” Cook Provisional 44. The Cook Provisional also discloses antenna tuning due to “variations of L and C values” due to “manufacturing tolerances,” “ageing,” “environmental effects (temperature, extraneous objects interacting with the magnetic or electric field surrounding the LC circuit),” and “non-linear and memory effects (e.g. in conjunction with the use of permeable magnetic materials).” *Id.* 51.

None of the above factors from the Cook Provisional are “based on the received power level at which power is received at the antenna,” and Petitioner does not assert that any of these factors are based on the received power level. *See* Pet. 15. Petitioner in fact does not assert with any particularity that the Cook Provisional discloses that the impedance value of the power converting circuit is varied to tune the resonant frequency based on the received power level. *See* 35 U.S.C. § 312(a)(3) (requiring petitions to identify “with particularity ... the grounds on which the challenge to each claim is based”).

The Petitioner therefore fails to meet its burden of demonstrating that the Cook Provisional provides written description support for claim 17 of Cook-554. Cook-554 therefore fails the *Dynamic Drinkware* test and does not constitute prior art to the challenged claims under pre-AIA § 102(e). Because Grounds I and II depend on Cook-554, those grounds fail for this reason alone.

C. Independent Claim 16 Is Patentable Over Cook-554, Alone or With Pohjonen (Ground 1)

1. Cook-554 Does Not Disclose “Wherein at Least One of the Resonators is Enclosed in a ... Material,” and Petitioner Relies on Non-Prior Art from Cook-554 to Establish Otherwise

Petitioner asserts that claim 16 is unpatentable as being obvious over Cook-554, alone or in view of Pohjonen. But even if Cook-554 constitutes prior art, Cook-554 does not disclose “wherein at least one of the resonators is enclosed in a ... material,” as required by claim 16. Horenstein Decl. ¶¶ 63, 98. Cook-554 discloses integration of a resonant magnetic antenna in a portable device, which a POSA would at best understand to mean that the resonant magnetic antenna is included as a part of the portable device instead of separately provided.

As recognized by Petitioner and its declarant, Dr. Allen, Cook-554 teaches “a second resonator ‘integrated’ into a ‘mobile, handheld device.’” Pet. 33; Allen Decl. ¶ 149. Petitioner and Dr. Allen assert that “[a] POSA would have understood

that ‘integrated’ in this context means that the resonator is ‘enclosed’ within the external housing of the mobile device. Pet. 33; Allen Decl. ¶ 149.

For the noted “context,” Petitioner cites Cook-554 for disclosing an “internal antenna 705 in the portable device 710.” Pet. 33 (citing Cook-554 9:20-28). As corresponding support from the Cook Provisional, Petitioner simply cites Figures 4-3 and 4-4, which correspond to FIGS. 6 and 7 of Cook-554. *Id.* Patent Owner submits, however, that nowhere does the Cook Provisional describe an “internal” antenna. The cited Figures 4-3 and 44 from the Cook Provisional are also insufficient, as explained below. The subject matter from Cook-554 relied on by Petitioner therefore does not constitute prior art to the ’719 patent. *See In re Giacomini*, 612 F.3d at 1383; *Dynamic Drinkware*, 800 F.3d at 1377, 1381–82.

Further to FIGS. 6 and 7, as well as FIG. 10, of Cook-554, Petitioner states: “Indeed, that is what Cook-554 shows in Figure 6 (device cover on; integrated resonator not visible), and Figures 7 and 10 (device cover off; integrated resonator shown).” Pet. 33-34. Cook-554, however, makes no mention of the portable device shown in FIGS. 6 and 7 including a “cover,” or that the figures show the portable device with a cover “on” and “off.”

Petitioner is attempting to treat FIGS. 6, 7 and 10 as working drawings that show or omit a particular part (i.e., cover) of the portable device. But patent

drawings are not working drawings, and the drawings in question do not clearly show a resonant antenna enclosed in the portable device. *See In re Mraz*, 455 F.2d 1069, 1072 (CCPA 1972) (citing *In re Wilson*, 312 F.2d 449, 454 (CCPA 1963)). FIGS. 6, 7 and 10 are instead simple diagrammatic drawings only intended to illustrate that the portable device and charging station integrate resonant magnetic antennas. The drawings are not intended to show how the resonant magnetic antenna is integrated into the portable device.

Petitioner also cites to Dr. Allen's declaration as support for the proposition that Cook-554's "integrated" would be understood as "enclosed." Pet. 33-34 (citing Allen Decl. ¶¶ 149). Dr. Allen, however, says nothing materially more than Petitioner. In fact, Dr. Allen cites to the exact same disclosure in Cook-554 and the Cook Provisional, and provides the same representations of FIGS. 6 and 7 from Cook-554.

Even further, Petitioner points to column 59, lines 45-49 of the '719 patent for teaching "integrated into ... cell phones ... so that they are not visible from outside these devices." *See* Pet. 34. Petitioner's use of ellipses in this manner appears to be an attempt to mislead the Board into thinking the '719 patent equates "integrated" with "enclosed." In full, the cited passage of the '719 patent reads as follows:

... The source and device resonators may be integrated in the power supplies and power consumers. For example, the source and device resonators may be integrated into keyboards, computer mice, displays, cell phones, etc. so that they are not visible outside these devices.

'719 patent 59:45-49. Read in context, the '719 patent does not equate “integrated” with “enclosed.” Instead, the '719 patent indicates that integration so that the source and device resonators are not visible from the outside is *an example* of one manner by which the source and device resonators may be integrated in a device.

At least as to subject matter that constitutes prior art, Cook-554 discloses integration of a resonator into a device, but Cook-554 does not disclose a specific manner of integration in which the resonator is enclosed in the device. A POSA would clearly understand there are a number of different manners by which the resonator could be “integrated into” the device without being enclosed in the device.

Cook-523 (including the same lead inventor as Cook-554) illustrates five ways in which an antenna may be “integrated into” a portable device. In four of the five ways, the antenna is located outside a non-metallic case (FIG. 12A) or a metallic case (FIGS. 12B, 12C, 13A) of the portable device. *See* Cook-523 13:16-

39. In the fifth way (FIG. 13B), the antenna is “within” a metallic case, but even in this way, the antenna is not “enclosed” in the metallic case. *Id.* 13:40-44; and *see* Allen Depo. (Ex. 2014) 34:13-19 (“So 13b is a bit more interesting, because there are regions of the enclosure that are metallic and regions that are not.”). That is, the antenna is not closed off on all sides by the metallic case. Instead, the metallic case includes openings at its ends, and an open slot / slotted area, through which the magnetic field is received. *Id.*

2. Petitioner Fails to Provide a Sufficient Motivation for a POSA to Enclose Cook-554’s Resonant Magnetic Antenna in a Low Loss Tangent Material

Petitioner also fails provide a sufficient motivation for a POSA to enclose Cook-554’s resonant magnetic antenna in a low loss tangent material, whether in view of the general knowledge of a POSA or Pohjonen. A POSA would readily understand that a design incorporating Cook-554’s resonant magnetic antenna into a portable device requires complicated tradeoffs that take into account a number of design constraints. And many of these designs are just as likely, if not more likely, to not *enclose* a magnetic resonant antenna in a low loss tangent material.

Petitioner cites to Cook-554 for a number of disclosures related to avoiding a metallic housing, reducing losses, and providing better penetration of magnetic fields. Pet. 35-36. Petitioner concludes that “[a] POSA would have understood this to mean integrating the antenna in a ‘low loss tangent material,’ because those

were the materials that were known to be ‘suitable for allowing electromagnetic waves (e.g., from the antenna) to pass.’” *Id.* As support, Petitioner cites to U.S. Pat. No. 9,223,345 (Ex. 1016, “Dabov”), Pohjonen, U.S. Pat. No. 7,623,078 (Ex. 1014, “Wang-078”), as well as Dr. Allen’s declaration. *Id.*

Contrary to the suggestion of Petitioner, a non-metallic material does not equate to a low loss tangent material, at least as construed by Petitioner and its declarant, Dr. Mark Allen to mean a material with a loss tangent from 0.0002 to 0.001 at a frequency of 10 GHz (taken as given but without admission). Pet. 33 n.3; Allen Decl. ¶ 58. Pohjonen itself references thermoplastic materials that are not low loss tangent materials under Petitioner’s construction. Pohjonen 2 (giving the loss tangent of acrylonitrile-butadiene-styrene (ABS) as 0.006-0.009, and the loss tangent of polyvinyl chloride (PVC) as 0.005-0.008). Dr. Allen even admitted during his deposition that the non-metallic case in FIG. 12A of Cook-523 would not be understood as low loss tangent simply by its being non-metallic. *See* Allen Depo. 32:15 – 33:9 (“It is non-metallic, according to the specification, or according to the drawing I don’t know that there is a specification or not about the loss tangent of that non-metallic case sitting here now.”).

Instead of *enclosing* its resonant magnetic antenna in part having a low loss tangent material, Cook-554 actually only advocates for the part “containing less

metallic and/or dielectric structure” to reduce losses and provide better penetration of magnetic fields. Cook-554 19:30-34. This is consistent with Cook-523, which in FIG. 13B provides a way to incorporate an antenna within a metallic case without *enclosing* the antenna. In this regard, Cook-523 discloses the metallic case open at its ends and having an open slot / slotted area to allow the magnetic field to pass. Cook-523, FIG. 13B, 13:40-44. The case of the device contains less metallic structure, reduces losses, and provides better penetration of magnetic fields. *See id.* 13:32-34 (“FIGS. 13A and 13B show multi-turn loop antennas integrated into a case in a way that minimizes eddy current effects.”); *see also* Allen Depo. 34:13-21 (“So 13b is a bit more interesting, because there are regions of the enclosure that are metallic and regions that are not. But certainly the regions that are metallic are, for the same reason, unlikely to be made of a low-loss tangent material.”).

The other references cited in the Petition also support devices that include an antenna having less metallic structure to improve the passage electromagnetic waves, but still not *enclosing* the antenna in a low loss tangent material. For example, as shown in FIG. 9 (reproduced below), Dabov describes an electronic device including an outer shell formed of a housing and bezel, and in which an antenna cap is coupled to the housing at the location of an antenna assembly to

“provide a radio-transparent outer surface for [the] antenna assembly.” Dabov

FIG. 9, 4:36-38, 9:36-39, 10:11-15, 27-32; Horenstein Decl. ¶ 105.

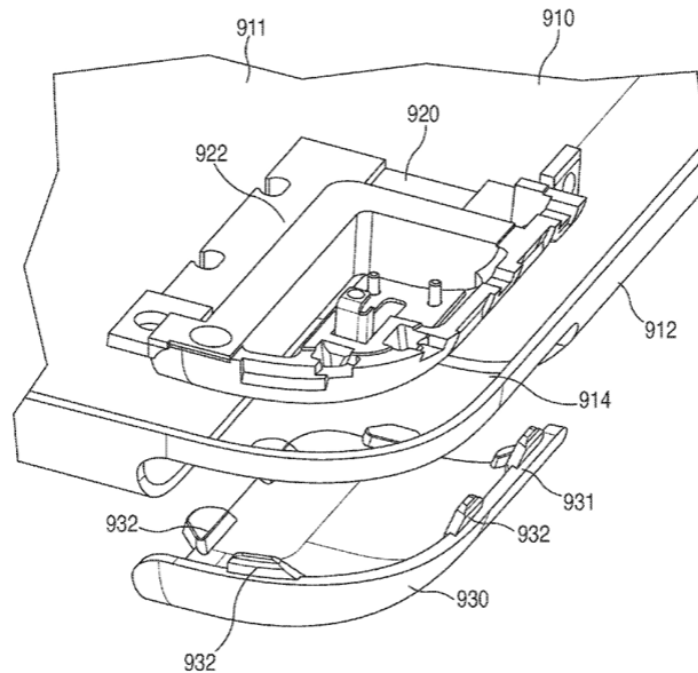


FIG. 9

Similar to Dabov, U.S. Pat. No. 8,138,977 (Ex. 1015, “Zhang”) describes a handheld wireless device including a housing with a conductive portion, and dielectric portions that “serve as caps that cover antennas that are mounted within [the] housing.” Zhang 3:54-61, 8:37 – 9:9; Horenstein Decl. ¶ 106. As disclosed, the dielectric portions allows the resonating element portion of an antenna “to operate without interference from the metal sidewalls of the housing.” Zhang 9:10-14; Horenstein Decl. ¶ 106. This is shown in a number of figures in Zhang, including FIG. 4A (reproduced below).

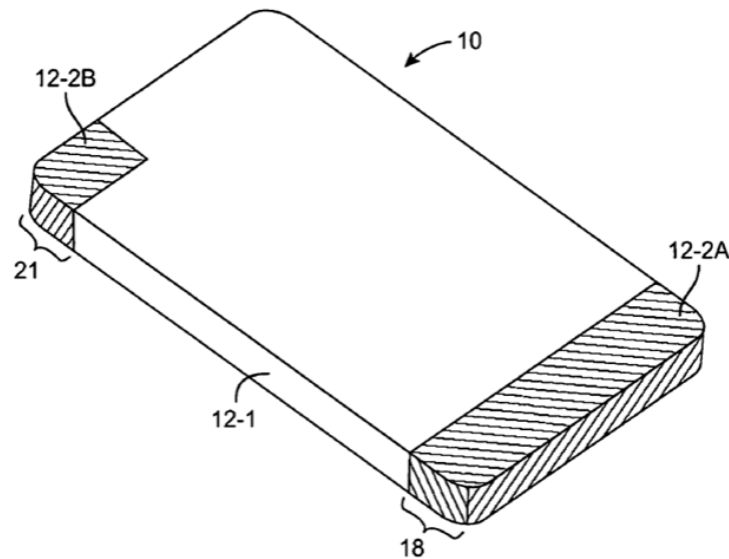


FIG. 4A

Even Pohjonen describes (and in fact claims) a portable radio device with an outer cover that includes a patch of thermoplastic material *at the location of the radiating antenna element* in the portable radio device. *See* Pohjonen Abstract, 3-4, 7, 13 (claim 1).

Petitioner argues that a POSA would have found it obvious to enclose Cook-554's resonant magnetic antenna in a low loss tangent material because "those materials (1) were commonly used for portable device covers with integrated antennas, (2) had the known benefit of minimizing losses to an integrated antenna, and (3) were non-metallic." Pet. 36-37. As explained above, however, the teachings of the prior art and even the Petitioner's reasoning, at best supports the

use of less metallic structure localized to the antenna where electromagnetic waves pass. Horenstein Decl. ¶ 104. The Petitioner has not sufficiently explained why a POSA would be motivated to even further *enclose* the antenna in non-metallic structure, much less a low loss tangent material.

As obvious as Petitioner purports a POSA would find it to enclose Cook-554's resonant magnetic antenna in a low loss tangent material, Petitioner fails to recognize what Cook-554 itself recognized, namely, the complexities of designing a system including a resonant magnetic antenna. In particular, Cook-554 recognized that "practical designs require thorough analysis, complicated tradeoffs and optimizations taking into account all design constraints affecting efficiency of a transmit antenna (volume, form factor, cost, power rating, characteristics and availability of passive and active electronic components, as well as integration aspects)." Cook-554 16:47-52; Horenstein Decl. ¶ 103.

A metal bezel or other metal frame of a housing provides increased stiffness. Dabov Abstract. "Metal portions of [a] housing ... may be shorted to an internal ground plane in [a] device ... to create a larger ground plane element for that device" Zhang 4:32-34, 9:41-45; Dabov 3:63-65. Metal also provide radio-frequency shielding for electronic components within the device. Zhang 6:27-29; Dabov 7:13-15. As further recognized by Zhang, as a material for a housing or

portions of a housing, “[a]luminum is relatively light in weight and, when anodized, has an attractive insulating and Scratch-resistant surface.” Zhang 4:25-27. “Stainless steel can be manufactured so that it has an attractive shiny appearance, is structurally strong, and does not corrode easily.” *Id.* 4:45-47. Even Pohjonen includes diamond-, diamond-like-, or nanocomposite coating over the outer cover of its portable radio device to provide increased hardness, added mechanical strength, and better thermal conductivity. Pohjonen 9-10.

Petitioner further asserts that it would have been obvious to a POSA to enclose Cook-554’s resonant magnetic antenna in a low loss tangent material “(1) to protect Cook-554’s second resonator from damage during manufacturing or use, and (2) improve efficiency of Cook-554’s second resonator while protecting it.” Pet. 18-20, 37; Horenstein Decl. ¶¶ 99-101, 107-113. This rationale is nothing more than a broad, conclusory statement, which is itself insufficient to establish obviousness. *KSR Int’l. Co. v. Teleflex, Inc.*, 550 U.S. 398, 416-18 (2007) (“[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that “conclusory statements” amount to an “insufficient articulation[] of motivation to combine”; “instead, the

finding must be supported by a ‘reasoned explanation’” (citation omitted)); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) (“To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.”).

More specifically, Petitioner fails to provide any evidence or explanation that Cook-554’s resonant magnetic antenna is susceptible to damage, which would lead a POSA to seek to protect the resonant magnetic antenna. Horenstein Decl. ¶¶ 99-100. Relatedly, Petitioner fails to explain how an outer cover would serve to protect an integrated resonant magnetic antenna “during manufacturing,” much less use. *Id.* ¶ 101. Petitioner cites a passage of Dabov that describes an antenna chassis to protect the antenna from mechanical damage during manufacturing of the electronic device. Pet. 18 (citing Dabov 10:43-50). But clearly an internal antenna chassis as in Dabov is markedly different from an outer cover in protecting an internal antenna during manufacturing. Moreover, not even in Dabov does the antenna chassis *enclose* its antenna.

Even further, Petitioner fails to explain how an outer cover formed of low loss tangent material in particular would serve to protect Cook-554’s resonant magnetic antenna. Horenstein Decl. ¶ 102. As indicated above, providing a metal

frame or bezel would at a minimum provide increased stiffness (without enclosing the antenna in a low loss tangent material). *See* Dabov Abstract. In the absence of any further explanation or articulated reasoning, the motivation of protecting the resonator from damage during manufacturing or use is nothing more than a generic goal.

3. A POSA Considering Cook-554 Would Not Look to the Teachings of Pohjonen

Petitioner argues that a POSA would find it obvious to enclose Cook-554's resonant magnetic antenna in a low loss tangent material as taught by Pohjonen. Pet. 17-21, 36-38. Patent Owner submits, however, that a POSA considering Cook-554 would not in fact look to the teachings of Pohjonen to improve Cook-554's resonant magnetic antenna. Horenstein Decl. ¶ 114.

Cook-554 is directed to magnetic field antennas that are designed to output mostly a magnetic field that is stationary in the near field. Cook-554 8:54-57 (“[a] preferred technique for wireless energy transfer is based on coupled magnetic resonance using magnetic-field antennas, e.g., a loop or coil ...”); and *see* Cook-523 2:49-53 (“The antenna ... is non-radiative, in the sense that much of the output of the antenna is not electromagnetic radiating energy, but is rather a magnetic field which is more stationary.”); Wiley (Ex. 2015) 498 (defining “near-field region”).

Pohjonen on the other hand is directed to a cover for a radiating antenna designed to radiate electromagnetic energy in the far field. Pohjonen 1 (describing a portable radio device including a “radiating antenna element” to “receive and transmit radio frequency transmissions”); and *see* Pohjonen Abstract, 2, 3, 6, 7; Wiley 275 (defining “far-field region”).

A POSA would understand that the magnetic field antenna of Cook-554 on the one hand, and the radiating antenna element of Pohjonen on the other hand, are different types of antennas subject to different design constraints. Horenstein Decl. ¶¶ 114-117. As explained in the ’719 patent,

Note too that the design of resonators for non-radiative wireless energy transfer differs from antennas designed for communication or far-field energy transmission purposes. Specifically, capacitively-loaded conductive loops may be used as resonant antennas (for example in cell phones), but those operate in the far-field regime where the radiation Q's are intentionally designed to be small to make the antenna efficient at radiating energy. Such **designs are not appropriate for the efficient near-field wireless energy transfer technique** disclosed in this application.

’710 patent 21:66 – 22:8 (emphasis added).

As applied in the instant case, and as would be understood by a POSA, the design of Cook-554’s magnetic field antenna (a resonator for non-radiative

wireless energy transfer) differs from Pohjonen's radiating antenna (designed for communication or far-field energy transmission). The radiating antenna in Pohjonen is designed to have a small Q to more efficiently transmit radiating energy; and accordingly, its design is not appropriate for Cook-554's near-field wireless energy transfer.

* * *

For at least the foregoing reasons, Petitioner therefore fails to establish that claim 16 is unpatentable as being obvious over Cook-554, alone or in view of Pohjonen; and accordingly, Ground 1 fails.

D. Independent Claim 17 Is Patentable Over Cook-554 (Ground 2)

1. Cook-554 Does Not Disclose “at Least One of the Resonators Includes a Coil of a Plurality of Turns of a Conducting Material Connected to a Network of Capacitors”

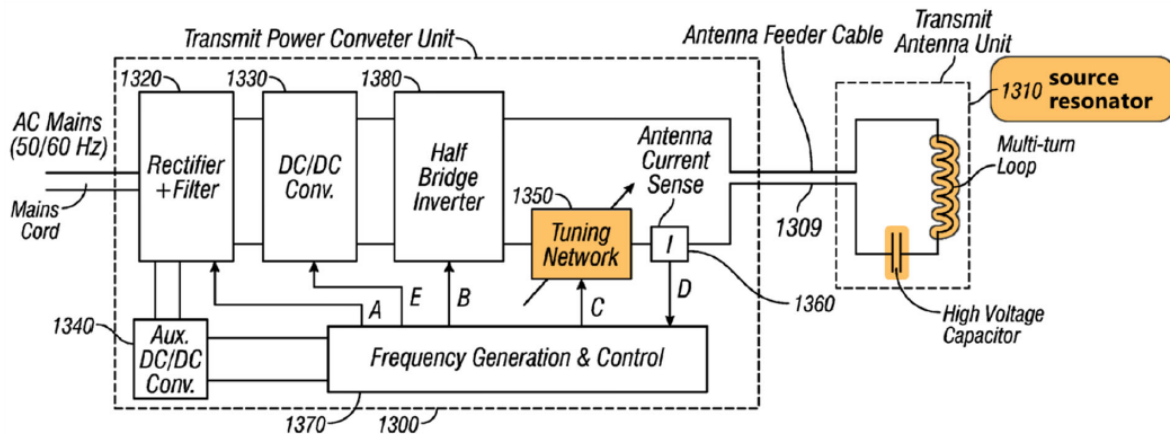
Petitioner asserts that claim 17 is unpatentable as being obvious over Cook-554. But even if Cook-554 constitutes prior art, Cook-554 does not teach or suggest all of the features of claim 17. In particular, Cook-554 does not teach or suggest “at least one of the resonators includes a coil of a plurality of turns of a

conducting material connected to a network of capacitors,” as required by claim 17.

Horenstein Decl. ¶ 119.

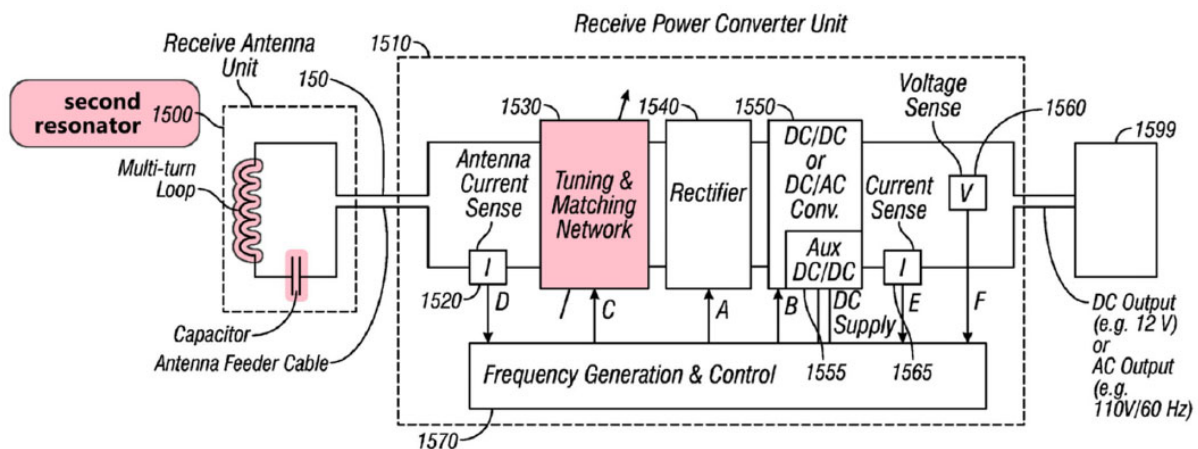
As explained above, Cook-554 discloses a wireless power device including a transmit subsystem and a receive subsystem, each of which includes an antenna unit and a power converter unit. *See* Cook-554 FIGS. 13 and 15, 2:40-41, 11:20-24, 13:46-49. Relative to claim 17, as shown below, Petitioner asserts that the

transmit antenna unit corresponds to the source resonator, and that the receive antenna unit corresponds to the second resonator, as shown below.



Pet. 44.

Similarly, Petitioner asserts that the receive antenna unit corresponds to the second resonator.



Id. 45.

Petitioner then alleges that the tuning network of the transmit power converter unit, and the tuning and matching network of the receive power converter unit, each described in Cook-554 as including a capacitor bank, correspond to the network of capacitors. *Id.* 44-45.

According to claim 17 of the '719 patent, “at least one of the resonators includes a coil of a plurality of turns of a conducting material connected to a network of capacitors.” That is, the coil and the network of capacitors are component parts of the resonator(s). But even by Petitioner’s interpretation of Cook-554, in the transmit subsystem, the tuning network is not a component part of the transmit antenna unit (alleged source resonator). Horenstein Decl. ¶ 121. Likewise, in the receive subsystem, the tuning and matching network is not a component part of the receive antenna unit (alleged second resonator). Horenstein Decl. ¶ 122.

As disclosed by Cook-554 (and shown above), the transmit antenna unit and the receive antenna unit each include a multi-turn loop (coil) and a capacitor that form a series tank circuit. Cook-554 13:7-14, 50-51, 55-57. In each antenna unit, the multi-turn loop may correspond to the coil in claim 17, but the single capacitor is not a network of capacitors. Petitioner does not in fact even allege that the capacitor in each antenna unit is a network of capacitors.

Even assuming the tuning network (in the transmit subsystem) or the tuning and matching network (in the receive subsystem) each include a capacitor bank and are a component part of a respective one of the antenna units (alleged resonators), the capacitor bank is also not a network of capacitors as in claim 17.

As explained above, properly construed, the network of capacitors in claim 17 means “a circuit topology of passive components including one or more capacitors that provides **two or more degrees of freedom**.” The capacitor bank in Cook-554 includes multiple capacitors, but a capacitor bank provides only a single degree of freedom. *See* Wiley 92 (defining “capacitor bank”).

As disclosed by Cook-554, the tuning network (in the transmit subsystem) tunes the resonant frequency of the transmit antenna unit, and the tuning and matching network (in the receive subsystem) tunes the resonant frequency of the receive antenna unit. Cook-554 11:31-33, 12:19-35, 14:31-36. Cook-554 further discloses that the resonant frequency may be tuned using electrically tunable reactors, such as tunable capacitors and/or tunable inductors. *Id.* 17:33-37. As shown in FIG. 16 in particular, Cook-554 discloses a switched capacitor bank that includes a set of capacitors with RF switches that are opened or closed to adjust the effective capacitance of the switched capacitor bank. *Id.* 17:41-61.

A POSA would readily understand that Cook-554's switched capacitor bank of the tuning network (or tuning and matching network) is not the same as or similar to a network of capacitors, which is a circuit topology of passive components including one or more capacitors that provides two or more degrees of freedom. Horenstein Decl. ¶¶ , 50-59, 119-120. The network of capacitors on the one hand requires two or more degrees of freedom, which allows the network to control or regulate both real and imaginary components of a complex impedance. *See*, e.g., '719 patent, FIGS. 30-35, 44:3-6, 42-46, 45:58-61, 51:45 – 57:33, 69:56-60; Horenstein Decl. ¶¶ , 50-59, 119-120. A switched capacitor bank does not provide the requisite two or more degrees of freedom. Instead, the capacitors in a switched capacitor bank are simply switched into or out of the circuit to achieve different capacitance values. A switched capacitor bank is essentially a single variable capacitor, which provides only a single degree of freedom for the effective capacitance of the switched capacitor bank.

* * *

For at least the foregoing reasons, Petitioner therefore fails to establish that claim 17 is unpatentable as being obvious over Cook-554; and accordingly, Ground 2 fails.

E. Independent Claim 16 Is Patentable Over Cook-523 and Pohjonen (Ground 3)

1. Petitioner Fails to Provide a Sufficient Motivation for a POSA to Enclose Cook-523's Non-Radiative Antenna in a Low Loss Tangent Material

Petitioner asserts that claim 16 is unpatentable as being obvious over Cook-523 and Pohjonen. In this regard, Petitioner asserts that Cook-523 teaches each and every claim element in claim 16, but concedes that Cook-523 fails to teach at least one of the resonators is enclosed in a low loss tangent material. Pet. 55.

Petitioner alleges, however, that a POSA would have found it obvious to enclose Cook-523's second resonator antenna in Pohjonen's low loss tangent cover, for reasons similar to those in Ground 1. For reasons similar to those given above in Section VI, Subsection C, Petitioner fails provide a sufficient motivation for a POSA to enclose Cook-523's non-radiative antenna in Pohjonen's low loss tangent cover. Horenstein Decl. ¶¶ 124-125.

In contrast to Cook-554, however, Cook-523 provides five specific ways in which its non-radiative antenna may be integrated into a portable device. *See* Cook-523 FIGS. 12A-12C, 13A and 13B; Horenstein Decl. ¶¶ 125-126. In only one of the five ways disclosed does Cook-523 incorporate its non-radiative antenna into a portable device having a non-metallic case. Cook-523 FIG. 12A, 13:18-20; Horenstein Decl. ¶ 125. But in this embodiment, the non-radiative antenna

surrounds the non-metallic case, instead of being enclosed in the non-metallic case. Horenstein Decl. ¶ 125.

In the other four ways disclosed by Cook-523, its non-radiative antenna is incorporated into a portable device having a metallic case. Cook-523 FIGS. 12B, 12C, 13A and 13B, 13:23-25, 29-31, 34-35, 40-42; Horenstein Decl. ¶¶ 126-127. In one of these ways (FIG. 13B), Cook-523 teaches that its non-radiative antenna is within the metallic case. Cook-523 13:40-44; Horenstein Decl. ¶ 127. But even in this embodiment, the non-radiative antenna is not *enclosed* in the metallic case. Instead, the metallic case includes openings at its ends, and an open slot / slotted area, through which the magnetic field is received. Cook-523 FIG. 13B, 13:43-44; Horenstein Decl. ¶ 127; and *see* Allen Depo. 34:13-21.

Notwithstanding the explicit teachings of Cook-523, Petitioner alleges that a POSA would be motivated to enclose Cook-523's non-radiative antenna in Pohjonen's low loss tangent cover to "(1) protect Cook-523's second resonator from damage during manufacturing or use, (2) improve efficiency of Cook-523's second resonator while protecting it, and (3) provide increased durability and enable surface treatments like decorative painting." Pet. 56.

Petitioner points to the embodiments of Cook-523 in which the non-radiative antenna is located outside the case of the portable device (FIGS. 12A-12C and

13A), and argues that the design leaves the antenna susceptible to damage, which a POSA would seek to avoid by adding Pohjonen's low loss tangent cover. *Id.*

Similar to above, however, this is simply a broad, conclusory statement that is insufficient to establish obviousness. *KSR Int'l. Co.*, 550 U.S. at 416-18.

Again, Petitioner fails to provide any evidence or explanation that Cook-523's non-radiative antenna is susceptible to damage, which would lead a POSA to seek to protect the non-radiative antenna. Relatedly, Petitioner fails to explain how an outer cover would serve to protect an integrated non-radiative antenna "during manufacturing," much less use. Horenstein Decl. ¶¶ 128-130. Again, Petitioner's reliance on an internal antenna chassis in Dabov is unavailing in comparison to an outer cover, and further considering Dabov's antenna chassis does not *enclose* its antenna.

Even further, Petitioner fails to explain how an outer cover formed of low loss tangent material in particular would serve to protect Cook-523's non-radiative antenna. In the absence of any further explanation or articulated reasoning, the motivation of protecting the resonator from damage during manufacturing or use is nothing more than a generic goal.

Moreover, to the extent a POSA would consider Cook-523's non-radiating antenna to be susceptible to damage in embodiments in which the non-radiating

antenna is external to the case, Cook-523 itself discloses an embodiment (FIG. 13B) in which the non-radiating antenna is within the case. A POSA would clearly understand that the case in this embodiment would protect the non-radiating antenna from damage. In this embodiment, however, the case is metallic. Cook 13:40-42. The metallic case also does not enclose the non-radiating antenna, instead including openings through which the magnetic field is received. *Id.* FIG. 13B, 13:43-44. These openings also minimize any eddy current effects of the magnetic case. *Id.* 13:32-34 (“FIGS. 13A and 13B show multi-turn loop antennas integrated into a case in a way that minimizes eddy current effects.”).

2. A POSA Considering Cook-523 Would Not Look to the Teachings of Pohjonen

Similar to Cook-554, Patent Owner further submits that a POSA considering Cook-523 would not in fact look to the teachings of Pohjonen to improve Cook-523’s non-radiative antenna. *See* Horenstein Decl. ¶ 114-117. In this regard, Cook-523 is directed to wireless power transmission using non-radiative antennas in which “much of the output of the antenna is not electromagnetic radiating energy, but is rather a magnetic field which is more stationary.” Cook-523 2:49-

53. Pohjonen is directed to a cover for a radiating antenna. Pohjonen Abstract, 1, 2, 3, 6, 7.

As would be understood by a POSA, the design of Cook-523's magnetic field antenna (a resonator for non-radiative wireless energy transfer) differs from Pohjonen's radiating antenna (designed for communication or far-field energy transmission). See '710 patent 21:66 – 22:8. The radiating antenna in Pohjonen is designed to have a small Q to more efficiently transmit radiating energy; and accordingly, its design is not appropriate for Cook-523's near-field wireless energy transfer. *See id.*

* * *

For at least the foregoing reasons, Petitioner therefore fails to establish that claim 16 is unpatentable as being obvious over Cook-523 and Pohjonen; and accordingly, Ground 3 fails.

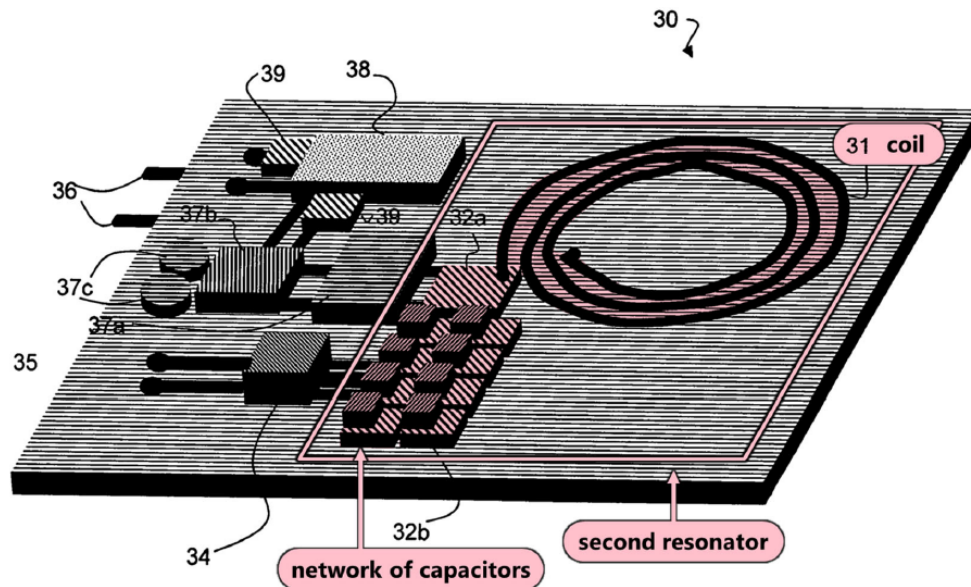
F. Independent Claim 17 Is Patentable Over Lee and Cook-523 (Ground 4)

1. Lee and Cook-523 Do Not Disclose “at Least One of the Resonators Includes a Coil of a Plurality of Turns of a Conducting Material Connected to a Network of Capacitors”

Petitioner asserts that claim 17 is unpatentable as being obvious over Lee and Cook-523. In this regard, Petitioner asserts that Lee teaches each and every claim element in claim 17, except for the Q-value limitation for which Petitioner

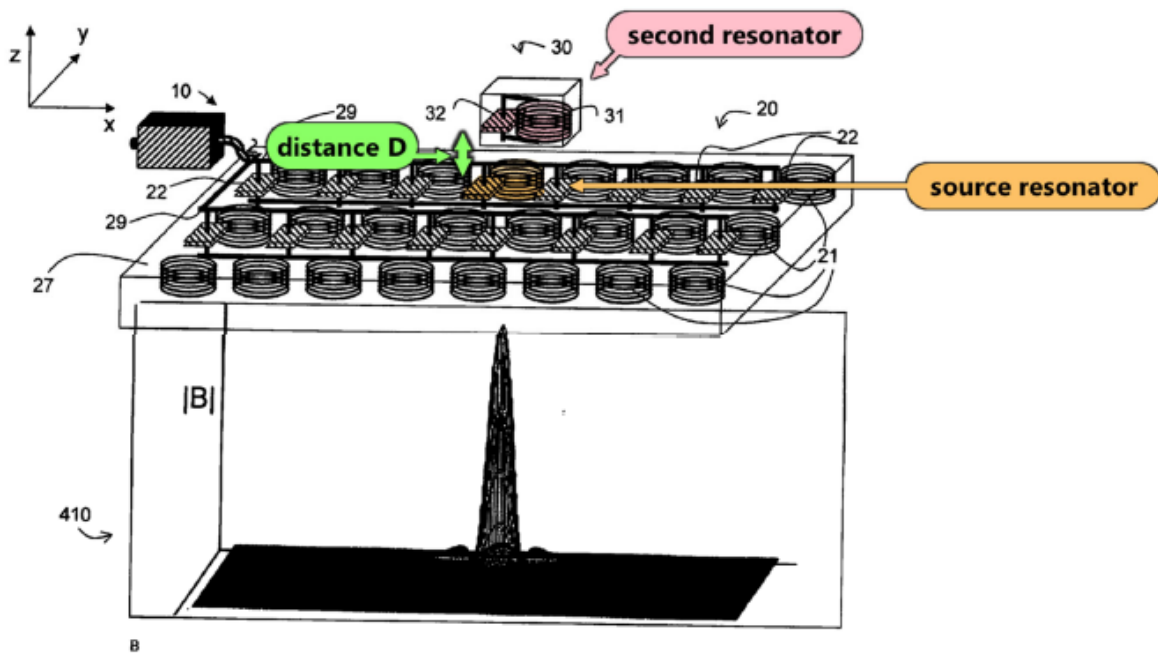
relies on Cook-523. Pet. 66. But as explained below, Lee and Cook-523 do not teach or suggest all of the features of claim 17. In particular, Lee and Cook-523 do not teach or suggest “at least one of the resonators includes a coil of a plurality of turns of a conducting material connected to a network of capacitors,” as required by claim 17.

As explained above, Lee discloses a secondary unit that includes a receiving coil and a main capacitor that form an LC network that has a resonant frequency. Lee FIG. 12, ¶¶ 47, 75, 78. The secondary unit also includes a switched capacitor bank. *Id.* ¶ 78. Relative to claim 17, as shown below, Petitioner asserts that the coil, main capacitor and switched capacitor bank correspond to the second resonator, as shown below.



Pet. 78.

Contrary to the position taken by Petitioner, the resonator in Lee does not in fact include the switched capacitor bank. Horenstein Decl. ¶ 133. Again, as disclosed by Lee, the receiving coil and a main capacitor that form an LC network that has a resonant frequency. Lee ¶¶ 47, 75, 78. Lee repeatedly refers to the LC network as what provides the resonant frequency for the secondary unit. *Id.* ¶¶ 56-60; and see *id.* ¶ 83 (referring to “[t]he series LC resonator”). Petitioner in fact elsewhere identifies the coil and main capacitor as the resonator, including in reference to FIG. 2 (as below).



Pet. 75, and see *id.* 64-65 (referring to Lee disclosing a second resonator configured as a “parallel LC” circuit”), 71, 75-76.

Similar to Cook-554’s capacitor bank, Lee’s switched capacitor bank is also not a network of capacitors, as in claim 17. Horenstein Decl. ¶¶ , 50-59, 119-120. Again, properly construed, the network of capacitors in claim 17 means “a circuit topology of passive components including one or more capacitors that provides **two or more degrees of freedom.**” The switched capacitor bank in Lee includes multiple capacitors, but the switched capacitor bank provides only a single degree of freedom.

As disclosed by Lee, the switched capacitor bank tunes the resonant frequency of the LC network (formed by the coil and main capacitor) to match a

primary driving frequency. *Id.* ¶¶ 75, 78. As shown in FIG. 13 in particular, Lee's switched capacitor bank includes capacitors in series with respective switches that are turned on/off to enable/disable respective ones of the capacitors to control a capacitance of the switched capacitor bank. *Id.* ¶ 78.

A POSA would readily understand that Lee's switched capacitor bank is not the same as or similar to a network of capacitors that which is a circuit topology of passive components including one or more capacitors that provides two or more degrees of freedom. The network of capacitors on the one hand requires two or more degrees of freedom, which allows the network to control or regulate both real and imaginary components of a complex impedance. *See, e.g.,* '719 patent, FIGS. 30-35, 44:3-6, 42-46, 45:58-61, 51:45 – 57:33, 69:56-60. A switched capacitor bank does not provide the requisite two or more degrees of freedom. Instead, the capacitors in a switched capacitor bank are simply switched into or out of the circuit to achieve different capacitance values. A switched capacitor bank is essentially a single variable capacitor, which provides only a single degree of freedom for the effective capacitance of the switched capacitor bank.

As also shown in FIG. 13, the secondary unit in Lee does in fact include an impedance matching network. *See also* Lee ¶ 75. In Lee, however, the impedance matching network is separate and distinct from the switched capacitor bank. Lee

also does not teach or suggest that the impedance matching network is formed by a network of capacitors, as in claim 17.

* * *

For at least the foregoing reasons, Petitioner therefore fails to establish that claim 17 is unpatentable as being obvious over Lee and Cook-523; and accordingly, Ground 4 fails.

VII. CONCLUSION

For the foregoing reasons, Petitioner fails to meet its burden of establishing that the challenged claims are unpatentable as being obvious over the prior art.

Dated: May 24, 2024

Respectfully submitted,

/Lance A. Lawson/

Lance A. Lawson, P.E., (Lead Counsel)

Reg. No. 44,862

Andrew T. Spence (Back-up Counsel)

Reg. No. 45,699

BURR & FORMAN LLP

One South at the Plaza, Suite 2610

101 S. Tryon Street

Charlotte, NC 28280

Tel: (704) 347-1170

Email: llawson@burr.com

aspence@burr.com

ip-docket@burr.com

Ryan M. Corbett (Back-up Counsel)

Reg. No. 63,724

BURR & FORMAN LLP

One Tampa City Center, Suite 3200

201 N. Franklin Street

Tampa, FL 33602

Tel: (813) 221-2626

Email: rcorbett@burr.com

ip-docket@burr.com

Attorneys for Patent Owner

CERTIFICATE OF COMPLIANCE UNDER 37 C.F.R. § 42.24(d)

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing paper complies with the type-volume limits of C.F.R. § 42.24(b)(2). The foregoing paper contains 11,939 words, as calculated by Microsoft Word, excluding the parts of the paper exempted by 37 C.F.R. § 42.24(a)(1).

Dated: May 24, 2024

/Lance A. Lawson/

Lance A. Lawson, P.E. (Reg. No. 44,862)

Attorney for Patent Owner

CERTIFICATE OF SERVICE

It is certified that a copy of the *Patent Owner's Response* has been served on
Petitioner as provided in 37 C.F.R. § 42.6(e) via electronic mail transmission
addressed to the persons at the address of record as follows:

David A. Zucker david.zucker@lw.com
Charles H. Sanders charles.sanders@lw.com
Blake R. Davis blake.davis@lw.com
Jeffrey G. Homrig jeff.homrig@lw.com
Steven W. Peters steven.peters@lw.com
Razi Safi razi.safi@lw.com

Dated: May 24, 2024

/Lance A. Lawson/
Lance A. Lawson, P.E. Reg. No. 44,862
Burr & Forman LLP
101 S. Tryon St., Ste 2610
Charlotte, NC 28280
(704) 347-6475
llawson@burr.com