

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

SCRAMOGE TECHNOLOGY LTD.,
Patent Owner.

IPR2022-00573
Patent 7,825,537 B2

Before JAMESON LEE, KRISTINA M. KALAN, and MICHELLE N.
WORMMEESTER, *Administrative Patent Judges*.

WORMMEESTER, *Administrative Patent Judge*.

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

I. INTRODUCTION

Apple Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–22 and 28 of U.S. Patent No. 7,825,537 B2 (Ex. 1001, “the ’537 patent”). Scramoge Technology Ltd. (“Patent Owner”) filed a Preliminary Response (Paper 9). With our authorization provided in an e-mail dated June 22, 2022, Petitioner filed a preliminary Reply (Paper 10) to Patent Owner’s Preliminary Response, and Patent Owner filed a preliminary Sur-reply (Paper 11) to Petitioner’s preliminary Reply. Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review of all the challenged claims based on all the grounds presented in the Petition. Paper 12 (“Inst. Dec.”). Thereafter, Patent Owner filed a Response (Paper 17, “PO Resp.”) to the Petition, Petitioner filed a Reply (Paper 19, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 20, “PO Sur-reply”). On June 15, 2023, we conducted an oral hearing. A copy of the transcript (Paper 31, “Tr.”) is in the record.

We have jurisdiction under 35 U.S.C. § 6(b). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–22 and 28 of the ’537 patent are unpatentable.

II. BACKGROUND

A. Related Proceedings

The parties identify several federal district court cases, including *Scramoge Technology Ltd. v. Apple Inc.*, No. 6:21-cv-01071-ADA (W.D. Tex.). Pet. 80–81; Paper 29, 2 (Patent Owner’s Second Amended Mandatory Notices).

B. The '537 Patent

The '537 patent describes “inductively supplying electrical power.”
Ex. 1001, 1:6–8. To illustrate, Figure 1 of the '537 patent is reproduced below.

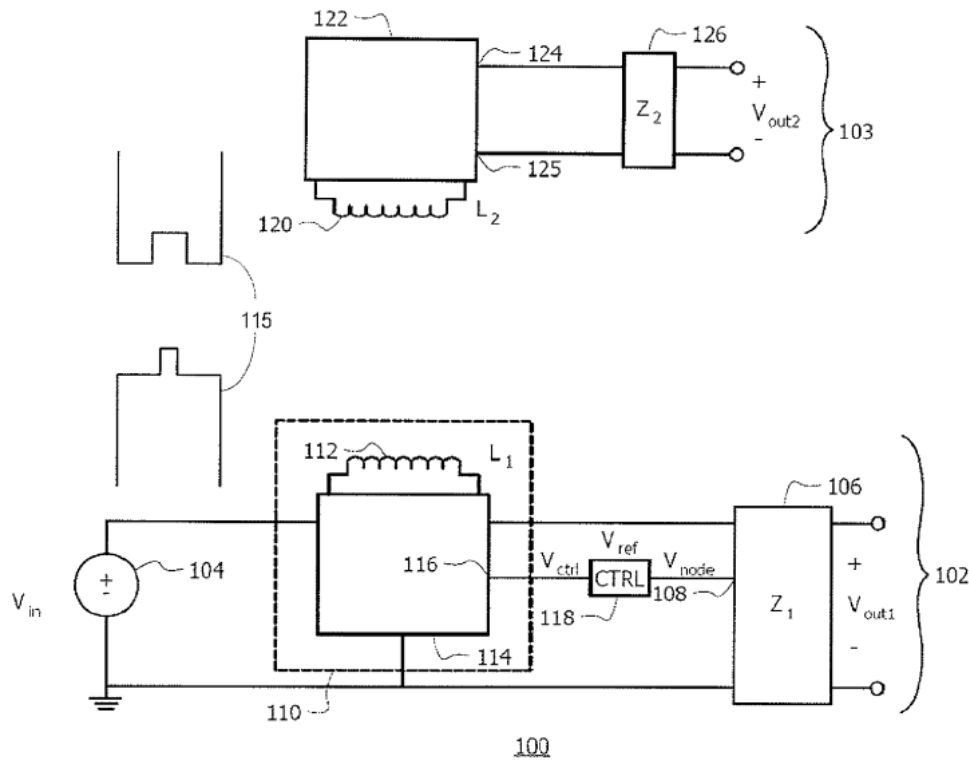


FIG. 1

Figure 1 shows inductive DC-DC converter circuit 100, which includes base unit 102 and target unit 103. *Id.* at 2:53–54, 3:22–27.

Base unit 102 includes DC voltage supply 104, which provides input DC voltage V_{in} . Ex. 1001, 3:31–33. Base unit 102 also includes load 106, which includes internal node 108. *Id.* at 3:33–34. DC voltage supply 104 and load 106 are electrically coupled through converter sub-circuit 110. *Id.* at 3:39–40. Converter sub-circuit 110 includes first inductive element 112 and switching network 114, which directs current to or from inductive element 112 at an operating frequency. *Id.* at 3:41–44. Switching

network 114 includes input node 116, which receives voltage signal V_{ctrl} . *Id.* at 3:45–48. Internal node 108 of load 106 and input node 116 of switching network 114 are electrically coupled through controller element (CTRL) 118, which monitors voltage V_{node} at node 108, comparing it to voltage V_{ref} , and adjusts voltage V_{ctrl} at node 116 based on the comparison. *Id.* at 3:48–53.

Target unit 103 includes second inductive element 120, rectifying element 122, and load 126. Ex. 1001, 3:61–4:6. Second inductive element 120 is electrically coupled to rectifying element 122. *Id.* at 3:61–66. Target unit 103 may be electrically coupled to an electronic device (e.g., battery, display unit, keypad) to provide power. *Id.* at 3:27–31.

In operation, first inductive element 112 serves as a primary coil for transferring power to target unit 103 via second inductive element 120, which serves as a secondary coil. Ex. 1001, 3:59–64. Second inductive element 120 generates a time-varying signal in response to coupling with first inductive element 112. *Id.* at 4:1–3. Rectifying element 122 generates a DC voltage signal between its node 124 and its node 125 for the time-varying signal generated by second inductive element 120. *Id.* at 3:65–4:3. The DC voltage can then be applied across second load 126 to produce output DC voltage V_{out2} . *Id.* at 4:3–6.

The '537 patent explains that to enhance power transfer efficiency, switching network 114 is used to adjust the operating frequency of first inductive element 112 until the oscillation of second inductive element 120 is induced at the self-resonant frequency. Ex. 1001, 4:20–42. The operating frequency of first inductive element 112 for inducing the self-resonant oscillation in second inductive element 120 can vary depending on the

separation between the two inductive elements as well as the configuration of rectifying element 122 and second load 126. *Id.* at 4:42–50.

C. Illustrative Claim

As noted above, Petitioner challenges claims 1–22 and 28 of the '537 patent, where claims 1, 12, and 28 are independent. Claim 1, reproduced below, is illustrative of the claims under challenge.

1. A method for inductively transferring power from a base unit providing input power, to a target unit providing output power, where the base unit and the target unit are electrically isolated, comprising:

positioning a second inductive element of said target unit within a predetermined distance of a first inductive element of said base unit;

applying a time varying electric current to said first inductive element to produce a time varying magnetic field, said time varying magnetic field induces an electric current in said second inductive element;

monitoring at least one parameter indicative of an efficiency of power transfer from said base unit to said target unit;

automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–22 and 28 of the '537 patent on the following six grounds. Pet. 6–76. We instituted *inter partes* review on all grounds presented in the Petition. Inst. Dec. 36.

Claims Challenged	35 U.S.C. § ¹	References
1–5, 8–16, 19–22, 28	103	Baarman, ² Partovi-002 ³
6, 7, 17, 18	103	Baarman, Partovi-002, Partovi-413 ⁴
1, 2, 8–11, 28	102	Flowerdew ⁵
3–5, 12–16, 19–22	103	Flowerdew, Jang ⁶
6, 7	103	Flowerdew, Partovi-413
17, 18	103	Flowerdew, Jang, Partovi-413

We refer to the first two grounds as the Baarman-based grounds and to the remaining four grounds as the Flowerdew-based grounds. In support of its asserted grounds, Petitioner relies on a Declaration of Dr. Tamas Szepesi, Ph.D. (Ex. 1003).

III. DISCUSSION

A. Claim Construction

In an *inter partes* review proceeding, we construe a claim of a patent “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” *See* 37 C.F.R.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the application from which the ’537 patent issued was filed before this date, the pre-AIA versions of §§ 102 and 103 apply.

² Baarman et al., U.S. Publ’n No. 2009/0174263 A1, published July 9, 2009 (Ex. 1004).

³ Partovi, U.S. Publ’n No. 2007/0279002 A1, published Dec. 6, 2007 (Ex. 1005).

⁴ Partovi et al., U.S. Publ’n No. 2009/0096413 A1, published Apr. 16, 2009 (Ex. 1006).

⁵ Flowerdew et al., U.S. Patent No. 7,211,986 B1, issued May 1, 2007 (Ex. 1007).

⁶ Jang et al., U.S. Publ’n No. 2004/0218406 A1, published Nov. 4, 2004 (Ex. 1010).

§ 42.100(b) (2021). Applying that standard, we construe a claim in accordance with its ordinary and customary meaning as would have been understood by one of ordinary skill in the art, taking into account the specification and the prosecution history pertaining to the patent. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc).

To the extent the parties dispute the meaning of a claim term, we address the dispute below in our analysis of whether the prior art meets the claim limitations.

B. Anticipation by Flowerdew

We turn now to Petitioner’s asserted grounds, starting with the Flowerdew-based grounds. Petitioner asserts that Flowerdew anticipates claims 1, 2, 8–11, and 28 of the ’537 patent. Pet. 47–61. Patent Owner does not respond. *See generally* PO Resp. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that Flowerdew anticipates claims 1, 2, 8–11, and 28 of the ’537 patent.

Before addressing Petitioner’s analysis, we provide an overview of the asserted prior art, Flowerdew.

1. Overview of Flowerdew

Flowerdew describes inductive battery chargers. Ex. 1007, 1:6–7. To illustrate, Figure 2 of Flowerdew is reproduced below.

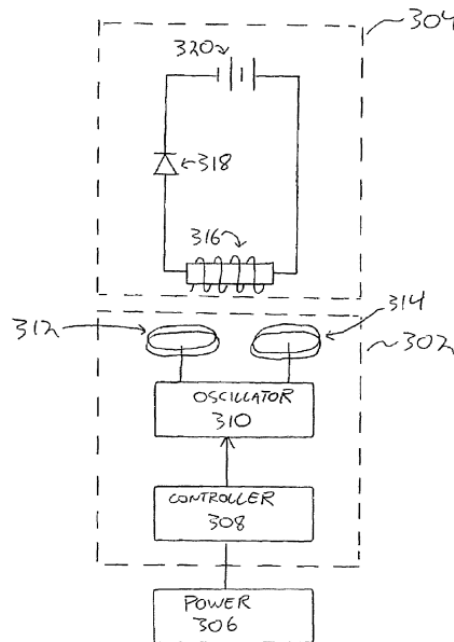


FIGURE 2

Figure 2 shows a charging system that includes primary unit (charger) 302 and secondary unit 304. *Id.* at 4:60–64. Primary unit 302 includes power source 306, controller 308, oscillator 310, and charging coils 312, 314. *Id.* at 5:16–17, 5:38–41. Secondary unit 304 includes receive coil 316, rectifier 318, and rechargeable battery 320, which may be charged by primary unit 302. *Id.* at 4:66–67, 5:61–6:2. Secondary unit 304 may be a small electronic device, such as a wireless headset, a mobile telephone, a personal digital assistant, or a camera. *Id.* at 5:1–4.

In operation, secondary unit 304 is placed near primary unit 302 so that the magnetic flux from the magnetic field created by charging coils 312, 314 passes through receive coil 316. *Ex.* 1007, 5:49–52; *see also id.* at 8:26–37. The magnetic flux in turn induces a voltage across receive coil 316, which results in an induced current that charges battery 320. *Id.*

at 5:56–58; *see also id.* at 8:38–50. A meter may be connected across receive coil 316 to display the degree of coupling. *Id.* at 5:58–60.

Flowerdew explains that “[t]he EMF induced in a coil depends strongly on the angle that it makes to the magnetic field.” Ex. 1007, 6:18–20. According to Flowerdew, “the maximum possible induction (coupling) occurs when the field passes through the coil,” which “occurs when the direction of the field is orthogonal to the plane of the coil.” *Id.* at 6:20–24. To illustrate, Figure 10 of Flowerdew is reproduced below.

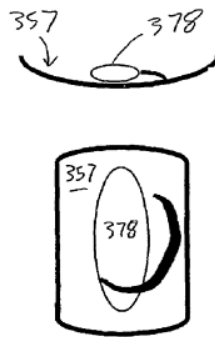


FIGURE 10

Figure 10 shows the placement of secondary unit 304 on charging surface 357 of primary unit 302.⁷ *Id.* at 11:25–27. When secondary unit 304 is placed on dished charging surface 357, secondary unit 304 will be aligned along one axis such that the coupling between the receive coil in secondary unit 304 and charging coils in charger 302 is maximized. *Id.* at 11:27–32.

⁷ Flowerdew’s Figure 10 shows element 378 as being placed on charging surface 357 of primary unit 302, but Flowerdew’s specification describes secondary unit 304 as being placed on charging surface 357 of primary unit 302. Ex. 1007, 11:25–32, Fig. 10.

2. Analysis of Claims 1, 2, 8–11, and 28

We discuss claims 1, 2, 8–11, and 28 of the '537 patent.

a. Independent Claim 1

Claim 1 is directed to a “method for inductively transferring power” comprising a “positioning” step, an “applying” step, a “monitoring” step, and an “automatically adjusting” step. Petitioner designates these steps as elements 1.1 through 1.4. We address the recited preamble and steps in turn.

i. Preamble

The preamble of claim 1 recites “[a] method for inductively transferring power from a base unit providing input power, to a target unit providing output power, where the base unit and the target unit are electrically isolated.” For the preamble, Petitioner identifies Flowerdew’s primary unit 302 as a “base unit” and Flowerdew’s secondary unit 304 as a “target unit.” Pet. 49. As support, Petitioner directs us to Flowerdew’s teaching that its “invention relates to inductive battery chargers,” where “[s]econdary unit 304 includes a rechargeable battery 320 to be charged by charger 302.” Ex. 1007, 1:67, 4:66–67, Fig. 2 (cited by Pet. 49).

Although we do not determine whether the preamble of claim 1 is limiting, we are persuaded that Flowerdew teaches the subject matter of the preamble. Patent Owner does not dispute Petitioner’s analysis for the preamble. *See generally* PO Resp.

ii. Element 1.1: “positioning” step

Claim 1 recites “positioning a second inductive element of said target unit within a predetermined distance of a first inductive element of said base unit.” For this step, which Petitioner designates as element 1.1, Petitioner identifies Flowerdew’s charging coils 312, 314 as a “first inductive element” and Flowerdew’s receive coil 316 as a “second inductive element.” Pet. 49, 49–50 n.2. As support, Petitioner directs us to Flowerdew’s teaching that “the charger takes the form of a shallow concave (herein also referred to as ‘dished’ or a ‘dish’) [. . .], which whilst substantially flat and thin, develops a magnetic field which is substantially horizontal rather than perpendicular to its surface, which is typically the case if a coil were wound in the same plane as a plate.” *Id.* at 49–50 (quoting Ex. 1007, 4:49–59). Petitioner further directs us to Flowerdew’s teaching that placing secondary unit 304 on a dished charging surface of primary unit 302 will align secondary unit 304 such that the coupling between the receive coil in secondary unit 304 and the charging coils in charger 302 is maximized. *Id.* at 50 (citing Ex. 1007, 11:25–32). Petitioner notes that Flowerdew teaches that the charging surface of primary unit 302 may include markers indicating a preferred alignment or orientation for items placed on that part of the surface to receive power from charger 302. *Id.* at 53 (citing Ex. 1007, 7:57–61).

Based on Petitioner’s argument and evidence, we are persuaded that Flowerdew teaches the recited positioning step of claim 1. Patent Owner does not dispute Petitioner’s analysis for this step. *See generally* PO Resp.

iii. Element 1.2: “applying” step

Claim 1 further recites “applying a time varying electric current to said first inductive element to produce a time varying magnetic field, said time varying magnetic field induces an electric current in said second inductive element.” For this step, which Petitioner designates as element 1.2, Petitioner directs us to Flowerdew’s teaching that “[a]n alternating current signal of prescribed frequency generated in oscillator 310 is supplied to charging coil 312 and charging coil 314,” and, “[a]s a result, an alternating magnetic field is generated by charging coil 312 and charging coil 314 above charging surface 357 of charger 302.” Ex. 1007, 8:32–37 (cited by Pet. 54). Flowerdew further teaches that “[t]he alternating magnetic field generates an induced electromotive force in the secondary unit coil 316 arranged in the secondary unit 304.” *Id.* at 8:38–40 (cited by Pet. 54). As discussed above, Flowerdew’s charging coils 312, 314 correspond to the recited first inductive element and Flowerdew’s receive coil 316 corresponds to the recited second inductive element. Pet. 49, 54.

Based on Petitioner’s argument and evidence, we are persuaded that Flowerdew teaches the recited applying step of claim 1. Patent Owner does not dispute Petitioner’s analysis for this step. *See generally* PO Resp.

iv. Elements 1.3, 1.4: “monitoring” step, “automatically adjusting” step

Claim 1 further recites “monitoring at least one parameter indicative of an efficiency of power transfer from said base unit to said target unit.” Petitioner designates this step as element 1.3. Pet. 54. Additionally, claim 1 recites “automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an

efficiency of power transfer from said base unit to said target unit.”

Petitioner designates this step as element 1.4. *Id.* We discuss these two steps together.

Petitioner directs us to where Flowerdew states,

Two element inductive charging systems typically create a resonance in both the transmitting and the receiving coils for a given frequency. The resonance maximizes the current, and hence the flux density from a given drive voltage, and maximizes the receive voltage for a given intercepted flux. . . . When the number and type of secondary units being charged is variable, the power extracted from the field and the amount of permeable material and its distribution are ill defined and therefore the inductance and loss resistance seen in the resonant system are also ill defined. Changes in the inductance or loss resistance resulting from placement of one or[] more secondary units must be compensated for.

Ex. 1007, 12:22–38 (cited by Pet. 54). To compensate for these changes, Flowerdew uses a resonance tuning circuit that varies the frequency of charging coils 312, 314 when secondary unit 304 is placed on the charging surface of primary unit 302, thereby keeping the system resonant. *Id.* at 12:58–62 (cited by Pet. 54–55). A sense coil near the driven coil provides a feedback signal to a microcontroller that produces the signal to the driver, and software allows for the output frequency to be adjusted to maximize the signal from the sense coil. *Id.* at 13:24–30 (cited by Pet. 55). Flowerdew explains that “[a]pplication of a variable frequency is predicated on the basis that the high efficiency achieved by driving a resonant system is needed for effective operation.” *Id.* at 13:30–35 (cited by Pet. 55).

Petitioner contends that “Flowerdew thus discloses a microcontroller of the charger 302 (*base unit*) that monitors a ‘feedback signal’ from the sense coil, and that automatically adjusts an output frequency (*at least one*

characteristic of said time varying electric current) responsive to the ‘feedback signal’ to achieve and maintain operation at the ‘resonant’ frequency of the coupled inductor system,” where “the ‘feedback signal’ from the sense coil constitutes ‘*at least one parameter indicative of an efficiency of power transfer from said base unit to said target unit.*’”

Pet. 55. According to Petitioner, “the drive frequency is adjusted in response to the ‘feedback signal’ to ‘*maximize an efficiency of power transfer*’ from the charger 302 (*base unit*) to the secondary unit 304 (*target unit*).” *Id.* at 55–56. Petitioner asserts that “operating at the resonant frequency maximizes power transfer efficiency.” *Id.* at 56 (citing Ex. 1007, 12:24–26, 13:31–32).

Based on Petitioner’s argument and evidence, we are persuaded that Flowerdew teaches the recited monitoring and adjusting steps of claim 1. Patent Owner does not dispute Petitioner’s analysis for these steps. *See generally* PO Resp.

b. Dependent Claim 2

Claim 2 depends from claim 1 and recites “wherein said characteristic comprises at least one of a frequency of said time varying current and a duty cycle of said time varying current.” For this limitation, Petitioner cross-references its discussion of elements 1.3 and 1.4, and asserts that “Flowerdew discloses automatic adjustments to a ‘frequency’ of the time varying current (*said characteristic*) applied to the primary inductive element (e.g., coils 312, 314).” Pet. 56. As discussed above with respect to elements 1.3 and 1.4, Flowerdew uses a resonance tuning circuit to vary the frequency of charging coils 312, 314 when secondary unit 304 is placed on

the charging surface of primary unit 302, thereby keeping the system resonant. Ex. 1007, 12:58–62 (cited by Pet. 54–55). A sense coil near the driven coil provides a feedback signal to a microcontroller that produces the signal to the driver, and software allows for the output frequency to be adjusted to maximize the signal from the sense coil. *Id.* at 13:24–30 (cited by Pet. 55). Flowerdew explains that “[a]pplication of a variable frequency is predicated on the basis that the high efficiency achieved by driving a resonant system is needed for effective operation.” *Id.* at 13:30–35 (cited by Pet. 55).

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

c. Dependent Claim 8

Claim 8 depends from claim 1 and recites “wherein said automatically adjusting step further comprises automatically adjusting said characteristic to induce an oscillation in said second inductive element at a frequency to be approximately equal to a self-resonant frequency of said second inductive element.” For this limitation, Petitioner again cross-references its discussion of elements 1.3 and 1.4, and asserts that “Flowerdew’s charger 302 (***base unit***) automatically selectively adjusts the drive frequency (***said characteristic***) applied to a primary coil 312/314 (***first inductive element***) to induce oscillating currents in the secondary coil 316 (***second inductive element***) ‘to keep the system resonant’ and maximize power transfer efficiency.” Pet. 56–57 (citing Ex. 1007, 12:22–63, 13:22–51). As discussed above with respect to elements 1.3 and 1.4, Flowerdew’s

resonance tuning circuit varies the frequency of charging coils 312, 314 when secondary unit 304 is placed on the charging surface of primary unit 302, thereby keeping the system resonant. Ex. 1007, 12:58–62 (cited by Pet. 54–55). A sense coil near the driven coil provides a feedback signal to a microcontroller that produces the signal to the driver, and software allows for the output frequency to be adjusted to maximize the signal from the sense coil. *Id.* at 13:24–30 (cited by Pet. 55). According to Flowerdew, “[a]pplication of a variable frequency is predicated on the basis that the high efficiency achieved by driving a resonant system is needed for effective operation.” *Id.* at 13:30–35 (cited by Pet. 55).

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

d. Dependent Claim 9

Claim 9 depends from claim 1 and recites,

responsive to a re-positioning of said second inductive element from a first position to a second position, automatically selectively re-adjusting said characteristic to maximize said efficiency, wherein said first position differs from said second position with regard to at least one characteristic selected from the group consisting of distance and orientation relative to said first inductive element.

For this limitation, Petitioner asserts that “Flowerdew expressly recognizes that ‘[c]hanges in the inductance or loss resistance resulting from placement of one or[] more secondary units must be compensated for,’” and that “[t]o compensate for such changes, Flowerdew’s primary charging unit monitors a ‘feedback signal’ from a ‘sense coil near a driven coil,’ and automatically

adjusts the ‘output frequency . . . to maximize the signal from the sense coil’ thereby ‘keep[ing] the system resonant.’” Pet. 57 (citing Ex. 1007, 12:36–38, 12:61–63, 13:23–33, 13:41–51). Petitioner contends,

Since the inductance or l[o]ss resistance of a resonant system, and its resonant frequency, change based on the degree of coupling between the primary and secondary coils (which itself is a function of the position—including distance and/or orientation—of the secondary coil with respect to a primary coil), Flowerdew’s system would compensate responsive to a re-positioning of the secondary 316 from a first position to a second position by automatically selectively re-adjusting the drive frequency (*said characteristic*) to maintain resonance and maximize power transfer efficiency.

Id. at 57–58 (citing Ex. 1007, 1:62–64, 5:52–56, 6:20–23). Petitioner additionally cross-references its discussion of elements 1.3 and 1.4. *Id.* at 58. As discussed above with respect to elements 1.3 and 1.4, Flowerdew teaches that “[a]pplication of a variable frequency is predicated on the basis that the high efficiency achieved by driving a resonant system is needed for effective operation.” Ex. 1007, 13:30–35 (cited by Pet. 55).

Based on Petitioner’s argument and evidence, we are persuaded that Flowerdew teaches the recited limitation of claim 9. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

e. Dependent Claim 10

Claim 10 depends from claim 1 and recites “responsive to a substitution of a target unit with a different target unit, automatically selectively re-adjusting said characteristic to maximize said efficiency.” For this limitation, Petitioner asserts that “Flowerdew discloses that the charger 302 (*base unit*) is configured to drive a primary coil 312/314 (*first*

inductive element) at a prescribed frequency, and to automatically adjust the frequency to ‘maintain resonance when the inductance is altered by the addition of a secondary unit 304.’” Pet. 58 (citing Ex. 1007, 2:51–53, 12:22–63, 13:22–51). Petitioner further directs us to Flowerdew’s teaching that its “invention is capable of charging a variety and/or plurality of secondary units,” and asserts that Flowerdew’s “system is configured to respond to detected changes in the ‘number and type of secondary units being charged.’” *Id.* (citing Ex. 1007, 12:30–42, 13:41–51). According to Petitioner, “changes in the type or number of secondary units being charged can ‘create a change in inductance and an associated increase in losses,’ which is detected (e.g., via the ‘feedback signal’ from a sense coil or explicit communication between the charger/primary unit and the secondary unit(s)) [and] causes a change in the drive coil frequency to ‘maintain resonance’ at the new resonant frequency of the system.” *Id.* at 58–59 (citing Ex. 1007, 13:22–51, 14:30–52). Petitioner contends, “[t]hus, Flowerdew discloses that the charging unit 302 is configured, responsive to a substitution of a target unit with a different target unit (e.g., substitution of a secondary 304 of a first ‘type’ with a secondary 304 of a second ‘type’ having different inductance/loss characteristics), to automatically selectively re-adjust the drive frequency (*said characteristic*) to maintain resonance and maximize said efficiency of power transfer from the charger 304 to the substituted secondary unit 306.” *Id.* at 59. As noted above regarding elements 1.3 and 1.4, Flowerdew teaches that “[a]pplication of a variable frequency is predicated on the basis that the high efficiency achieved by driving a resonant system is needed for effective operation.” Ex. 1007, 13:30–35 (cited by Pet. 55).

Based on Petitioner's argument and evidence, we are persuaded that Flowerdew teaches the recited limitation of claim 10. Patent Owner does not dispute Petitioner's analysis for this limitation. *See generally* PO Resp.

f. Dependent Claim 11

Claim 11 depends from claim 1 and recites "rectifying an output current induced in said second inductive element to produce a DC output." For this limitation, Petitioner directs us to Flowerdew's teaching that, "[w]ithin secondary unit 304, the secondary unit coil 316 connects to a rectifier which serves as an A.C. to D.C. converter." Ex. 1007, 5:61–63 (cited by Pet. 59). As discussed above, Flowerdew's coil 316 corresponds to the recited second inductive element. Pet. 49.

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

g. Independent Claim 28

Claim 28 is directed to a "method for inductively transferring power" comprising a "positioning" step, an "applying" step, a "monitoring" step, and an "automatically adjusting" step. The preamble and positioning step recited in claim 28 are similar to the preamble and positioning step recited in claim 1. In this regard, Petitioner relies on its discussion of claim 1 for its analysis of claim 28. Pet. 60. Similarly, our analysis of claim 1 applies to claim 28.

The applying, monitoring, and automatically adjusting steps recited in claim 28 are similar to the applying, monitoring, and automatically adjusting

steps recited in claim 1, but include additional requirements. We address these steps, including the additional requirements, in turn.

i. “applying” step

Claim 28 recites “applying a time varying electric current to said first inductive element to produce a time varying magnetic field having an operating frequency, said time varying magnetic field inducing an electric current in said second inductive element.” Unlike claim 1, claim 28 requires the time varying magnetic field to *have an operating frequency*.

With respect to the applying step of claim 28, Petitioner cross-references its analysis for claim element 1.2. Pet. 60. As discussed above with respect to claim element 1.2, Petitioner directs us to Flowerdew’s teaching that “[a]n alternating current signal of prescribed frequency generated in oscillator 310 is supplied to charging coil 312 and charging coil 314,” and, “[a]s a result, an alternating magnetic field is generated by charging coil 312 and charging coil 314 above charging surface 357 of charger 302.” Ex. 1007, 8:32–37 (cited by Pet. 54). Flowerdew further teaches that “[t]he alternating magnetic field generates an induced electromotive force in the secondary unit coil 316 arranged in the secondary unit 304.” *Id.* at 8:38–40 (cited by Pet. 54). Flowerdew’s charging coils 312, 314 correspond to the recited first inductive element and Flowerdew’s receive coil 316 corresponds to the recited second inductive element. Pet. 49, 54.

For the additional requirement that the time varying magnetic field has an operating frequency, Petitioner directs us to Flowerdew’s description of using a resonance tuning circuit for operating the charging coils in a

resonance circuit with a rechargeable device placed on the charging surface. Ex. 1007, 12:38–42 (cited by Pet. 60). Flowerdew teaches that “the frequency is changed to keep the system resonant.” *Id.* at 12:61–63 (cited by Pet. 60). Petitioner argues that the resulting frequency satisfies the operating frequency requirement. Pet. 60.

Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim element 1.2 (*see supra* Part III.B.2.a.iii), we are persuaded that Flowerdew teaches the recited applying step of claim 28. Patent Owner does not dispute Petitioner’s analysis for this step. *See generally* PO Resp.

ii. “monitoring” step, “automatically adjusting” step

Claim 28 further recites “monitoring at least one parameter of an electronic component of said base unit that is indicative of an efficiency of power transfer from said base unit to said target unit.” This step is similar to the monitoring step recited in claim 1, except that it requires specifically monitoring a parameter *of an electronic component of said base unit*. Claim 28 also recites “automatically adjusting said operating frequency based on a value of said parameter to maximize said efficiency of power transfer from said base unit to said target unit.” *Id.* at 12:58–60. This step is similar to the automatically adjusting step recited in claim 1, except that it requires specifically automatically adjusting *said operating frequency*.

Petitioner cross-references its analysis for claim elements 1.3 and 1.4. Pet. 60–61. As discussed above with respect to claim elements 1.3 and 1.4, Flowerdew uses a resonance tuning circuit that varies the frequency of charging coils 312, 314 when secondary unit 304 is placed on the charging

surface of primary unit 302, thereby keeping the system resonant. Ex. 1007, 12:58–62 (cited by Pet. 54–55). Flowerdew teaches that a sense coil near the driven coil provides a feedback signal to a microcontroller that produces the signal to the driver, and software allows for the output frequency to be adjusted to maximize the signal from the sense coil. *Id.* at 13:24–30 (cited by Pet. 55). Flowerdew explains that “[a]pplication of a variable frequency is predicated on the basis that the high efficiency achieved by driving a resonant system is needed for effective operation.” *Id.* at 13:30–35 (cited by Pet. 55).

Petitioner contends that “Flowerdew discloses a microcontroller in the charger 302 that monitors a ‘feedback signal’ (*at least one parameter*) of a ‘sense coil’ (*electronic component of said base unit*) that is indicative of resonance and thus efficiency of power transfer from the charger 302 (*base unit*) to the secondary unit 304 (*target unit*).” Pet. 60. As noted above, Flowerdew teaches that software allows for the output frequency to be adjusted to maximize the signal from the sense coil. Ex. 1007, 13:24–30 (cited by Pet. 55).

Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim elements 1.3 and 1.4 (*see supra* Part III.B.2.a.iv), we are persuaded that Flowerdew teaches the recited monitoring and automatically adjusting steps of claim 28. Patent Owner does not dispute Petitioner’s analysis for these steps. *See generally* PO Resp.

3. *Summary*

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that Flowerdew anticipates claims 1, 2, 8–11, and 28.

C. Obviousness over Flowerdew and Jang

Petitioner asserts that claims 3–5, 12–16, and 19–22 of the '537 patent would have been obvious over Flowerdew and Jang. Pet. 61–72. Patent Owner opposes. PO Resp. 19–27. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 3, 12–16, and 19–22 would have been obvious over Flowerdew and Jang. We also determine that Petitioner has not demonstrated by a preponderance of the evidence that claims 4 and 5 would have been obvious over Flowerdew and Jang.

We provided an overview of Flowerdew above. *See supra* Part III.B.1. Before addressing the parties' arguments, we additionally provide an overview of Jang.

1. Overview of Jang

Jang describes contactless electrical energy transmission systems, where power is transferred through “an air-gap inductive coupling without there being any direct electric connection between a primary side and a secondary side.” Ex. 1010 ¶¶ 1, 2. To illustrate, Figure 4 of Jang is reproduced below.

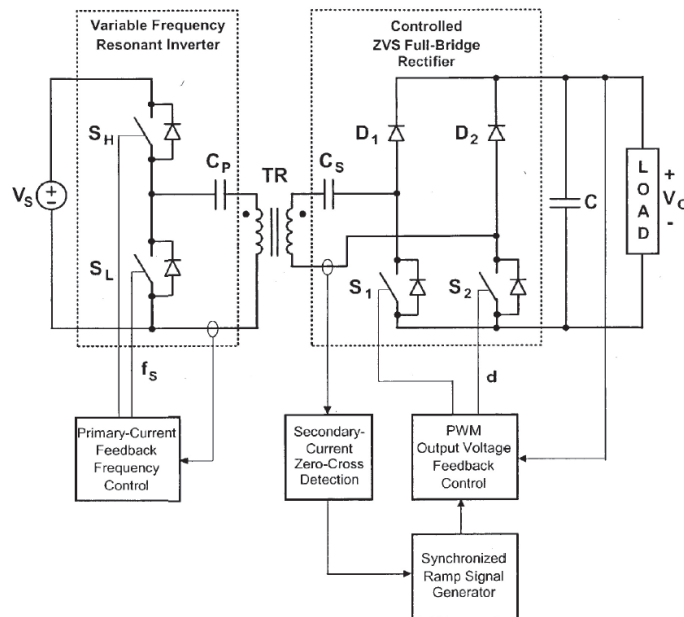


Fig. 4

Figure 4 is a block diagram of a contactless electrical energy transmission system. *Id.* ¶¶ 21, 23. The system includes a primary side (left) and a secondary side (right) that are inductively coupled through the primary and secondary windings of a transformer. *Id.* ¶ 21, Fig. 4; *see also id.* at Fig. 3. The primary side includes an inverter, and the secondary side includes a rectifier and a load. *Id.* ¶ 21. The inverter at the primary side couples a power source with voltage V_s to the primary winding through a primary resonant circuit. *Id.* The inverter includes primary switches S_H and S_L , which form a primary controlled switching circuit. *Id.* ¶ 23. The rectifier at the secondary side includes switches S_1 and S_2 , which form a secondary controlled switching circuit. *Id.*

During a switching cycle, the various switches will be on or off at different times, depending on the stage of the cycle, thereby affecting the direction of the flow of current through the system. *See Ex. 1010* ¶¶ 26–29. That is, when certain switches are on (and others are off) the current will

flow in one direction, whereas when certain other switches are on (and others are off) the current will flow in the opposite direction. *See id.*

2. Analysis of Claims 3–5, 12–16, and 19–22

We discuss claims 3–5, 12–16, and 19–22 of the '537 patent.

a. Dependent Claim 3

Claim 3 depends from claim 1 and recites “producing said time varying electric current by switching a DC voltage source using an electronically controlled switch element.” As discussed above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Flowerdew anticipates independent claim 1. *See supra* Part III.B.2.a.

Petitioner provides two alternative arguments in connection with the limitation of claim 3. For one argument, Petitioner relies on Flowerdew. Specifically, Petitioner asserts that Flowerdew’s “[c]harger 302 is designed to draw power from a power source 306 such as a standard electrical wall outlet’ (which AC power is rectified to produce DC power . . .), or from ‘an auxiliary power source from another piece of electronic equipment, such as through a USB port on a personal computer’ that directly provides a DC voltage source,” where charger 302 corresponds to the recited base unit. Pet. 62–63 (citing Ex. 1007, 5:5–9). Petitioner further asserts that “Flowerdew also discloses that the primary windings of its inductive power supply are driven by a digital driver.” *Id.* at 63 (citing Ex. 1007, 13:4–9). According to Petitioner, an ordinarily skilled artisan “would have known that such digital drivers provide an ‘electronically controlled switching

element' configured to switch a DC voltage source to produce the time-varying electric current that drives the primary coils 312/314 of oscillator 310.” *Id.* Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* (citing Ex. 1003 ¶¶ 238–241). Patent Owner does not dispute Petitioner’s analysis in this regard. *See generally* PO Resp.

For its alternative argument, Petitioner relies additionally on Jang “to the extent Flowerdew does not *expressly* disclose the additional features recited in Claim 3.” Pet. 63. Petitioner asserts in particular that “Jang describes the use of high-side and low-side switches (S_H and S_L , respectively) to switch a DC voltage source V_S to produce a variable-frequency alternating current through a primary-side inductor.” *Id.* (citing Ex. 1010 ¶ 26, Fig. 8). To illustrate, Petitioner provides an annotated version of Figure 8 of Jang, which is reproduced below. *Id.* at 64.

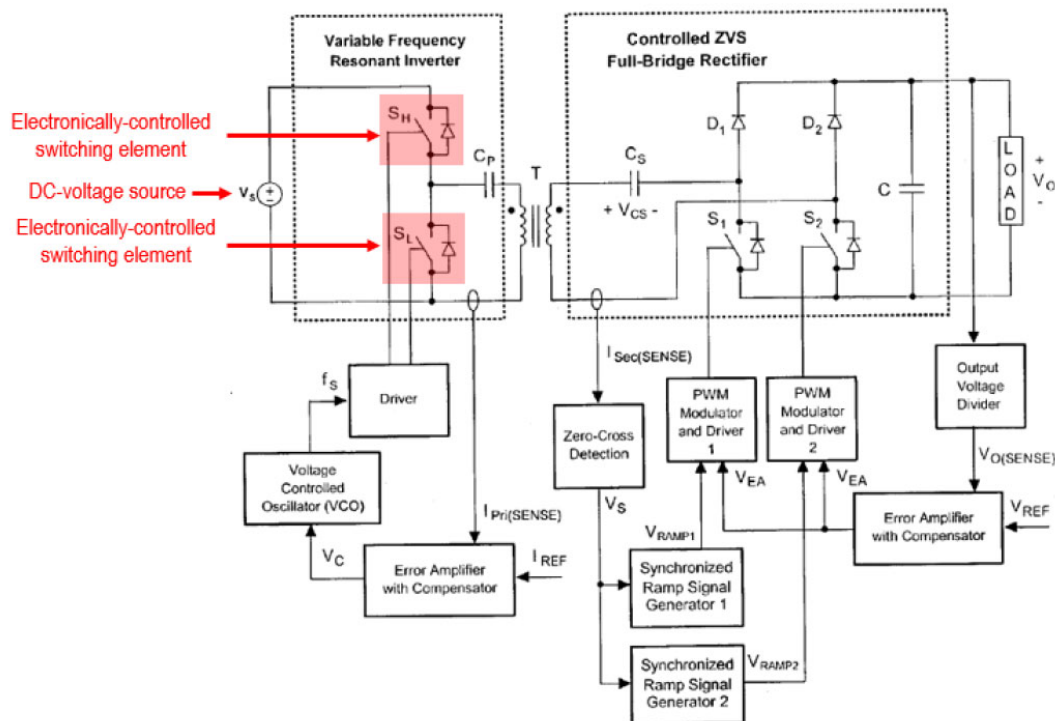


Fig. 8

Figure 8 of Jang, as annotated by Petitioner, is a block diagram of a contactless electrical energy transmission system. *See* Ex. 1010 ¶ 20. The system includes a variable frequency resonant inverter that comprises primary switches S_H and S_L . *Id.* ¶¶ 21, 23.

Petitioner contends that “[i]t would have been obvious to implement Flowerdew’s charging circuit according to Jang’s suggested use of electronically-controlled switching elements for switching a DC voltage source to produce a time-varying electric current to apply to a primary inductive element (e.g., primary coils 312 and/or 314).” Pet. 64. As support, Petitioner asserts that an ordinarily skilled artisan “would have looked to examples such as Jang for additional details as to how to implement aspects of Flowerdew’s charger 302, including oscillator 310—especially since Flowerdew acknowledges that the description of oscillator 310 in Flowerdew is ‘simplified’ (although Flowerdew expressly teaches that various designs/components can be adopted to implement the charging circuit).” *Id.* at 65 (citing Ex. 1007, 6:8–13, 15:54–67). Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 63–65 (citing Ex. 1003 ¶¶ 242–245).

With respect to Petitioner’s alternative argument, which proposes combining Flowerdew and Jang, Patent Owner asserts that “tellingly absent is any analysis of how there is any benefit in the combination[] over and above what Flowerdew already teaches.” PO Resp. 20. According to Patent Owner, “the Petition fails to establish a motivation to combine Flowerdew with Jang.” *Id.*; *see also id.* at 19–21.

We disagree with Patent Owner. Flowerdew teaches that its charger 302 includes “a controller 308 for driving an oscillator 310,” which

“provides a high frequency A.C. signal to drive a charger coil [i.e., charging coils 312, 314].” Ex. 1007, 5:16–19, 5:38–41, Fig. 2. Flowerdew further teaches that “[o]ther circuit elements and arrangements may be utilized by charger 302 in order to provide alternating current flow to charging coil 312 and charging coil 314.” *Id.* at 6:8–13 (cited by Pet. 65); *see also id.* at 15:55–56 (“[A] variety of charging circuits may be utilized.”) (cited by Pet. 65). As an example, Petitioner points to Jang’s use of high-side and low-side switches that switch a DC voltage source to produce a variable-frequency alternating current through a primary-side inductor. Pet. 63 (citing Ex. 1010 ¶ 26). That Flowerdew and Jang both describe mechanisms for providing alternating current flow to a charging coil and that the use of Jang’s switches was a known way to do that is the very reason for combining Flowerdew and Jang. Petitioner need not show that implementing Flowerdew’s charger with Jang’s switches to provide alternating current flow to a charging coil would have been “an ‘improvement’ in a categorical sense.” *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023). Rather, Petitioner need only show that Jang’s switches would have been a “suitable option” for implementation in Flowerdew’s charger. *See id.* Patent Owner does not dispute that an ordinarily skilled artisan would have recognized that using Jang’s switches would have provided alternating current flow to a charging coil in systems like Flowerdew’s system. *See generally* PO Resp.

Accordingly, on the record before us, we are persuaded that Petitioner’s proposed combination of Flowerdew and Jang teaches the recited limitation of claim 3. We also are persuaded that Petitioner’s proffered reasoning for modifying Flowerdew’s charger to include Jang’s

switches, namely, to provide a way to implement Flowerdew’s charger, is sufficient to support the legal conclusion of obviousness. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (“[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.”).

b. Dependent Claim 4

Claim 4 depends from claim 3 and recites “communicating said time varying electric current to a load in said base unit, and selecting said parameter to be a measured current or voltage associated with said load.” For this limitation, Petitioner directs us to Flowerdew’s teaching that “a sense coil near a driven coil could provide a feedback signal to a microcontroller that produces the signal to the driver,” and that “[s]oftware can provide a process whereby the output frequency is adjusted to maximize the signal from the sense coil.” Ex. 1007, 13:26–30 (cited by Pet. 65). Petitioner further asserts that “operating at ‘resonance maximizes the current’ through the primary coils, and thus the feedback signal from the sense coil provides a measurement of the current conducted through a primary coil 312/314 (especially since the ‘feedback signal’ and the ‘current’ through the primary coil are both ‘maximized’ at resonance).” Pet. 65–66; *see also* Ex. 1007, 12:24–26 (“The resonance maximizes the current[.]”) (cited by Pet. 54).

Petitioner additionally contends that an ordinarily skilled artisan “would have understood that an interface would be provided between the physical ‘sense coil’ disclosed in Flowerdew and the ‘microcontroller’ that monitors the ‘feedback signal’ from the sense coil (especially since directly

coupling the sense coil to an input pin of the microcontroller would damage the integrated circuit in the microcontroller).” Pet. 66. According to Petitioner, “[t]he interface, such as a peak rectifier circuit, would predictably include one or more components such as an R-C load circuit, to generate the feedback signal that is actually provided as input to the microcontroller.” *Id.* Petitioner asserts that such interface “would thus provide a ‘**load**’ in the charger 302 (**base unit**) to which the time varying electric current is communicated.” *Id.* Petitioner further asserts that “[t]he sense coil feedback signal would be provided to the microcontroller through this interface, and thus the feedback signal would constitute a selected parameter associated with the interface (**load**).” *Id.* Petitioner adds, “since signals are provided to microcontrollers using voltage levels, Flowerdew suggests that the feedback signal provided to the microcontroller would be in the form of a measured voltage (which also provides a measure of current through the primary inductor), such as a peak rectified voltage corresponding to the peak sense coil feedback signal level.” *Id.* at 66–67. Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 65–67 (citing Ex. 1003 ¶¶ 246–248).

Patent Owner counters that “[t]he ‘sense coil’ of Flowerdew is not electrically connected to the primary coil,” and that “[t]he ‘sense coil’ receives the time varying magnetic field generated by the primary coil, not the time varying electric current applied to the primary coil.” PO Resp. 24.

Petitioner responds that Patent Owner “imports limitations into the claim” by “argu[ing] that claim 4 requires that the ‘load’ directly receives the same ‘*time varying electric current*’ that is applied to ‘*the first inductive element*.’” Pet. Reply 33. According to Petitioner, “[c]laim 4 does not require this,” however, “simply recit[ing] ‘*communicating said time varying*

electric current to a load,’ without regard to any indirect or direct form of communication.” *Id.* Petitioner asserts that “Flowerdew discloses communicating a time varying electric current to a load because it teaches communicating an AC signal (*time varying electric current*) to an interface between its sense coil and microcontroller (*load*).” *Id.* (citing Ex. 1007, 13:26–30). Petitioner adds that “Flowerdew also teaches using a rectifier to convert the AC signal generated by its secondary coil to DC,” and that “Flowerdew therefore suggests that the interface between the sense coil and the microcontroller would be a rectifier, which was, as Dr. Szepesi testified, a circuit commonly implemented using an R-C load circuit.” *Id.* at 34.

Patent Owner contends that “[f]or the ‘electric current’ to be communicated to the ‘load,’ the communication must be a direct electrical connection,” and that “[i]ndirect communication, e.g., by induction, will not communicate the ‘time varying electric current’ to the load.” PO Sur-reply 15. Patent Owner asserts that “Petitioner concludes that the ‘AC signal’ [in Flowerdew] is the claimed ‘time varying electric current’ but does not explain how the ‘AC signal’ qualifies as the ‘electric current that is also applied to the ‘first inductive element.’” *Id.* at 15–16.

We agree with Patent Owner regarding the portion of claim 4 that recites “communicating said time varying electric current to a load in said base unit.” Claim 1 (from which claim 4 depends indirectly) recites “applying a time varying electric current to said first inductive element to produce a time varying magnetic field,” and, as just noted, claim 4 requires “communicating *said time varying electric current* to a load in said base unit” (emphasis added). As Patent Owner points out, Flowerdew’s teaching of “a sense coil *near* a driven coil” implies that the sense coil receives the

time varying magnetic field that is produced by the driven coil, not the time varying electric current that is applied to the driven coil. *See* PO Resp. 24; Ex. 1007, 13:26–28 (emphasis added). Petitioner does not adequately explain how the time varying electric current that is applied to the driven coil is itself communicated to the interface between the sense coil and the microcontroller in Flowerdew. Indeed, Petitioner asserts that Flowerdew’s “feedback signal from the sense coil provides a *measurement* of the current conducted through a primary coil 312/314,” and that it is “provided to the microcontroller through this interface.” Pet. 66 (emphasis added); *see also id.* at 66–67 (“[S]ince signals are provided to microcontrollers using voltage levels, Flowerdew suggests that the feedback signal provided to the microcontroller would be in the form of a measured voltage (which also provides a measure of current through the primary inductor)[.]”); Pet. Reply 33–34.

We note Dr. Szepesi’s declaration testimony that “[t]he signal on the sense coil is a (substantially sinusoidal) AC signal, because it is induced by the time varying (AC) current of the primary coil.” Ex. 1003 ¶ 248 (cited by Pet. 66–67). That induced AC signal, however, is not the time varying electric current that is applied to the driven coil.

Accordingly, on the record before us, we are not persuaded that Flowerdew teaches the limitation of claim 4, specifically the requirement of “communicating said time varying electric current to a load in said base unit.”

c. Dependent Claim 5

Claim 5 depends from claim 4 and recites “comparing said measured current or voltage to a constant reference value.” For this limitation, Petitioner relies on Flowerdew and Jang. Pet. 67–69. Petitioner’s analysis of claim 5 does not cure the deficiency discussed above with respect to claim 4. For the reasons given above, we are not persuaded that Petitioner’s proposed combination of Flowerdew and Jang teaches the limitation of claim 5. *See supra* Part III.C.2.b.

d. Independent Claim 12

Claim 12 is directed to an “inductive power transfer system” that comprises a “base unit,” a “positioning structure,” a “switch element,” and a “control circuit.” We address these limitations in turn.

i. Element 12.1: “base unit”

Claim 12 recites “a base unit comprising a first inductive element configured for providing input power to a second inductive element of a target unit providing output power, said base unit electrically isolated from said target unit.” For this limitation, which Petitioner designates as element 12.1, Petitioner cross-references its analysis for the preamble of claim 1 with respect to anticipation by Flowerdew. Pet. 69–70. Petitioner further contends that “Flowerdew discloses a charger 302 (*base unit*) comprising primary coils 312, 314 that individually and collectively provide a ‘*first inductive element*’ configured for providing input power to a secondary coil 316 (*second inductive element*) of a secondary unit 304 (*target unit*) providing output power, where the charger 302 (*base unit*) and

secondary unit 304 (*target unit*) are electrically isolated.” *Id.* In its discussion of the preamble of claim 1, Petitioner points to Flowerdew’s teaching that its invention relates to inductive battery chargers, where a charging system includes charger 302 and secondary unit 304 that has a rechargeable battery to be charged by charger 302. *Id.* at 49 (citing Ex. 1007, 1:6–7, 4:60–67, 8:26–37). Flowerdew teaches that charger 302 includes charging coils 312, 314, and secondary unit 304 includes coil 316. Ex. 1007, Fig. 2 (cited by Pet. 69–70). Flowerdew further teaches that when secondary unit 304 is placed on charger 302, an alternating current is supplied to charging coils 312, 314 so that the resulting alternating magnetic field induces an electromotive force in secondary unit coil 316. *Id.* at 8:26–40.

Based on Petitioner’s argument and evidence, and for the reasons given above regarding the preamble of claim 1 (*see supra* Part III.B.2.a), we are persuaded that Flowerdew teaches the recited base unit of claim 12. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

ii. Element 12.2: “positioning structure”

Claim 12 further recites “a positioning structure provided on at least one of said base unit and said target unit for removably positioning said second inductive element at a predetermined orientation and distance relative to said first inductive element.” For this limitation, which Petitioner designates as element 12.2, Petitioner cross-references its analysis for claim element 1.1 with respect to anticipation by Flowerdew. Pet. 70. Petitioner further contends that “Flowerdew discloses a “*positioning structure*” (e.g., a

concave/dish-shaped charging surface 357) on charger 302 (*base unit*) for removably positioning the secondary coil 316 (*second inductive element*) at a predetermined orientation and distance relative to primary coils 312, 314 (*first inductive element*).” *Id.* As support, Petitioner directs us to Flowerdew’s teaching that charger 302 has a dished surface, and that secondary unit 304 tends to align in one axis when it is placed on the dished portion of charger 302. *Id.* (citing Ex. 1007, 11:25–29, Fig. 10). Such alignment maximizes the coupling between secondary coil 316 and primary coils 312, 314. Ex. 1007, 11:29–32 (cited by Pet. 50 (discussing claim element 1.1)).

Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim element 1.1 (*see supra* Part III.B.2.b), we are persuaded that Flowerdew teaches the recited positioning structure of claim 12. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

iii. Element 12.3: “switch element”

Claim 12 further recites “a switch element configured for selectively applying a time varying electric current to said first inductive element to produce a time varying magnetic field, said time varying magnetic field inducing an electric current in said second inductive element.” For this limitation, which Petitioner designates as element 12.3, Petitioner relies additionally on Jang and cross-references its analysis for claim 3 with respect to obviousness over Flowerdew and Jang. Pet. 70. In its discussion of claim 3, Petitioner asserts that “Jang describes the use of high-side and low-side switches (S_H and S_L , respectively) to switch a DC voltage

source V_s to produce a variable-frequency alternating current through a primary-side inductor.” *Id.* at 63 (citing Ex. 1010 ¶ 26, Fig. 8). To illustrate, Petitioner provides an annotated version of Figure 8 of Jang, which is reproduced below. *Id.* at 64 (discussing claim 3).

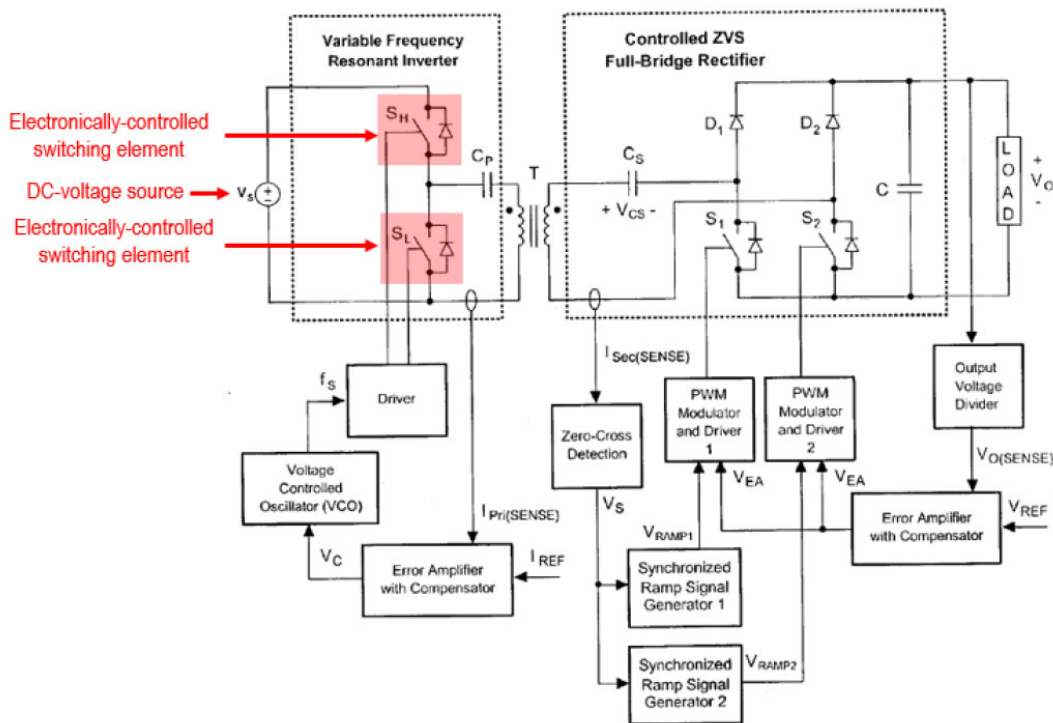


Fig. 8

Figure 8 of Jang, as annotated by Petitioner, is a block diagram of a contactless electrical energy transmission system. *See* Ex. 1010 ¶ 20. The system includes a variable frequency resonant inverter that comprises primary switches S_H and S_L . *Id.* ¶¶ 21, 23. Petitioner additionally points to the declaration testimony of Dr. Szepesi. Pet. 63 (discussing claim 3) (citing Ex. 1003 ¶¶ 238–245). Dr. Szepesi states that “Flowerdew teaches that the primary windings of its inductive power supply are driven by a digital driver” that “can be provided by a logic gate.” Ex. 1003 ¶ 239 (citing Ex. 1007, 13:2–9, Fig. 13). According to Dr. Szepesi, “a simple logic gate is

an inverter which inverts the logic signal from its input to its output.” *Id.* ¶ 240.

Petitioner contends that “[i]t would have been obvious to implement Flowerdew’s charging circuit according to Jang’s suggested use of electronically-controlled switching elements for switching a DC voltage source to produce a time-varying electric current to apply to a primary inductive element (e.g., primary coils 312 and/or 314).” Pet. 64 (discussing claim 3). As support, Petitioner asserts that “a [person of ordinary skill in the art] would have looked to examples such as Jang for additional details as to how to implement aspects of Flowerdew’s charger 302, including oscillator 310—especially since Flowerdew acknowledges that the description of oscillator 310 in Flowerdew is ‘simplified’ (although Flowerdew expressly teaches that various designs/components can be adopted to implement the charging circuit).” *Id.* at 65 (discussing claim 3) (citing Ex. 1007, 6:8–13, 15:54–67).

Patent Owner makes the same arguments as it does for claim 3. Responding to Petitioner’s argument proposing to combine Flowerdew and Jang, Patent Owner asserts that “tellingly absent is any analysis of how there is any benefit in the combination[] over and above what Flowerdew already teaches.” PO Resp. 20. According to Patent Owner, “the Petition fails to establish a motivation to combine Flowerdew with Jang.” *Id.*; *see also id.* at 19–21. For the reasons given above with respect to claim 3, Patent Owner’s arguments do not undermine Petitioner’s showing for claim 12. *See supra* Part III.C.2.a.

Accordingly, on the record before us, we are persuaded that Petitioner’s proposed combination of Flowerdew and Jang teaches the

recited switch element of claim 12. We also are persuaded that Petitioner's proffered reasoning for modifying Flowerdew's charging system to include Jang's inverter, namely, to provide a way to implement Flowerdew's digital driver, is sufficient to support the legal conclusion of obviousness. *See In re Kahn*, 441 F.3d at 988.

iv. Elements 12.4, 12.5: "control circuit"

Lastly, claim 12 recites "a control circuit configured for monitoring at least one parameter indicative of an efficiency of power transfer from said base unit to said target unit, and automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit." Petitioner designates this limitation as elements 12.4 and 12.5, without explanation. Pet. 71. We interpret the Petition as designating the "monitoring" aspect of the limitation as element 12.4 and the "automatically adjusting" aspect of the limitation as element 12.5.

Regarding the limitation as a whole, Petitioner contends that "Flowerdew discloses a controller 308 (*control circuit*) configured for monitoring a 'feedback signal' from a sense coil (*at least one parameter indicative of an efficiency of power transfer*) from charger 302 (*base unit*) to secondary unit 304 (*target unit*), and automatically adjusting the drive frequency (*at least one characteristic*) of the time-varying current responsive to the feedback signal to maintain resonance and maximize an efficiency of power transfer." Pet. 71 (citing Ex. 1007, 13:22–40). Petitioner cross-references its analysis for elements 1.3 and 1.4 with respect to anticipation by Flowerdew. *Id.*

Based on Petitioner's argument and evidence, and for the reasons given above with respect to claim elements 1.3 and 1.4 (*see supra* Part III.B.2.a.iv), we are persuaded that Flowerdew teaches the recited control circuit of claim 12. Patent Owner does not dispute Petitioner's analysis for this limitation. *See generally* PO Resp.

e. Dependent Claims 13, 14, and 19–22

Claims 13, 14, and 19–22 depend from claim 12 and recite similar limitations as claims 2, 3, and 8–11, respectively. Accordingly, for claims 13, 14, and 19–22, Petitioner relies on its discussion of claims 2, 3, and 8–11. Pet. 71–72. Patent Owner does not separately dispute Petitioner's analysis for claims 13, 14, and 19–22. On this record, and for the reasons given above for claims 2, 3, and 8–11, we are persuaded by Petitioner's showing for the recited limitations of claims 13, 14, and 19–22. *See supra* Parts III.B.2.b–f, III.C.2.a.

f. Dependent Claim 15

Claim 15 depends from claim 14 and recites “a load circuit coupled to said first inductive element, and where said parameter comprises a current or voltage associated with said load.” For this limitation, Petitioner cross-references its discussion of claim 4. Pet. 71. As discussed above, claim 4 requires, in part, “communicating said time varying electric current to a load in said base unit,” and we are not persuaded by Petitioner's showing for this requirement. *See supra* Part III.C.2.b. Although Petitioner cross-references its discussion of claim 4, we note that claim 15 does not recite “communicating said time varying electric current to a load in said base

unit.” Accordingly, we do not address this requirement of claim 4 in our analysis of claim 15. For the reasons explained below, we are persuaded by Petitioner’s showing for claim 15.

In its discussion of claim 4, Petitioner directs us to Flowerdew’s teaching that “a sense coil near a driven coil could provide a feedback signal to a microcontroller that produces the signal to the driver,” and that “[s]oftware can provide a process whereby the output frequency is adjusted to maximize the signal from the sense coil.” Ex. 1007, 13:26–30 (cited by Pet. 65). Petitioner contends that an ordinarily skilled artisan “would have understood that an interface would be provided between the physical ‘sense coil’ disclosed in Flowerdew and the ‘microcontroller’ that monitors the ‘feedback signal’ from the sense coil (especially since directly coupling the sense coil to an input pin of the microcontroller would damage the integrated circuit in the microcontroller).” Pet. 66. According to Petitioner, “[t]he interface, such as a peak rectifier circuit, would predictably include one or more components such as an R-C load circuit, to generate the feedback signal that is actually provided as input to the microcontroller.” *Id.* Petitioner asserts that “[t]he sense coil feedback signal would be provided to the microcontroller through this interface, and thus the feedback signal would constitute a selected parameter associated with the interface (*load*).” *Id.* Petitioner further asserts, “since signals are provided to microcontrollers using voltage levels, Flowerdew suggests that the feedback signal provided to the microcontroller would be in the form of a measured voltage . . . , such as a peak rectified voltage corresponding to the peak sense coil feedback signal level.” *Id.* at 66–67. Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 65–67 (citing Ex. 1003 ¶¶ 246–248).

Regarding claim 15 in particular, Petitioner adds that Flowerdew’s “‘sense coil’ interface (*load circuit*) is coupled to a primary coil 312/314 (*first inductive element*), which is evident from the fact that the feedback signal communicated to the microcontroller through such an interface corresponds to the current conducted through the primary coil 312/314.” Pet. 71 (citing Ex. 1007, 13:22–32). Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* (citing Ex. 1003 ¶¶ 268–269).

Patent Owner counters that “[t]he ‘sense coil’ of Flowerdew is not electrically connected to the primary coil,” and that it “receives the time varying magnetic field generated by the primary coil, not the time varying electric current applied to the primary coil.” PO Resp. 24. In support of its position, Patent Owner asserts that “[t]he ’537 patent teaches that the load circuit is electrically connected to the first inductive element.” *Id.* (citing Ex. 1001, 3:39–43, Fig. 1).

Petitioner responds that Patent Owner “attempts to import limitations into the claim,” and that “[c]laim 15 simply recites ‘*a load circuit coupled to said first inductive element.*’” Pet. Reply 34. Petitioner asserts that Flowerdew’s “feedback signal received through the interface corresponds to the AC signal conducted through the primary coil,” and, “[t]hus, Flowerdew’s *load circuit* is *coupled* to its primary coil because it receives a feedback signal indicative of the signal applied to the primary coil.” *Id.* at 35. Petitioner adds that “claim 15 uses the term ‘coupled’ alone rather than the phrase ‘electrically coupled,’ which is recited in various instances in the specification and in other claims.” *Id.* at 34–35 (citing Ex. 1001, 1:18, 1:26–27, 2:23–26, 3:27–28, 3:39–40, 3:65–67, 4:1–3, 6:43–44, claims 23, 27).

Patent Owner contends that “[t]here is no hard and fast rule that ‘coupling’ and ‘coupled’ must be construed differently than ‘electrically coupled.’” PO Sur-reply 16. In fact, Patent Owner asserts that “the use of ‘coupling’ and ‘coupled’ is limited to an electrical connection.” *Id.* As support, Patent Owner directs us to claim 14, which recites “said switch element is configured for coupling and decoupling a DC voltage source to said first inductive element to produce said time varying current.” *Id.* at 17. According to Patent Owner, claim 14 “requires a ‘switch element’ for electrically connecting (‘coupling’) the ‘voltage source’ to the ‘first inductive element to produce said time varying current,’ as well as electrically disconnecting (‘decoupling’) the ‘voltage source’ from the ‘first inductive element.’” *Id.* Turning back to claim 15, which depends from claim 14, Patent Owner points to the recited language “a load circuit coupled to said first inductive element,” and asserts that “[c]oupled,’ as used in claim 15, is the past tense of ‘couple’ and should be construed the same as ‘coupling,’ as used in claim 14, as the present participle of ‘couple,’ to refer to an electrical connection.” *Id.*

We disagree with Patent Owner. Our reviewing court has emphasized that 35 U.S.C. § 112 ¶ 2 “puts the burden of precise claim drafting squarely on the applicant.” *In re Morris*, 127 F.3d 1048, 1056 (Fed. Cir. 1997). Claim 15 of the ’537 patent recites “a load circuit coupled to said first inductive element.” If the applicant intended for the load circuit and first inductive element to be electrically coupled, then the applicant should have included that limitation in the claim during prosecution. As Petitioner points out, the applicant did just that for claims 23 and 27 (which are not challenged in this proceeding), which recite “electrically coupled.”

We note Patent Owner’s contention that “[t]he ’537 patent teaches that the load circuit is electrically connected to the first inductive element.” PO Resp. 24. The specification, however, “is not a substitute for, nor can it be used to rewrite, the chosen claim language.” *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004); *see also Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (expressly rejecting “the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment”); *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1346–47 (Fed. Cir. 2015) (“caution[ing] against limiting the claimed invention to preferred embodiments or specific examples in the specification”). We recognize that “understanding the claim language may be aided by the explanations contained in the written description,” but “it is important not to import into a claim limitations that are not a part of the claim.” *SuperGuide*, 358 F.3d at 875. Thus, “a particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment.” *Id.*

In this case, the claim language itself recites nothing about an electrical connection between the load circuit and the first inductive element. As our reviewing court has explained, “it is the *claims*, not the written description, which define the scope of the patent right.” *Laitram Corp. v. NEC Corp.*, 163 F.3d 1342, 1347 (Fed. Cir. 1998). Although the ’537 patent discloses examples and embodiments where the load circuit and first inductive element are electrically connected, nowhere does the specification limit “coupled” to those examples and embodiments. Indeed, the ’537 patent states that “[a]lthough the invention has been illustrated and

described with respect to one or more implementations, equivalent alterations and modifications will occur to others skilled in the art upon the reading and understanding of this specification and the annexed drawings,” and, regarding “the various functions performed by the . . . described components (assemblies, devices, circuits, systems, etc.), the terms . . . used to describe such components are intended to correspond, unless otherwise indicated, to any component which performs the specified function of the described component (e.g., that is functionally equivalent), even though not structurally equivalent to the disclosed structure.” Ex. 1001, 9:39–52.

Moreover, even if claim 14’s “coupling” requires an electrical connection, as Patent Owner contends, that does not mean that claim 15’s “coupled” also requires an electrical connection. *See* PO Resp. 24; PO Sur-reply 16. In claim 14, “coupling” refers to the relationship between the DC voltage source and the first inductive element. By contrast, “coupled” in claim 15 refers to the relationship between the load circuit and the first inductive element.

Accordingly, on the record before us, we are persuaded that Flowerdew teaches the recited limitation of claim 15.

g. Dependent Claim 16

Claim 16 depends from claim 15 and recites “said control circuit automatically selectively adjusts said characteristic based on a comparison of said measured current or voltage to a constant reference value.” For this limitation, Petitioner cross-references its discussion of claim 5. Pet. 72. In that discussion, Petitioner directs us to Flowerdew’s teaching that “[w]hen there is no item to be charged the charger runs at the lowest possible

frequency,” which “could be automatically associated with a low-power standby mode, with high power only being provided when the resonant frequency is within a predefined range.” Ex. 1007, 13:46–51 (cited by Pet. 67). Petitioner also directs us to Flowerdew’s teaching that a “‘free running’ state, where no secondary unit 304 is present, can be detected and the power output reduced to a predetermined level or applied periodically to determine whether an item has been placed on the charging surface.” *Id.* at 13:18–21 (cited by Pet. 67). Petitioner asserts that “Flowerdew does not expressly disclose how the charger implements the ‘low-power mode’ or ‘free running state’ in which power output is reduced to a ‘predetermined level.’” Pet. 67.

According to Petitioner, Jang suggests “a predictable option for regulating current applied to the primary in an inductive power transfer system.” Pet. 67–68. Petitioner asserts that “Jang describes a feedback loop configured to minimize the difference between a measurement indicative of current through the primary inductor and a constant reference value” by “adjust[ing] the switching frequency to drive the measured current value to the constant reference value.” *Id.* at 68 (citing Ex. 1010 ¶¶ 31–37). Petitioner further asserts that, “[w]ith these techniques, Jang ‘maintains a *constant energy transfer* between the primary and secondary sides.’” *Id.* (citing Ex. 1010 ¶¶ 31–32).

Petitioner contends that “[i]t would have been obvious to modify Flowerdew in accordance with Jang’s suggestion to regulate the drive frequency based on a feedback loop that compares a measurement of the current through a primary coil to a constant reference value.” Pet. 68. As support, Petitioner asserts,

[T]he “feedback signal” from Flowerdew’s “sense coil” (*load*) that is indicative of a measured current through a primary coil 312/314 can be compared to a constant reference value (e.g., I_{REF}) based on Jang’s teaching to stabilize the current flow through the primary coil (e.g., comparing a peak rectified feedback signal from the sense coil to a constant reference value I_{REF}).

Id. Petitioner further asserts that an ordinarily skilled artisan “would have been prompted to modify Flowerdew according to Jang’s suggestion here to achieve a stable current through the primary coil in the low-power standby mode, and to maintain power output at a ‘predetermined level’ in the ‘free running state.’” *Id.* at 68–69. Petitioner adds that Jang’s “feedback loop would ensure that the operating frequency and current flow during ‘low-power mode’ or the ‘free running state’ would not drift into frequency ranges associated with unacceptably high current flow,” and “would also be readily capable of being implemented in Flowerdew, particularly given that Flowerdew already provides a ‘sense coil’ for measuring current flow.” *Id.* at 69. Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 67–69 (citing Ex. 1003 ¶¶ 249–256).

Patent Owner counters that “Petitioner’s premise [for combining Flowerdew and Jang] is incorrect because Flowerdew ***expressly discloses the characteristics*** of the ‘low-power standby mode,’ or ‘free running state,’” which “Flowerdew uses . . . synonymously to refer to the condition when there is no secondary unit present for inductive power transfer.” PO Resp. 25; *see also id.* at 25–26 (citing Ex. 1007, 13:18–21, 13:26–35, 13:46–51). According to Patent Owner, “[b]ecause Flowerdew expressly discloses how the charger implements the ‘low-power standby mode’ / ‘free running state,’ there is no need to look to Jang, as Petitioner suggests, to

regulate the drive frequency based on a feedback loop that compares a measurement of the current through a primary coil to a constant reference value.” *Id.* at 26–27. Additionally, Patent Owner asserts that Petitioner does not “offer any benefit or contrast any drawbacks, including increased complexity, to the proposed modification to Flowerdew.” *Id.* at 27. Patent Owner concludes that “where the Petition’s proposed combination would have no identified benefit but would have at least the drawback of added complexity to Flowerdew, the Petition necessarily arrives at its proposed combination through the impermissible use of hindsight.” *Id.*

Petitioner replies that “[w]hile Flowerdew may discuss the *characteristics* of its lower-power standby mode, the basis for the proposed combination is the *implementation details* regarding how to implement a low-power standby mode.” Pet. Reply 36. Petitioner asserts that “Flowerdew does not explain how ‘the power output reduced to a predetermined level’ would be maintained at the predetermined level,” and that an ordinarily skilled artisan “would have looked to relevant art to understand how to maintain a predetermined level of power output when in a low-power standby mode.” *Id.* Petitioner further asserts that “Jang teaches adjusting the frequency to keep the magnitude of the primary current constant based on a comparison of a sensed signal to a constant reference value provided by a reference current signal I_{REF} ,” and that “comparing the feedback signal from Flowerdew’s sense coil to a constant reference value, as suggested by Jang, would allow stabilization of the current flowing [through] Flowerdew’s primary coil in the low-power standby mode/free-running state.” *Id.* (citing Ex. 1010 ¶¶ 9, 31–32).

Patent Owner responds that “Petitioner ignores that Flowerdew clearly describes a ‘low power mode’ that **maintains a reduced power output at a predetermined level by running the charger at the lowest possible frequency.**” PO Sur-reply 18 (citing Ex. 1007, 13:46–49). Patent Owner asserts that “Flowerdew teaches how the charger (i) goes into ‘lower power mode’; (ii) maintains ‘low power mode’ at a predetermined level; and (iii) exits ‘low power mode,’” and that Petitioner therefore “is incorrect that ‘a [person of ordinary skill in the art] would have looked to relevant art to understand how to maintain a predetermined level of power output when in a low-power standby mode.’” *Id.* at 19; *see also id.* at 18–19 (citing Ex. 1007, 13:20–21, 13:26–35, 13:49–51). Patent Owner adds,

Petitioner offers no explanation as to why Flowerdew’s disclosure of reducing output frequency to the lowest possible level when resonant frequency is outside a predefined range is lacking compared to Jang’s disclosure of adjusting the frequency to keep the magnitude of the primary current constant based on a comparison of a sensed signal to a constant reference value, such that a [person of ordinary skill in the art] would look to Jang to modify Flowerdew’s “low power mode” mechanism.

Id.

We disagree with Patent Owner’s contentions. That Flowerdew and Jang both describe mechanisms for maintaining reduced power output at a predetermined level, and that the use of Jang’s feedback loop was a known way to do that is sufficient reason for combining Flowerdew and Jang. As discussed above, Petitioner need not show that implementing Flowerdew’s charger with Jang’s feedback loop to maintain power output at a predetermined level would have been “an ‘improvement’ in a categorical sense.” *See Intel*, 61 F.4th at 1381. Petitioner need only show that Jang’s

feedback loop would have been a “suitable option” for implementation in Flowerdew’s charger. *See id.* Patent Owner does not dispute that an ordinarily skilled artisan would have recognized that using Jang’s feedback loop would have provided a way to maintain power output at a predetermined level in systems like Flowerdew’s system. *See generally* PO Resp.

We note Patent Owner’s allegation that Petitioner’s “proposed combination . . . would have at least the drawback of added complexity to Flowerdew.” PO Resp. 27. Even if this were true, Patent Owner essentially alleges that there would be tradeoffs in making the combination; but “[t]he fact that [a] motivating benefit comes at the expense of another benefit . . . should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another.” *See Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000). The relative advantages (e.g., alternative option for implementing a charger) and disadvantages (e.g., added complexity) of adding Jang’s feedback loop to Flowerdew’s charger amount to a tradeoff, a decision well within the level of an ordinarily skilled artisan. Indeed, Flowerdew states that “a variety of charging circuits may be utilized,” and that “[i]t will be apparent to those skilled in the art that modifications and variations of the described embodiments are possible, and that other elements or methods may be used to perform equivalent functions.” *See* Ex. 1007, 15:55–67.

Accordingly, on the record before us, we are persuaded that Petitioner’s proposed combination of Flowerdew and Jang teaches the recited limitation of claim 16. We also are persuaded that Petitioner’s proffered reasoning for modifying Flowerdew’s charger to include Jang’s

feedback loop, namely, to provide a way to implement Flowerdew's charger, is sufficient to support the legal conclusion of obviousness. *See In re Kahn*, 441 F.3d at 988.

3. Summary

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 3, 12–16, and 19–22 would have been obvious over Flowerdew and Jang. Petitioner has not, however, demonstrated by a preponderance of the evidence that claims 4 and 5 would have been obvious over Flowerdew and Jang.

D. Obviousness over Flowerdew and Partovi-413

Petitioner asserts that claims 6 and 7 of the '537 patent would have been obvious over Flowerdew and Partovi-413. Pet. 72–75. Patent Owner opposes. PO Resp. 19–21. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 6 and 7 would have been obvious over Flowerdew and Partovi-413.

We provided an overview of Flowerdew above. *See supra* Part III.B.1. Before addressing the parties' arguments, we additionally provide an overview of Partovi-413.

1. Overview of Partovi-413

Partovi-413 relates to inductively charging portable devices. Ex. 1006 ¶ 3. Partovi-413 describes a system that includes two parts. *Id.* ¶ 13. The first part is a pad (or other base unit) that includes a primary, which generates an alternating magnetic field by applying an alternating current to

a coil. *Id.* The second part is a receiver that receives the energy from the alternating magnetic field and transfers it to a mobile device with a rechargeable battery. *Id.* The receiver may include a coil that senses a changing magnetic field, which the receiver rectifies to produce a direct current voltage that in turn is used to charge the mobile device. *Id.*

The system may use a technique called Zero Voltage Switching to provide more efficient power transfer and power supply control. Ex. 1006 ¶ 246. According to Partovi-413, the common geometries in switching mode power supplies include boost buck, flyback, and boost. *Id.* To illustrate, Figure 26 of Partovi-413 is reproduced below.

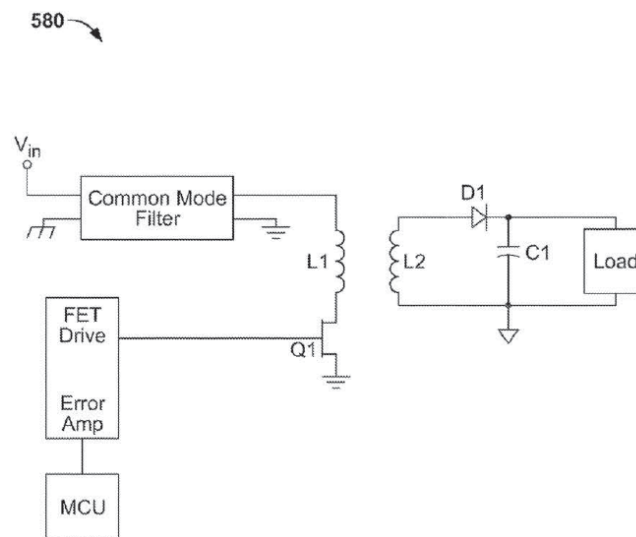


FIG. 26

Figure 26 shows a flyback power supply geometry 580. *Id.* ¶ 247. When the transistor (FET) is closed, the current through the primary coil stores energy in the coil, and when the transistor is open, the energy is transferred to the receiver coil and the load. *Id.* The circuit may include a capacitor, where the capacitor and the coil inductor form a resonant circuit. *Id.* ¶ 249. When the switch is on, current passes through the inductor as the voltage across the capacitor is zero, whereas when the switch is off, the voltage

across the capacitor increases to twice the input voltage and then resonates back to zero. *Id.* The switch is closed right when the voltage comes back to zero, thus minimizing power usage and achieving high efficiencies. *Id.*

2. Analysis of Claims 6 and 7

Turning now to our discussion of claims 6 and 7, we start with claim 6.

a. Dependent Claim 6

Claim 6 depends from method claim 1 and recites “producing said time varying magnetic field with a DC to DC type switching mode power supply circuit.” As discussed above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Flowerdew anticipates independent claim 1. *See supra* Part III.B.2.a.

For claim 6, Petitioner relies on Partovi-413, which teaches that “[i]n switching mode power supplies used today, the common geometries used are boost buck, flyback, boost, or a variation of these types.” Ex. 1006 ¶ 246 (cited by Pet. 71). Dr. Szepesi testifies in his declaration that a flyback circuit is an example of a DC-DC type switching mode power supply. Ex. 1003 ¶ 281 (cited by Pet. 71).

Petitioner contends that an ordinarily skilled artisan “would have recognized that implementing Flowerdew’s inductive power supply using a DC-DC switching-mode power supply topology (e.g., flyback . . .) was an ordinary, non-innovative option at the time . . . , and would have been motivated to implement the power supply in this manner.” Pet. 73–74; *see also id.* at 74–75. Petitioner asserts that the ordinarily skilled artisan “would

have looked to flyback, buck, boost, and buck-boost topologies since they were known to produce time-varying electric currents through a primary inductor.” *Id.* at 74; *see also id.* at 73 (citing Ex. 1006 ¶ 246). Petitioner also asserts that “modifying Flowerdew to use a switching mode power supply topology like those suggested by Partovi-413 would have involved the mere use of a known circuit topology for a similar purpose (an inductive wireless power transfer system) to produce predictable results.” *Id.* at 74. Petitioner adds that the ordinarily skilled artisan “would have understood that use of DC-DC switching mode power supply topologies as suggested in Partovi-413 was consistent with Flowerdew’s statement that ‘[o]ther circuit elements and arrangements may be utilized by charger 302 in order to provide alternating current flow to charging coil 312 and charging coil 314.’” *Id.* at 74–75 (quoting Ex. 1007, 6:11–13). Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 73–75 (citing Ex. 1003 ¶¶ 280–281).

Patent Owner makes essentially the same arguments here as it does for claim 3. In particular, responding to Petitioner’s argument proposing to combine Flowerdew and Partovi-413, Patent Owner asserts that “tellingly absent is any analysis of how there is any benefit in the combination[] over and above what Flowerdew already teaches.”⁸ PO Resp. 20. According to Patent Owner, “the Petition fails to establish a motivation to combine . . . Flowerdew with Jang and Partovi-413.” *Id.*; *see also id.* at 19–21.

⁸ In the previous paragraph, Patent Owner refers to claim 12, but we believe Patent Owner intended to refer to claim 6. *See* PO Resp. 20 (“Also with respect to claim 12, the Petitioner asserts that DC to DC type switching mode power supply circuits were a predictable option in inductive power systems prior to the filing date of the ’537 patent . . .”).

For reasons similar to those given above with respect to claim 3, Patent Owner's arguments do not undermine Petitioner's showing for claim 6. *See supra* Part III.C.2.a. Specifically, that Flowerdew and Partovi-413 both describe mechanisms for providing alternating current flow to a charging coil and that the use of Partovi-413's flyback topology was a known way to do that is the very reason for combining Flowerdew and Partovi-413. Again, Petitioner need not show that implementing Flowerdew's charger with Partovi-413's flyback topology to provide alternating current flow to a charging coil would have been "an 'improvement' in a categorical sense." *See Intel*, 61 F.4th at 1381. Petitioner need only show that Partovi-413's flyback topology would have been a "suitable option" for implementation in Flowerdew's charger. *See id.* Patent Owner does not dispute that an ordinarily skilled artisan would have recognized that using any of Partovi-413's topologies would have provided alternating current flow to a charging coil in systems like Flowerdew's system. *See generally* PO Resp.

Based on the record before us, we are persuaded that Petitioner's proposed combination of Flowerdew and Partovi-413 teaches the recited step of claim 6. We also are persuaded by Petitioner's proffered reasoning for modifying Flowerdew's charging system to include the flyback topology of Partovi-413, namely, to provide a way to implement Flowerdew's charger 302.

b. Dependent Claim 7

Claim 7 depends from claim 6 and recites "utilizing said first inductive element as a primary energy storage component in a DC to DC

conversion process of said DC to DC type switching mode power supply circuit.” For this step, Petitioner asserts that in a flyback topology, “the time-varying magnetic field is produced by switching a DC input to the primary inductor (*first inductive element*), thereby generating a time-varying current through the inductor.” Pet. 75. According to Petitioner, “[t]he primary inductor (*first inductive element*) thus provides the primary energy storage component (e.g., storing energy in magnetic fields) in the DC-DC conversion process of such DC-DC type switching mode power supply circuits.” *Id.* Petitioner relies on Dr. Szepesi’s declaration testimony as support. *Id.* (citing Ex. 1003 ¶¶ 287–288). Dr. Szepesi testifies in his declaration that “in DC to DC type switching regulators, of the types considered by Partovi-413, there are two energy storage elements, an inductor and a capacitor.” Ex. 1003 ¶ 288. We note this testimony is consistent with the teaching in Partovi-413 that “the current through the primary coil stores energy in this coil” during the time that the transistor is closed. Ex. 1006 ¶ 247 (discussing Figure 26).

Based on Petitioner’s argument and evidence, we are persuaded that Petitioner’s proposed combination of Flowerdew and Partovi-413 teaches the recited step of claim 7. Patent Owner does not dispute Petitioner’s analysis for this claim. *See generally* PO Resp.

3. Summary

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 6 and 7 would have been obvious over Flowerdew and Partovi-413.

E. Obviousness over Flowerdew, Jang, and Partovi-413

Petitioner asserts that claims 17 and 18 of the '537 patent would have been obvious over Flowerdew, Jang, and Partovi-413. Pet. 75–76. Patent Owner opposes. PO Resp. 19–21. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 17 and 18 would have been obvious over Flowerdew, Jang, and Partovi-413.

Claim 17 depends from system claim 12 and recites a similar limitation as method claim 6. Claim 18 depends from claim 17 and recites a similar limitation as method claim 7. As discussed above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that independent claim 12 would have been obvious over Flowerdew and Jang. *See supra* Part III.C.2.d. With respect to claims 17 and 18, Petitioner relies on its discussion of claims 6 and 7. Pet. 76. Patent Owner makes essentially the same arguments as it does for claim 6. *See* PO Resp. 20 (“[T]he Petition fails to establish a motivation to combine . . . Flowerdew with Jang and Partovi-413.”). Our analysis for claims 6 and 7 (*see supra* Part III.D) applies to claims 17 and 18. Accordingly, based on the record before us, and for the reasons given above regarding claims 6, 7, and 12, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 17 and 18 would have been obvious over Flowerdew, Jang, and Partovi-413.

F. Obviousness over Baarman and Partovi-002

We turn now to the Baarman-based grounds. Petitioner asserts that claims 1–5, 8–16, 19–22, and 28 of the '537 patent would have been obvious

over Baarman and Partovi-002. Pet. 6–42. Patent Owner opposes. PO Resp. 4–19. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–5 and 12–15 would have been obvious over Baarman and Partovi-002. We also determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 16 would have been obvious over Baarman and Partovi-002. We do not reach whether claims 8–11, 19–22, and 28 would have been obvious over Baarman and Partovi-002.

1. Qualification of Baarman as Prior Art

The parties dispute whether Baarman, a pre-grant publication, qualifies as prior art. Thus, as a preliminary matter, we consider the issue.

The '537 patent's filing date is November 14, 2008. Ex. 1006, code (22). Baarman's filing date is January 7, 2009, which is *after* the '537 patent's filing date. Ex. 1004, code (22). Baarman, however, claims priority to U.S. Provisional Application No. 61/019,411 (Ex. 1009, “the '411 Provisional” or “the Baarman Provisional Application”), which was filed on January 7, 2008, *before* the '537 patent's filing date. Ex. 1004, code (60).

Petitioner contends that “Baarman qualifies as prior art to the '537 patent based on its provisional priority date.” Pet. 6. As support, Petitioner asserts that, “[i]n accordance with *Dynamic Drinkware*, the '411 Provisional provides clear and unambiguous support for at least independent claim 1 of Baarman.” *Id.* (citing *Dynamic Drinkware, LLC v. Nat'l Geographics, Inc.*, 800 F.3d 1375 (Fed. Cir. 2015)). Petitioner also provides a table that “identifies exemplary support in the '411 Provisional

for each limitation of Baarman’s claim 1, and the testimony of Dr. Szepesi.” *Id.* at 6–8.

Patent Owner responds that “the Baarman Provisional Application must satisfy both (i) the written description requirement, and (ii) the enablement requirement, with respect to the claims of Baarman.” PO Resp. 4–5 (citing 35 U.S.C. § 119(e)(1)). Patent Owner asserts that “neither Petitioner nor its expert show[s] that any claim of Baarman is enabled by the Baarman Provisional Application, leaving Baarman with the priority date of January 7, 2009, *after* the ’537 patent’s filing date of November 14, 2008.” *Id.* at 8. According to Patent Owner, “Petitioner and its expert, . . . at best, only attempt to establish that the Baarman Provisional Application provides written description support for claim 1 of Baarman,” but neither “address[es] the issue of enablement.” *Id.* at 9. Patent Owner adds that neither “offer[s] any opinions regarding any of the *Wands* factors as they would pertain to the claims of Baarman vis-à-vis the Baarman Provisional Application.” *Id.* (citing *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988)).

Petitioner counters that, “[t]o the extent Patent Owner is arguing that the Petition does not address or show enablement because the Petition does not use the word ‘enable’ or a derivative thereof, Patent Owner ignores the Petition’s express statement that the ’411 Provisional supports Baarman’s claim 1 ‘in accordance with *Dynamic Drinkware*,’” which “encompass[es] the enablement requirement.” Pet. Reply 4 (citing Pet. 6). Petitioner asserts that its “table in the Petition (and Expert Declaration) ‘provides an element-by-element analysis of Baarman’s claim 1, and identifies, for each claim element, exemplary disclosure from the ’411 Provisional that is relevant to

and plainly supportive of the corresponding element of Baarman’s claim 1.” *Id.* at 5 (citing Pet. 7–8; Ex. 1003 ¶ 89); *see also id.* at 6–18. Petitioner further asserts that it thus “met its burden of production,” and that “[t]he burden of production then shifted to Patent Owner to prove via evidence that Baarman was not entitled to the benefit of the filing date of the ’411 Provisional.” *Id.* at 5. According to Petitioner, “Patent Owner has failed to meet its burden” because it does not “argue[] that Baarman’s claim 1 is not enabled by the ’411 Provisional,” let alone “refute the evidence of record with any of its own evidence or expert testimony to explain how or why it surmises that enablement is not shown.” *Id.* at 5–6.

In response, Patent Owner reiterates that “[t]he Petition failed to present prima facie evidence of enablement” because it did not “provide[] any explanation on whether the Baarman Provisional Application ‘teach[es] those in the art to make and use the invention [claimed in Baarman] without undue experimentation.’” PO Sur-reply 3 (citing *Wands*, 858 F.2d at 737). Patent Owner asserts that Petitioner does “not provide any analysis regarding the degree of experimentation required to practice the claims.” *Id.* at 4.

Our reviewing court has explained that “for a non-provisional application to claim priority to a provisional application for prior art purposes, ‘the specification of the *provisional* [application] must contain a written description of the invention . . . in such full, clear, concise, and exact terms, to enable an ordinarily skilled artisan to practice the invention claimed in the *non-provisional* application.’” *Amgen Inc. v. Sanofi*, 872 F.3d 1367, 1380 (Fed. Cir. 2017) (citing *Dynamic Drinkware*, 800 F.3d at 1378). That is, “the disclosure filed as the provisional application [must]

adequately provide[] (1) a written description of the subject matter of the claim(s) at issue in the later filed nonprovisional application, and (2) an enabling disclosure to permit one of ordinary skill in the art to make and use the claimed invention in the later filed nonprovisional application without undue experimentation.” *Dynamic Drinkware*, 800 F.3d at 1380 (quoting MPEP § 211.05(I)(A) (2014)).

At bottom, Patent Owner argues that Petitioner does not show that the Baarman Provisional Application provides an enabling disclosure to allow an ordinarily skilled artisan to make and use the claimed invention in Baarman without undue experimentation. We disagree. Claim 1 of Baarman recites “a primary circuit for generating a signal at an operating frequency and a duty cycle.” Ex. 1004, claim 1. Petitioner points to where the Baarman Provisional Application describes primary circuit 300 having a primary controller that “includes two microcontrollers, one to control the frequency and one to control the duty cycle.” Ex. 1009, 4 (cited by Pet. 7). The Baarman Provisional Application teaches that the microcontrollers “control[] the timing of the driver circuit 316 and switching circuit 318,” where “timing refers to both the frequency and duty cycle of the signal being generated.” *Id.* at 5 (cited by Pet. 7). The Baarman Provisional Application explains that “[f]requency . . . refers to the number of repetitions per unit time of a complete waveform,” whereas “[d]uty cycle refers to the proportion of time during which the waveform is high compared to the total amount of time for a complete waveform,” and provides an illustrative graph. *Id.* at 5, Fig. 7. The Baarman Provisional Application further identifies example components that can be used to make the primary circuit, specifying that “[t]he frequency microcontroller may be . . . a

PIC24FJ32GA002,” and that “[t]he duty microcontroller may be . . . a dsPIC30F2020.” *Id.* at 4. Additionally, the Baarman Provisional Application includes accompanying drawings that show the arrangement of circuit components. *Id.* at Figs. 3A, 3B (cited by Pet. 7).

Claim 1 of Baarman further recites “a tank circuit in electrical communication with said primary circuit, wherein said primary circuit applies said signal to said tank circuit to transfer an amount of power to said remote device.” Ex. 1004, claim 1. Petitioner cites Figures 3A and 3B of the Baarman Provisional Application, which show primary circuit 300 and tank circuit 320. Pet. 7 (citing Ex. 1009, Figs. 3A, 3B). The Baarman Provisional Application explains that these figures “together are a circuit diagram of an inductive power supply.” Ex. 1009, 2. Petitioner also points to the teaching in the Baarman Provisional Application that the primary controller, driver circuit, and switching circuit “together generate an AC signal . . . that is applied to the tank circuit . . . to create an inductive field for transferring power wirelessly to a secondary circuit.” Ex. 1009, 3 (cited by Pet. 7). In particular,

[T]he primary controller 310 may establish the operating frequency The controller 310, in turn, operates the driver circuit . . . at the frequency established by the primary controller 310. The driver circuit 316 provides the signals necessary to operate the switching circuit 318. As a result, the switching circuit 318 provides AC (alternating current) power to the tank circuit 320 from a source of DC (direct current) power. Ex. 1009, 7 (cited by Pet. 7).

Claim 1 of Baarman further recites “said inductive power supply receives feedback from said remote device.” Ex. 1004, claim 1. Petitioner points to where the Baarman Provisional Application teaches that the

secondary circuit may include a current sensor or a voltage sensor, a signal resistor for communicating using reflected impedance, and a wireless transmitter. Ex. 1009, 3 (cited by Pet. 7). Petitioner also points to where the Baarman Provisional Application teaches that “[t]he secondary communicates feedback about the received power back to the primary controller.” *Id.* at 1 (cited by Pet. 7). Specifically, the Baarman Provisional Application teaches,

The primary circuit may adjust the duty cycle depending on the demands of the secondary. For example, in one embodiment, one goal may be to maintain a certain amount of voltage or current in the secondary. Using feedback from the secondary, such as the sensed voltage and/or current, the operating frequency may be adjusted to ensure optimum power transfer efficiency by ensuring operation at substantially resonant frequency and the duty cycle may be adjusted to provide additional or less power to meet the desired goal.

Id. at 16 (cited by Pet. 7). The Baarman Provisional Application further teaches that “[p]lanned shunting of the signal resistor on the secondary[] . . . may be used to provide information to the primary using reflected impedance detected with the current sensor [of the primary circuit 300].” *Id.* at 8 (cited by Pet. 7).

Claim 1 of Baarman further recites “in response to said feedback, said primary circuit controls said operating frequency of said signal to optimize power transfer efficiency between said inductive power supply and said remote device.” Ex. 1004, claim 1. As discussed above, the Baarman Provisional Application teaches that “[u]sing feedback from the secondary, such as the sensed voltage and/or current, the operating frequency may be adjusted to ensure optimum power transfer efficiency.” Ex. 1009, 16 (cited by Pet. 8). Petitioner points to where the Baarman Provisional Application

further describes an “adjust operating frequency step 508 [that] is a multi-step process which ensures that the operating frequency is being maintained substantially at resonance.” *Id.* at 3, 13–14, Figs. 5, 6 (cited by Pet. 8). The description details each step and is accompanied by an illustrative flowchart. *Id.* at 13–14, Fig. 6.

Lastly, claim 1 of Baarman recites “in response to said feedback, said primary circuit controls said duty cycle of said signal to control said amount of power transferred to said remote device.” Ex. 1004, claim 1. As discussed above, the Baarman Provisional Application teaches that “[u]sing feedback from the secondary, such as the sensed voltage and/or current, . . . the duty cycle may be adjusted to provide additional or less power to meet the desired goal.” Ex. 1009, 16 (cited by Pet. 8). Petitioner points us to where the Baarman Provisional Application further describes in detail a “process for adjusting the duty cycle,” where the primary controller “continuously determines if the amount of power being transferred is too high.” *Id.* at 3 (cited by Pet. 8). The Baarman Provisional Application explains that the duty cycle is decreased if too much power is provided, and it is increased if too little power is provided. *Id.* The Baarman Provisional Application further explains that “the duty cycle may be stepped up or down proportional to the amount of power demanded by the secondary,” which “can be determined by reading the current and/or voltage sensor.” *Id.* at 16.

On the record before us, we are persuaded that the Baarman Provisional Application provides an enabling disclosure, which includes a detailed written description and accompanying drawings, such as block diagrams, circuit diagrams, flowcharts, and a graph, that specifies how to make and use the claimed invention in Baarman. As discussed above,

Petitioner points to where the Baarman Provisional Application illustrates the arrangement of electrical components in an inductive power supply such as the one claimed in Baarman, and even identifies specific commercial components that can be used. Petitioner also points to where the Baarman Provisional Application details how to use the inductive power supply to generate a signal at an operating frequency and a duty cycle, to apply that signal to transfer power to a remote device, to receive feedback from that remote device, and to control the operating frequency and the duty cycle in response to that feedback.

We note Patent Owner's contention that Petitioner does not address the *Wands* factors, which may be considered in determining whether a disclosure would require undue experimentation. *See* PO Resp. 9; *Enzo Biochem, Inc. v. Calgene, Inc.*, 188 F.3d 1362, 1371 (Fed. Cir. 1999). These factors, however, "while illustrative are not mandatory." *Cephalon, Inc. v. Watson Pharms., Inc.*, 707 F.3d 1330, 1336 (Fed. Cir. 2013). Moreover, "[a]lthough experimentation must not be undue, a reasonable amount of routine experimentation required to practice a claimed invention does not violate the enablement requirement." *Id.* Based on the cited portions of the Baarman Provisional Application, we do not discern that practicing Baarman's claimed invention would require undue experimentation. Patent Owner's Response does not present any arguments to the contrary. *See generally* PO Resp.

As Petitioner contends, it has "met its burden of production" by arguing obviousness based on its assertion that Baarman is prior art, as discussed above. *See* Pet. Reply 5; *Dynamic Drinkware*, 800 F.3d at 1379. The burden of production then shifts to Patent Owner to argue or produce

evidence that Baarman is not prior art because it is not entitled to the benefit of the Baarman Provisional Application's filing date of January 7, 2008. *See Dynamic Drinkware*, 800 F.3d at 1379–80. To shift the burden back to Petitioner, Patent Owner would have needed to present evidence to support an argument that the Baarman Provisional Application does not provide written description support of the claims recited in Baarman or an enabling disclosure that permits an ordinarily skilled artisan to make and use the claimed invention in Baarman without undue experimentation. *See id.* Patent Owner does not do that here. Instead, Patent Owner's Response merely presents the bare assertion that Petitioner has not met its burden to show enablement, without providing any countervailing evidence of non-enablement. PO Resp. 9.

Because Patent Owner neither argues nor presents evidence that Baarman is not entitled to the benefit of the filing date of the Baarman Provisional Application, we determine that Petitioner shows that Baarman qualifies as prior art.

2. Overview of Asserted Prior Art

Before addressing the parties' arguments, we provide an overview of the asserted prior art, Baarman and Partovi-002.

a. Baarman

Baarman describes “a system and method for wirelessly supplying power.” Ex. 1004 ¶ 2. To illustrate, Figure 1 of Baarman is reproduced below.

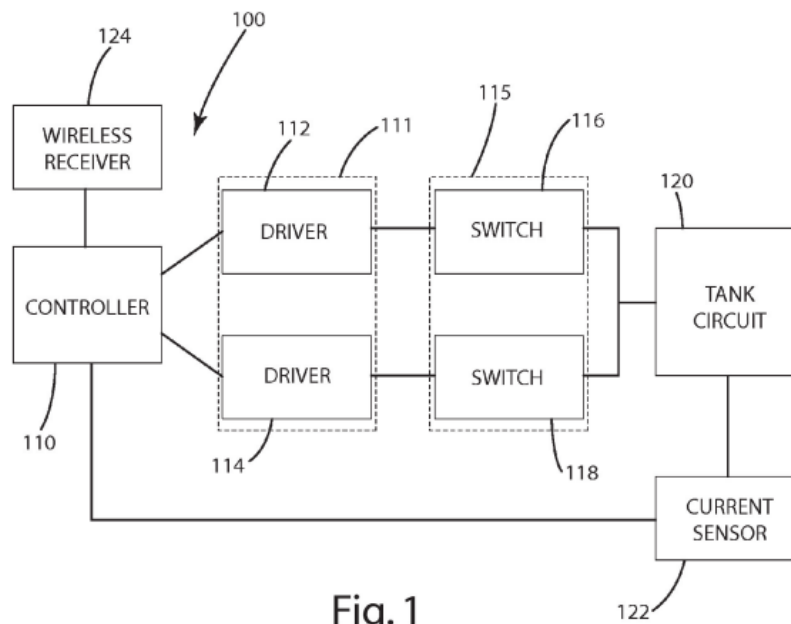


Fig. 1

Figure 1 of Baarman shows inductive power supply or primary circuit 100. *Id.* ¶ 19. Primary circuit 100 includes primary controller 110, driver circuit 111 (which has drivers 112, 114), switching circuit 115 (which has switches 116, 118), tank circuit 120, primary sensor 122, and wireless receiver 124. *Id.* Baarman explains that “[t]he primary controller 110, driver circuit 111 and the switching circuit 115 together generate an AC signal at a selected frequency and selected duty cycle that is applied to the tank circuit 120 to create an inductive field for transferring power wirelessly to a secondary circuit.” *Id.*

Figure 2 of Baarman, reproduced below, shows a secondary circuit.

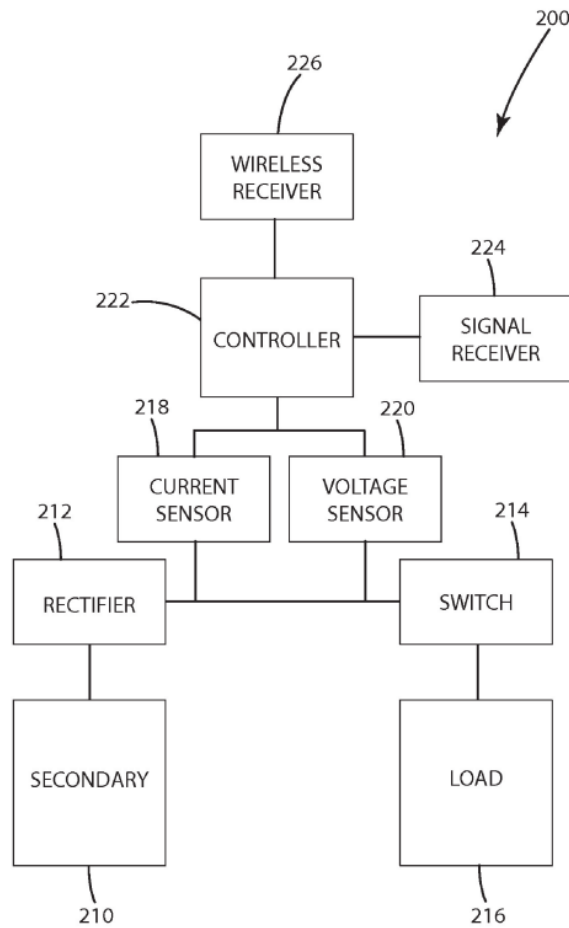


Fig. 2

In particular, Figure 2 of Baarman shows secondary circuit 200. Ex. 1004

¶ 19. Secondary circuit 200 includes secondary 210, rectifier 212, switch 214, load 216, current sensor 218, voltage sensor 220, secondary

controller 222, and signal resistor 224 for communicating using reflected impedance, and wireless transmitter 226.⁹ *Id.*

In operation, the initial operating frequency is set substantially at resonant frequency, and the initial duty cycle is set at a relatively low value. Ex. 1004 ¶ 20. Primary controller 110 continuously adjusts the operating frequency to maintain substantially resonant frequency. *Id.* Primary controller 110 also continuously determines whether the amount of power being transferred is too high, decreasing the duty cycle if the amount exceeds a preset threshold and increasing the duty cycle if too little power is being provided. *Id.*

b. Partovi-002

Partovi-002 describes a power source, charging system, and inductive receiver for mobile devices. Ex. 1005 ¶ 39. In particular, Partovi-002 describes a pad (base unit) that includes a primary, which creates a magnetic field by applying an alternating current to a coil or other type of current-carrying wire. *Id.* Partovi-002 also describes a receiver that receives the energy from the alternating magnetic field and transfers it to a mobile device. *Id.* The receiver may include electronic components or logic to set

⁹ Baarman's Figure 2 refers to element 224 as a signal receiver, but Baarman's specification refers to that element as a signal resistor. Ex. 1004 ¶ 19, Fig. 2. Similarly, Baarman's Figure 2 refers to element 226 as a wireless receiver, but Baarman's specification refers to the element as a wireless transmitter. *Id.* Based on Baarman's description of another embodiment of a secondary circuit, we understand element 224 to represent a signal resistor and element 226 to represent a wireless transmitter. *See, e.g., id.* ¶ 34 (describing secondary circuit 400 having signal resistor 432 and wireless transmitter 430).

the voltage and current to the levels required by the mobile device, or to communicate information to and from the pad. *Id.* Partovi-002's system may incorporate efficiency measures that improve the efficiency of power transfer between the charger and the receiver. *Id.*

Partovi-002 explains that an important aspect of power transfer efficiency involves the alignment of coils with respect to each other. Ex. 1005 ¶ 135. To illustrate, Figure 13 of Partovi-002 is reproduced below.

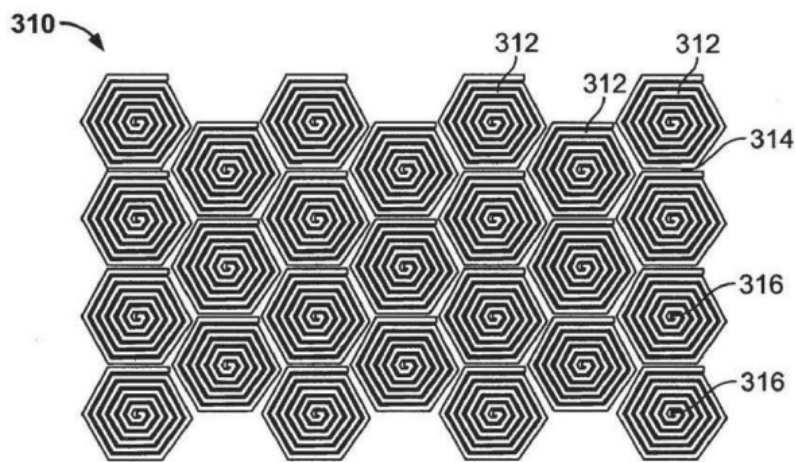


FIG. 13

Figure 13 of Partovi-002 shows pad-type charger 310, which includes a layer of coils 312 with minimal spacing 314 between the coils. *Id.* Each coil 314 has center 316. *Id.* Partovi-002 explains that “[t]he power transfer for a 1.25” diameter coil as the center of the secondary is offset from the center of primary,” and that “[t]he power drops off to 25% of the maximum value when the two coils are offset by a coil radius.” *Id.* To better align the coils, Partovi-002 uses magnets centered on the primary and the secondary coils, which provides a way of automatically bringing the two coils into alignment. *Id.*

In another embodiment, the primary can be incorporated into a cup shape. Ex. 1005 ¶ 85. Partovi-002 explains that “[a] mobile device can be placed into the cup on end and the receiver could be built-in to the end of the mobile device . . . or on the back or circumference of the device.” *Id.* The receiver may receive power from the bottom or wall of the cup. *Id.*

3. Analysis of Claims 1–5, 8–16, 19–22, and 28

We discuss claims 1–5, 8–16, 19–22, and 28 of the ’537 patent.

a. Independent Claim 1

As discussed above, claim 1 is directed to a “method for inductively transferring power” comprising a “positioning” step, an “applying” step, a “monitoring” step, and an “automatically adjusting” step. Petitioner designates these steps as elements 1.1 through 1.4. We address the recited preamble and steps in turn.

i. Preamble

The preamble of claim 1 recites “[a] method for inductively transferring power from a base unit providing input power, to a target unit providing output power, where the base unit and the target unit are electrically isolated.” For the preamble, Petitioner identifies Baarman’s primary circuit (inductive power supply) as a “base unit” and Baarman’s secondary circuit as a “target unit.” Pet. 13. As support, Petitioner directs us to Baarman’s teaching that its primary circuit is capable of providing power wirelessly. Ex. 1004 ¶ 21 (cited by Pet. 13). Baarman teaches in particular that its primary circuit’s “primary controller 110, driver

circuit 111 and . . . switching circuit 115 together generate an AC signal at a selected frequency and selected duty cycle that is applied to the tank circuit 120 to create an inductive field for transferring power wirelessly to a secondary circuit.” Ex. 1004 ¶ 19, Figs. 1, 2 (cited by Pet. 13–16).

Although we do not determine whether the preamble of claim 1 is limiting, we are persuaded that Baarman teaches the subject matter of the preamble. Patent Owner does not dispute Petitioner’s analysis for the preamble. *See generally* PO Resp.

ii. Element 1.1: “positioning” step

Element 1.1 of claim 1 recites “positioning a second inductive element of said target unit within a predetermined distance of a first inductive element of said base unit.” Petitioner provides two alternative arguments. For one argument, Petitioner contends that Baarman “plainly suggests” the recited positioning step. Pet. 17. As support, Petitioner asserts that “Baarman acknowledges the well-understood principle of inductive systems that the level and efficiency of power transfer from the primary to the secondary is impacted by the positioning of the secondary inductor relative to the primary coil.” *Id.* at 16 (citing Ex. 1004 ¶ 45); *see also* Pet. Reply 19 (citing Ex. 1004 ¶¶ 44–45). Relying on Dr. Szepesi’s declaration testimony, Petitioner further asserts that “the strength of the magnetic field in an inductive power transfer system diminishes with distance from the primary inductor and thus a stronger magnetic coupling can be achieved by positioning the secondary inductor in closer proximity to the primary inductor, and in alignment with the magnetic field lines.” Pet. 16 (citing Ex. 1003 ¶ 112). Petitioner also relies on the teachings of U.S. Patent

No. 6,825,620 (Ex. 1008, “Kuennen”), which Petitioner asserts is incorporated by reference in Baarman. *Id.* (citing Ex. 1004 ¶ 28). Petitioner points specifically to where Kuennen describes an “air gap [that] is the distance between the inductive coupler and the secondary coil,” and that “provides a magnetic flux path for inducing sufficient voltage in the secondary coil to establish and maintain an operating point for the secondary load.” *Id.* at 16–17 (quoting Ex. 1008, 3:22–28). Petitioner adds that Kuennen teaches that its “secondary coil (element 52, FIG. 2B) in assembly 14 should be removably seated onto a main housing 12 at a predetermined distance from the primary inductor (electronics assembly 44 in bottom of base 18, FIG. 2A).” *Id.* at 17 (citing Ex. 1008, 5:34–62, 8:29–48, 15:64–16:44, Figs. 2A, 2B, 4). Patent Owner does not dispute Petitioner’s analysis in this regard. *See generally* PO Resp.

For its alternative argument, Petitioner relies additionally on Partovi-002 “[t]o the extent Element[1.1] is narrowly construed such that Baarman does not expressly disclose this claim element.” Pet. 17. Petitioner asserts in particular that “Partovi-002 suggests several conventional solutions to achieve a desired positioning within a predetermined distance between the primary and secondary inductors in a wireless power transfer system.” *Id.* As an example, Petitioner asserts that “Partovi-002 proposes a method of ‘automatic’ alignment using ‘magnets centered on the primary and the secondary coil,’” where “[t]he magnets produce a force that brings the receiving unit into alignment with the secondary coil of the charging pad to enable efficient wireless inductive power transfer.” *Id.* (citing Ex. 1005 ¶ 135, Fig. 13). According to Petitioner, “[t]he magnetic alignment method ensures that the secondary

inductor coil is positioned within at least a ‘coil radius’ of the primary inductor coil.” *Id.* at 17–18 (citing Ex. 1005 ¶ 135).

As another example, Petitioner asserts that “Partovi-002 suggests that ‘the primary can be incorporated into a shape such as a cup,’” where “[a] mobile device can be placed into the cup standing on end and the receiver could be built-in to the end of the mobile device . . . or on the back or circumference of the device.” Pet. 18 (citing Ex. 1005 ¶ 85). Relying on the declaration testimony of Dr. Szepesi, Petitioner further asserts that “[t]he secondary inductor would thus be advantageously positioned within a predetermined distance of the primary inductor when the mobile device is mechanically mated within the cup-shaped base unit.” *Id.* (citing Ex. 1003 ¶ 115).

Petitioner contends that an ordinarily skilled artisan “would have recognized that positioning the secondary inductive element in a close, predetermined arrangement relative to the primary inductive element (as suggested by Partovi-002) would have improved the magnetic coupling and efficiency of power transfer from the primary circuit (*base unit*) to the secondary circuit (*target unit*).” Pet. 19. Petitioner adds that an ordinarily skilled artisan “would have been further motivated by Partovi-002’s suggestions to implement magnetic and mechanical structures that achieve a predetermined position/alignment of the primary and secondary inductors so as to provide convenient, user-friendly methods of relative positioning performed quickly and with a reduced likelihood of user error.” *Id.* Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* (citing Ex. 1003 ¶¶ 116–117).

With respect to Petitioner’s alternative argument, which proposes combining Baarman and Partovi-002, Patent Owner asserts that, “tellingly absent, is any analysis of how there is *any* benefit in the combination[] over and above what Baarman already teaches.” PO Resp. 10. Patent Owner further asserts that Petitioner’s “allegation of benefits of . . . substituting the positioning system of Baarman with the positioning system of Partovi-002[] . . . amounts to an unsupported assumption that a [person of ordinary skill in the art] would have seen some benefit from indiscriminately applying all inductive power transfer positioning systems . . . to Baarman’s inductive power transfer system.” *Id.* at 13. Patent Owner adds that Petitioner “fails to compare the inductive power transfer positioning system . . . disclosed by Baarman with the Petition’s proposed combinations including the positioning system of Partovi-002 . . . or identify any affirmative reason a [person of ordinary skill in the art] would have had to make the proposed modifications.” *Id.* at 13–14. According to Patent Owner, Petitioner’s “failure to show that a [person of ordinary skill in the art] *would have been motivated* to make its proposed combination is established by the Petition’s failure to articulate any benefit of that combination over and above what Baarman already teaches.” *Id.* at 12.

We disagree with Patent Owner. That Baarman and Partovi-002 both describe what Patent Owner refers to as “positioning systems” and that Partovi-002’s use of magnets or a cup was a known way to provide a positioning system is the very reason for combining Baarman and Partovi-002. *See* PO Resp. 13. As discussed previously, Petitioner need not show that implementing Baarman’s inductive power transfer system with Partovi-002’s magnets or cup to provide a positioning system would have been “an

‘improvement’ in a categorical sense.” *See Intel*, 61 F.4th at 1381.

Petitioner instead need only show that Partovi-002’s magnets or cup would have been a “suitable option” for implementation in Baarman’s inductive power transfer system. *See id.* Patent Owner does not dispute that an ordinarily skilled artisan would have recognized that using Partovi-002’s magnets or cup would have provided a positioning system in inductive power transfer systems like Baarman’s system. *See generally* PO Resp.

We note that Petitioner nevertheless identifies various benefits of combining Baarman and Partovi-002, such as “improv[ing] . . . magnetic coupling and efficiency of power transfer,” providing a way “to better keep the coils aligned,” and providing “an automatic method of bringing . . . two parts into alignment.” Pet. 19. Petitioner supports its position with citations to the record. For example, Petitioner points to where Partovi-002 explains that “[a]n important aspect of power transfer efficiency relates to the alignment of coils with respect to each other,” and that “to better keep the coils aligned, use of magnets centered on the primary and the secondary coil can provide an automatic method of bringing the two parts into alignment.” Ex. 1005 ¶ 135 (cited by Pet. 19).

Accordingly, on the record before us, we are persuaded that Petitioner’s proposed combination of Baarman and Partovi-002 teaches the recited positioning step of claim 1. We also are persuaded that Petitioner’s proffered reasoning for modifying Baarman’s system to include Partovi-002’s positioning system is sufficient to support the legal conclusion of obviousness. *See Kahn*, 441 F.3d at 988.

iii. Element 1.2: “applying” step

Element 1.2 of claim 1 recites “applying a time varying electric current to said first inductive element to produce a time varying magnetic field, said time varying magnetic field induces an electric current in said second inductive element.” For this step, Petitioner directs us to Baarman’s teaching that “[t]he primary controller 110, driver circuit 111 and the switching circuit 115 together generate an AC signal at a selected frequency and selected duty cycle that is applied to the tank circuit 120 to create an inductive field for transferring power wirelessly to a secondary circuit.” Ex. 1004 ¶ 19 (cited by Pet. 20); *see also id.* ¶ 29 (“The driver circuit 316 provides the signals necessary to operate the switching circuit 318. As a result, the switching circuit 318 provides AC (alternating current) power to the tank circuit 320 from a source of DC (direct current) power.”) (cited by Pet. 20).

Based on Petitioner’s argument and evidence, we are persuaded that Baarman teaches the applying step of claim 1. Patent Owner does not dispute Petitioner’s analysis for this step. *See generally* PO Resp.

iv. Element 1.3: “monitoring” step

Element 1.3 of claim 1 recites “monitoring at least one parameter indicative of an efficiency of power transfer from said base unit to said target unit.” Petitioner provides two alternative arguments.

For the first argument, Petitioner directs us to Baarman’s teaching that “[b]y sensing the voltage and/or current in the secondary circuit and knowing the voltage and/or current provided by the primary circuit, the primary controller can calculate the power transfer efficiency.” Ex. 1004

¶ 35 (cited by Pet. 21); *see also id.* ¶ 37 (“Communication of the sensed voltage and/or current in the secondary may be transmitted to the primary controller 310 in a variety of ways.”) (cited by Pet. 22). Petitioner asserts that these voltages and currents “provide ‘at least one parameter’ indicative of power transfer efficiency from the primary circuit (base unit) to the secondary circuit (target unit).” Pet. 21. Petitioner further asserts that “[t]he result of the primary controller’s efficiency calculation also provides ‘at least one parameter’ indicative of power transfer efficiency—and is in fact a direct expression of such efficiency.” *Id.*

For the second, alternative argument, Petitioner asserts that “Baarman’s primary controller monitors the peak rectified tank current voltage, which provides ‘at least one parameter’ indicative of power transfer efficiency.” Pet. 22 (citing Ex. 1004 ¶¶ 29–31, Fig. 3D). Petitioner asserts that “[t]he peak rectified tank current voltage is obtained using current sensor 322 to monitor the current through the tank circuit (including the primary conductor), and the voltage itself is generated on R-C circuit R11-C17 (and then provided to the primary microcontroller as I_SENSE).”¹⁰ *Id.* According to Petitioner, “[t]he peak rectified tank current voltage is indicative of power transfer efficiency since the magnitude of the voltage corresponds to the current through the tank circuit, which varies with power transfer efficiency and which is maximized when the system is at resonance.” *Id.* (citing Ex. 1004 ¶ 6). Petitioner relies on the declaration

¹⁰ During oral argument, Petitioner’s counsel stated, “We have the current coming in, a certain wavelength coming in through the diode [D6] going to the load [R11-C17] that’s affecting the *voltage at the load*,” which Petitioner calls the “peak rectified tank current voltage.” Tr. 17:1–3 (emphasis added); *see also* Ex. 1004, Fig. 3D.

testimony of Dr. Szepesi. *Id.* at 22–23 (citing Ex. 1003 ¶¶ 62–67, 92–95, 120–125).

Based on Petitioner’s argument and evidence, we are persuaded that Baarman teaches the monitoring step of claim 1. Patent Owner does not dispute Petitioner’s analysis for this step. *See generally* PO Resp.

v. Element 1.4: “automatically adjusting” step

Element 1.4 of claim 1 recites “automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit.” Petitioner again provides two alternative arguments, building on the respective arguments discussed above as to element 1.3.

For the first argument, Petitioner asserts,

Baarman’s primary circuit automatically adjusts a “frequency” of the time-varying current applied to the primary inductor (***at least one characteristic of said time varying electric current***) responsive to the monitored power transfer efficiency parameters (e.g., the primary current, primary voltage, secondary current, and secondary voltage values, and ultimately the calculated power transfer efficiency) to maximize an efficiency of power transfer from the primary circuit (***base unit***) to the secondary circuit (***target unit***).

Pet. 23 (citing Ex. 1004 ¶ 35). Petitioner further asserts that “Baarman seeks to maximize power transfer efficiency by driving the system at ‘resonance’—which is explicitly recognized as the ‘operating frequency that yields the best power transfer efficiency.’” *Id.* (quoting Ex. 1004 ¶ 35). As support, Petitioner directs us to Baarman’s teaching that “[b]y sensing the voltage and/or current in the secondary circuit and knowing the voltage and/or current provided by the primary circuit, the primary controller can

calculate the power transfer efficiency,” and that “[b]y sweeping a range of operating frequencies, noting the power transfer efficiency at each frequency, the operating frequency closest to resonance can be determined.” Ex. 1004 ¶ 35 (quoted by Pet. 23–24). Petitioner asserts that “[t]he primary controller automatically sets the operating frequency at the frequency that achieves the highest power transfer efficiency, both when setting the ‘initial operating frequency’ and during continued operation (even as the load or position of the secondary changes relative to the primary).” Pet. 24–25 (citing Ex. 1004 ¶¶ 41–45, Figs. 6, 7).

For the second, alternative argument, Petitioner asserts that “Baarman’s primary controller automatically adjusts the frequency of the time-varying electric current (*at least one characteristic*) responsive to the peak rectified tank current voltage (*at least one parameter*) obtained from current sensor 322 (e.g., the voltage generated on R11-C17 and input to the microcontroller as I_SENSE).” Pet. 25–26. As support, Petitioner directs us to Baarman’s teaching that “the primary controller 310 may establish the operating frequency as a function of input from the current sensor 322.” Ex. 1004 ¶ 29 (cited by Pet. 26); *see also id.* at Fig. 3D (cited by Pet. 26). Petitioner further asserts that “[t]he frequency is automatically adjusted to maintain resonance and maximize power transfer efficiency.” Pet. 26 (citing Ex. 1004 ¶¶ 6, 35, 44, Figs. 6, 7).

Based on Petitioner’s argument and evidence, we are persuaded that Baarman teaches the automatically adjusting step of claim 1. Patent Owner does not dispute Petitioner’s analysis for this step. *See generally* PO Resp.

b. Dependent Claim 2

Claim 2 depends from claim 1 and recites “said characteristic comprises at least one of a frequency of said time varying current and a duty cycle of said time varying current.” For this limitation, Petitioner cross-references its analysis for claim element 1.4 and asserts that “Baarman discloses automatically adjusting a ‘frequency’ of the time varying current through the primary inductor (*at least one characteristic of said time varying electric current*) responsive to the power transfer efficiency parameters.” Pet. 26 (citing Ex. 1004 ¶¶ 25, 35, 41–45, 50, Figs. 5–7). Petitioner further directs us to Baarman’s teaching that “the operating frequency may be adjusted to ensure optimum power transfer efficiency.” Ex. 1004 ¶ 50 (cited by Pet. 26).

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

c. Dependent Claim 3

Claim 3 depends from claim 1 and recites “producing said time varying electric current by switching a DC voltage source using an electronically controlled switch element.” For this limitation, Petitioner asserts that “Baarman discloses that the time varying electric current through the primary inductor in the primary circuit (*base unit*) is produced by switching a ‘*DC voltage source*’ using an ‘*electronically controlled switch*’ (e.g., switching circuits 115/318).” Pet. 26 (citing Ex. 1004 ¶¶ 24–26, Figs. 1, 3A–3D). As discussed above with respect to claim element 1.2, Baarman teaches that that “[t]he primary controller 110, driver circuit 111

and the switching circuit 115 together generate an AC signal at a selected frequency and selected duty cycle that is applied to the tank circuit 120 to create an inductive field for transferring power wirelessly to a secondary circuit.” Ex. 1004 ¶ 19 (cited by Pet. 20). Baarman further teaches that “[t]he driver circuit 316 provides the signals necessary to operate the switching circuit 318,” and, “[a]s a result, the switching circuit 318 provides AC (alternating current) power to the tank circuit 320 from a source of DC (direct current) power.” *Id.* ¶ 29 (cited by Pet. 20). In addition, Baarman teaches that the power source “suppl[ies] low voltage power,” and that “[t]he switching circuit 318 includes two switches,” which “are implemented as MOS field effect transistors.” *Id.* ¶¶ 24, 26 (cited by Pet. 26).

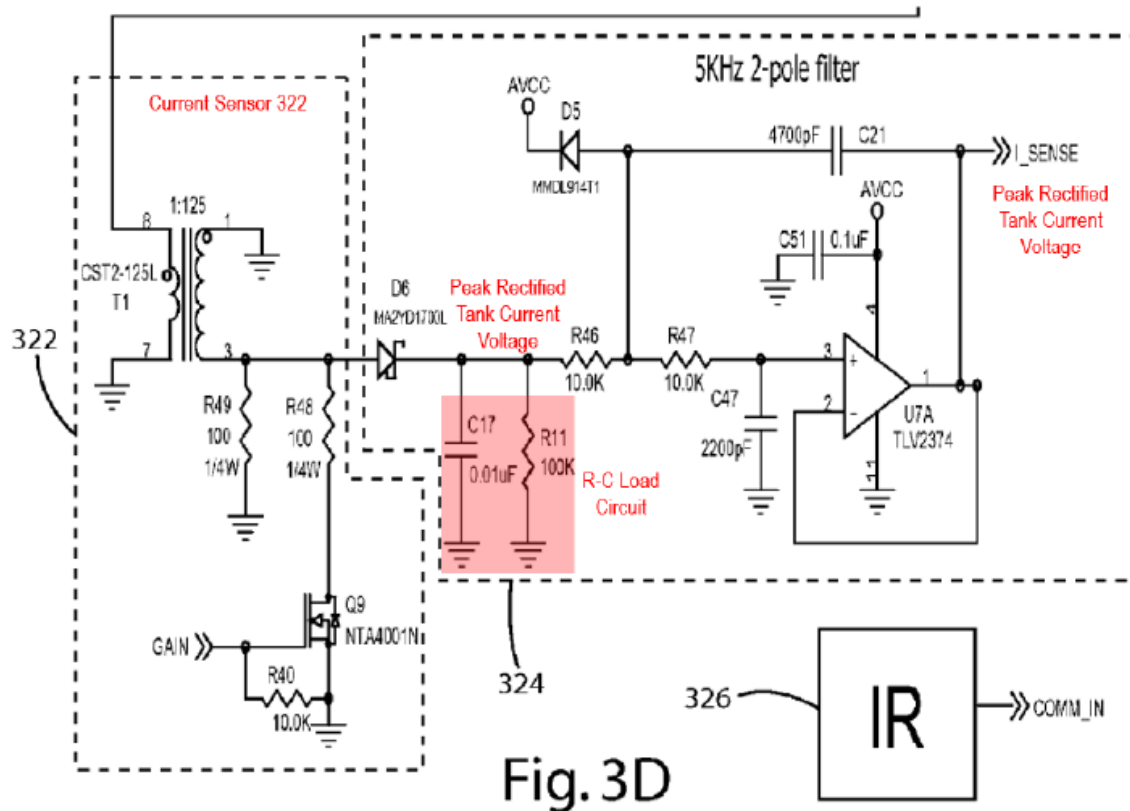
Based on Petitioner’s argument and evidence, we are persuaded that Baarman teaches the recited limitation of claim 3. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

d. Dependent Claim 4

Claim 4 depends from claim 3 and recites “communicating said time varying electric current to a load in said base unit, and selecting said parameter to be a measured current or voltage associated with said load.” Petitioner provides two alternative arguments, building on the respective arguments discussed above as to claim 1 (elements 1.3, 1.4).

For one argument, Petitioner asserts that “Baarman discloses that a current sensor 122/322 in the primary circuit (***base unit***) measures current through tank circuit 120, which includes the primary inductor.” Pet. 27 (citing Ex. 1004 ¶¶ 29, 31, Figs. 1, 3D). To illustrate, Petitioner provides a

cropped and annotated version of Figure 3D of Baarman, reproduced below.
Pet. 28.



Petitioner’s version of Figure 3D of Baarman is a portion of a circuit diagram of an inductive power supply. *See* Ex. 1004 ¶ 13. Petitioner asserts that Figure 3D shows that “current sensor 322 communicates the time-varying electric current from the tank circuit (including the primary inductor) to an R-C load circuit R11-C17 (*load*) in the primary (*base unit*).” Pet. 27 (citing Ex. 1004 ¶ 31, Fig. 3D). Petitioner also asserts that “Figure 3D shows in more detail that the peak rectified tank current voltage (*said parameter*) generated on R-C load circuit R11-C17 (*load*) is the actual measurement obtained from current sensor 322.” *Id.* at 27–28 (citing Ex. 1004, Fig. 3D). In addition, Petitioner asserts that “[t]he peak rectified current voltage is then input to the primary microcontroller as I_SENSE.”

Id. at 28 (citing Ex. 1004, Fig. 3D). Petitioner concludes that “Baarman thus discloses selecting the peak rectified tank current [voltage] (*said parameter*) to be a measured voltage associated with R-C load circuit R11-C17 (*load*).”

Id. In support of its position, Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 27–28 (citing Ex. 1003 ¶ 134).

For the other, alternative argument, Petitioner refers back to its analysis for claim elements 1.3 and 1.4, where it argues that “Baarman monitors ‘*at least one parameter*’ indicative of power transfer efficiency by calculating a power transfer efficiency value using primary current, primary voltage, secondary current, and secondary voltage values.” Pet 29 (citing Ex. 1004 ¶ 35). Petitioner asserts that “[t]he secondary circuit (*target unit*) communicates the secondary current and voltage measurements to the primary circuit (*base unit*) using a ‘signal resistor 432,’ which are then detected in the signal from current sensor 122/322.” *Id.* (citing Ex. 1004 ¶¶ 30–32, 36, 38–39). Petitioner contends that “[t]he secondary current and voltage measurements thus provide a measured current and measured voltage associated with load circuit R11-C17 (*load*).” *Id.* According to Petitioner, “the secondary current and voltage are ‘*associated*’ with load circuit R11-C17 since their communication to the primary controller would result in corresponding pulses in the peak rectified current voltage on R11-C17 to communicate the ‘stream of data’ containing the messages to the primary controller via fluctuations in the reflected impedance.” *Id.* at 29–30

(citing Ex. 1004 ¶ 38).¹¹ Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* (citing Ex. 1003 ¶ 135).

Based on Petitioner's argument and evidence, we are persuaded that Baarman teaches the recited limitation of claim 4. Patent Owner does not appear to dispute Petitioner's analysis for this limitation. *See generally* PO Resp. To the extent that Patent Owner disputes Petitioner's analysis for claim 4 as it relates to claim 5 (which depends from claim 4), we address that dispute below with respect to claim 5.

e. Dependent Claim 5

Claim 5 depends from claim 4 and recites "comparing said measured current or voltage to a constant reference value." Petitioner provides two alternative arguments, building on the respective arguments discussed above regarding claim 4.

For one argument, Petitioner asserts that "Baarman discloses that the secondary circuit includes capabilities to signal 'over-current' or 'over-voltage' states in the secondary by shunting a 'signal resistor' in the secondary, and an indication of the over-current or over-voltage state is then

¹¹ During oral argument, Petitioner's counsel further explained, "So, we're calling that associated because without the load in that loop -- and the load is for both what's being measured at the primary coil as well as what's being measured at the secondary coil -- we're having to extract from that the voltage value, because that's the parameter being used by the controller. . . . So, the output of what the load outputs gets detected and that has now been sent as an input back to the load in this loop. That's the association[.] . . . [T]he circuit keeps going, Your Honor. It is a loop. What comes out of the load then impacts the coil, which we are then detecting with the detector, which then becomes an input to the load[.]" Tr. 18:11–23, 19:21–24.

detected through fluctuations in the reflected impedance at the primary circuit using current sensor 122/322.” Pet. 30 (citing Ex. 1004 ¶¶ 30, 38). Petitioner further directs us to Baarman’s incorporation by reference of U.S. Application No. 11/855,710, which was published as U.S. Publication No. 2008/0079392 (Ex. 1012, “Baarman-392”). *Id.* (citing Ex. 1004 ¶ 38); Ex. 1012, code (21). Petitioner asserts that Baarman-392 “discloses that over-current and over-voltage states are detected by comparing the secondary measured current or voltage levels (*said measured current or voltage*) to a predetermined, constant reference value.” Pet. 30. As support, Petitioner points to where Baarman-392 teaches,

The output of an over-voltage detector 36 indicates whether the voltage across the battery 34 is above a predetermined level. Similarly, the output of an overcurrent detector 40 indicates whether the current to the battery 34 is above a predetermined amount.

Ex. 1012 ¶ 35, Fig. 2 (cited by Pet. 30–31). Petitioner also points to where Baarman-392 teaches,

In operation, if the output of the over-voltage detector 36 or the output of the over-current detector 40 indicate[s] an over-voltage or an over-current situation, then the output of the OR gate 38 turns on the switch 42. When the switch 42 is on, current from the rectifier 32 flows through the resistor 44 to ground.

Id. ¶ 36, Fig. 2 (cited by Pet. 30–31). Petitioner relies on the declaration testimony of Dr. Szepesi. Pet. 30–31 (citing Ex. 1003 ¶ 140).

For its other, alternative argument, Petitioner asserts “Baarman also suggests that the peak rectified current voltage (*said measured voltage*) would be compared to a constant reference voltage which represents the peak rectified value of the primary inductor’s current.” Pet. 31. As support, Petitioner directs us to where Baarman-392 teaches,

In one embodiment, the feedback detector is a current sensor coupled to the primary tank circuit. . . . [W]hen the current is shunted through the feedback signaling resistor in the secondary, the current through the secondary coil increases, which varies the reflected impedance of the secondary circuit resulting in increased current through the primary coil. The increase in current through the primary coil is detected by the current sensor in the primary circuit, which could include a peak detector, thereby providing to the controller a feedback signal for detecting whether the battery is in an over-voltage or over-current state. . . . [T]he frequency control mechanism makes appropriate adjustments to the frequency to correct the over-voltage or over-current state by reducing the power supplied to the secondary coil.

Ex. 1012 ¶ 14 (cited by Pet. 31). Dr. Szepesi testifies that “to recognize the error condition and perform the action described in Baarman (through incorporation of Baarman-392) (reducing the drive frequency to reduce the power supplied to the secondary coil), the primary controller would determine that the primary coil current is above the level corresponding to the highest power [for] normal operation with some margin.” Ex. 1003 ¶ 139 (cited by Pet. 31). According to Dr. Szepesi, the “known way to do this at the time of the invention of the ‘537 patent was comparing the measured voltage, e.g., the voltage on R-C circuit R11-C17 (see Fig. 4), which is a voltage representing the peak rectified value of the primary inductor’s current, to a reference voltage which represents the threshold above which the primary controller recognizes it as secondary load modulation signaling.” *Id.*

Patent Owner makes several arguments. We address the arguments in turn.

i. Peak Rectified Tank Current Voltage

With respect to Petitioner’s argument that the measured peak rectified tank current voltage in Baarman corresponds to the recited measured voltage, Patent Owner argues that “Baarman does not use the term ‘peak rectified tank current voltage’ with respect to the output of the R-C load circuit R11-C17 or the conditioned I-SENSE signal and Petitioner does not explain why either the output of the R-C load circuit R11-C17 or the conditioned I-SENSE signal should be qualified as ‘peak.’” PO Resp. 16.

Patent Owner’s argument in this regard, however, does not undermine Petitioner’s showing for claim 5. Claim 5 recites “comparing said measured current or voltage to a constant reference value.” Petitioner identifies the voltage at R-C load circuit R11-C17 as the recited measured voltage. Nowhere does the claim language require the measured voltage to be qualified as “peak.” Accordingly, even if Petitioner has mischaracterized Baarman’s voltage at R-C load circuit R11-C17 as “peak,” that voltage still satisfies the recited measured voltage. Patent Owner does not argue otherwise.

ii. Secondary Circuit Current and Voltage

As to Petitioner’s argument that the measured current or voltage in Baarman’s *secondary circuit* corresponds to the recited measured current or voltage, Patent Owner asserts that “Petitioner does not explain how the secondary circuit voltage and current satisfy th[e] requirement” of claim 4 (from which claim 5 depends) “that the ‘time varying electric current’ that is applied ‘to the first inductive element’ in the base unit be communicated to the load.” PO Resp. 16–17. Patent Owner reasons that, “[w]hile the

parameters of secondary circuit voltage and current can be used by the primary controller 310 to determine the efficiency of power transfer, those parameters are *not measured* through the current or voltage associated with the current sensor and conditioning circuitry of Baarman's primary circuit." *Id.* at 17; *see also id.* at 17–18. As shown in Figure 3D of Baarman, conditioning circuitry 324 of the primary circuit includes R-C load circuit R11-C17 (which corresponds to the recited load). Ex. 1004, Fig. 3D.

Petitioner responds that "Baarman teaches that the voltage/current sensed (measured) by its secondary circuit is '*associated with*' its load (load circuit R11-C17) because the load's voltage is affected and altered by, at least in part, the measured voltage/current." Pet. Reply 25. Petitioner asserts that "Baarman's secondary circuit includes a signal resistor that communicates the measured voltage/current to a current sensor of the primary circuit via reflected impedance," and that "Baarman explains, via its incorporation of Baarman-392, that variations in the reflected impedance of the secondary circuit cause increased current through the primary coil of the primary circuit, which is detected by the current sensor." *Id.* (citing Ex. 1004 ¶¶ 19, 30–31, 37; Ex. 1012 ¶ 14). Petitioner further asserts that "[t]he current sensor's detection of increased current through the primary coil causes temporary increases in the measured voltage associated with the R-C load circuit R11-C17 (*load*)." *Id.* at 25–26. According to Petitioner, "[b]ecause the voltage is affected by the measured voltage/current, the measured voltage/current is associated with the load." *Id.* at 26. Petitioner adds that claim 5 does not "require that the current or voltage be measured in the base unit (or the target unit)," and that the claim "require[s] only that the (measured) current or voltage that is being monitored be *associated with* the

load and impose[s] no limitation on *where* the measurement or monitoring itself occurs.” *Id.* Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 25 (citing Ex. 1003 ¶ 135).

Patent Owner counters that Petitioner’s “analysis is divorced from the claim language.” PO Sur-reply 7. Patent Owner asserts that claim 4 (through its dependency from claim 1) requires “automatically adjusting at least one characteristic of said time varying electric current [*responsive to the measured current or voltage associated with said load*] to maximize an efficiency of power transfer.” *Id.* at 7–8. Patent Owner further asserts that “[w]hen Baarman automatically adjusts the operating frequency based on the secondary voltage and current, it does so in response to the secondary voltage and current,” *not* “in response to the voltage of the load circuit R11-C17.” *Id.* at 8. According to Patent Owner, “[t]he plain and ordinary meaning of ‘associated’ is ‘connected,’” and “[c]laim 4 therefore requires the ‘parameter indicative of an efficiency of power transfer’ to be a ‘measured voltage or current **connected with** said load.’” *Id.* As support, Patent Owner directs us to the ’537 patent’s description of a measurement of a “voltage generated **across** at least a portion of the load.” *Id.* (emphasis added) (citing Ex. 1001, 5:18–34). Patent Owner contends that Baarman’s “secondary voltage and current are ‘associated with’ the secondary circuit, not the R11-C17 load circuit,” and that Petitioner does not explain “how the secondary voltage or current is ‘connected with’ the load other than to assert that the secondary voltage or current is communicated through the load.” *Id.* at 9.

We disagree with Patent Owner. As Patent Owner acknowledges, Petitioner explains that “the voltage at the R11-C17 circuit will change as a

result of the communication of measured secondary voltage and current from the secondary circuit.” PO Sur-reply 8–9. Petitioner explains in particular that “variations in the reflected impedance of the secondary circuit cause increased current through the primary coil of the primary circuit, which is detected by the current sensor,” and that “[t]he current sensor’s detection of increased current through the primary coil causes temporary increases in the measured voltage associated with the R-C load circuit R11-C17 (*load*).” Pet. Reply 25–26. Petitioner’s counsel further explained during oral argument,

[T]he output of what the load outputs gets detected and that has now been sent as an input back to the load in this loop. That’s the association[.]

* * *

[T]he circuit keeps going[.] It is a loop. What comes out of the load then impacts the coil, which we are then detecting with the detector, which then becomes an input to the load[.]

Tr. 18:11–23, 19:21–24. In this regard, we are persuaded that the measured voltage and current from the secondary circuit in Baarman are “associated” with R-C load circuit R11-C17.

We note Patent Owner’s contention that Baarman’s “secondary circuit voltage and current . . . are *not measured* through the current or voltage associated with the current sensor and conditioning circuitry of Baarman’s primary circuit,” which includes load circuit R11-C17. PO Resp. 17. Patent Owner relies on the ’537 patent’s description of a measurement of a “voltage generated across at least a portion of the load.” PO Sur-reply 8 (citing Ex. 1001, 5:18–34). Claim 5, however, requires “a measured current or voltage *associated* with said load” (emphasis added). The claim language

recites nothing about measuring a voltage or current *across* the load. If the applicant for the '537 patent intended for the current or voltage to be measured *across* the load, then the applicant should have included that limitation in the claim during prosecution. *See Morris*, 127 F.3d at 1056 (“[T]he burden of precise claim drafting [is] squarely on the applicant.”).

Additionally, although the '537 patent discloses examples and embodiments where the voltage or current across the load is measured, nowhere does the specification limit “measured current or voltage” to those examples and embodiments. Indeed, the '537 patent states that “the CTRL 118 can be configured to . . . monitor[] the voltage generated across at least a portion of the load 106.” Ex. 1001, 5:18–34 (emphasis added). As noted above, our reviewing court has “cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.” *Williamson*, 792 F.3d at 1346–47.

iii. Relationship Between the Adjusting and Comparing Steps

Patent Owner argues that, “[e]ven assuming, *arguendo*, that Petitioner was correct that Baarman’s measurement of the secondary circuit current and/or voltage could satisfy the measurement requirements of claim[] 5 . . . , Baarman’s ‘over-current’ and ‘over-voltage’ mechanism still does not satisfy the claims as a whole.” PO Resp. 18. According to Patent Owner, “[t]his is because Baarman does not describe using the ‘over-current’ and ‘over-voltage’ mechanism to adjust a characteristic of the time varying electric current to ‘maximize an efficiency of power transfer,’ as required by claim[] 5.” *Id.* Patent Owner asserts that its argument also applies where

Petitioner identifies Baarman's peak rectified tank current voltage as the recited measured voltage. *Id.* at 18–19.

Petitioner responds that claim 5 does not recite that “the comparison . . . must be used to ‘maximize an efficiency of power transfer.’” Pet. Reply 27. Petitioner asserts that “when Patent Owner wanted to recite a particular purpose to the adjustment of the characteristic, it explicitly recited as such in the claim (*i.e.*, claim element [1.4]).” *Id.* at 27–28; *see also* Ex. 1001, claim 1 (reciting “automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit.”). Petitioner further asserts that “[c]laim 5 does not recite any adjustment as a result of the comparison, [or] any purpose or requirement for the comparison.” Pet. Reply 28.

Patent Owner counters that claim 5 “modifies the requirement of claim 4 that the parameter by which claim 1 ‘automatically adjust[s] at least one characteristic of said time varying electric current’ is ‘a measured current or voltage associated with said load’ to require that the parameter is determined by ‘comparing said measured current or voltage to a constant reference value.’” PO Sur-reply 10. According to Patent Owner, “[b]ecause claim 1 requires the adjustment of the time varying electric current based on that parameter, Petitioner is wrong that ‘[c]laim 5 does not recite any adjustment as a result of the comparison.’” *Id.*

We disagree with Patent Owner. Claim 1 recites “automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit.” Claim 4, which depends indirectly

from claim 1, recites “selecting said parameter to be a measured current or voltage associated with said load.” Thus, claim 4 requires automatically adjusting at least one characteristic of the time varying electric current responsive to a measured current or voltage associated with the load to maximize an efficiency of power transfer from the base unit to the target unit.

Claim 5, which depends from claim 4, recites “comparing said measured current or voltage to a constant reference value.” Thus, claim 5 requires (1) automatically adjusting at least one characteristic of the time varying electric current responsive to a measured current or voltage associated with the load to maximize an efficiency of power transfer from the base unit to the target unit, and (2) comparing the measured current or voltage to a constant reference value.

Nothing in the claim language requires that “the parameter is determined by ‘comparing said measured current or voltage to a constant reference value,’” as Patent Owner contends. *See* PO Sur-reply 10. The claims simply say that the parameter is the measured current or voltage. Although claim 5 requires the measured current or voltage to be used in carrying out the adjusting step and the comparing step, claim 5 does not tie the adjusting step and the comparing step to each other. In other words, the two steps are carried out independently of one another; neither is carried out based on the other. If the applicant for the ’537 patent intended to require “any adjustment as a result of the comparison,” as Patent Owner contends, then the applicant should have included that limitation in the claim during prosecution. *See* PO Sur-reply 10; *Morris*, 127 F.3d at 1056 (“[T]he burden of precise claim drafting [is] squarely on the applicant.”). Indeed, the

applicant did just that for claim 16, which recites “said control circuit automatically selectively adjusts said characteristic *based on* a comparison of said measured current or voltage to a constant reference value” (emphasis added).

On the record before us, we are persuaded that Baarman teaches the recited limitation of claim 5.

f. Dependent Claims 8–11 and Independent Claim 28

As discussed above, we determine that Petitioner has shown by a preponderance of the evidence that Flowerdew anticipates claims 8–11 and 28. *See supra* Part III.B.2. Because the Flowerdew-based ground is dispositive as to challenged claims 8–11 and 28, we need not reach the ground based on Baarman and Partovi-002 as to these claims. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (nonprecedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”). Accordingly, we do not reach Petitioner’s arguments that claims 8–11 and 28 would have been obvious over Baarman and Partovi-002.

g. Independent Claim 12

As discussed above, claim 12 is directed to an “inductive power transfer system” comprising a “base unit,” a “positioning structure,” a “switch element,” and a “control circuit.” Petitioner designates these limitations as elements 12.1 through 12.4. We address the recited limitations in turn.

i. Element 12.1: “base unit”

Element 12.1 of claim 12 recites “a base unit comprising a first inductive element configured for providing input power to a second inductive element of a target unit providing output power, said base unit electrically isolated from said target unit.” For this limitation, Petitioner asserts that “Baarman discloses a primary circuit (***base unit***) having a tank circuit that includes a primary inductor (***first inductive element***).” Pet. 34–35 (citing Ex. 1004 ¶ 28, Figs. 1, 3A–3D). Petitioner further asserts that, “[w]hen driven by [a] switching network, the primary inductor provides input power to a secondary inductor (e.g., secondary 210) (***second inductive element***) of a secondary circuit (***target unit***) that provides output power to a load (e.g., load 216).” *Id.* at 35 (citing Ex. 1004 ¶ 19). Petitioner additionally asserts that “Baarman’s circuit (***base unit***) is electrically isolated from the secondary circuit (***target unit***).” *Id.* As support, Petitioner directs us to Baarman’s teaching that its primary circuit includes a primary controller, a driver circuit, a switching circuit, and a tank circuit, where the tank circuit includes the primary. Ex. 1004 ¶¶ 19, 28 (cited by Pet. 34–35). Baarman further teaches that “[t]he primary controller 110, driver circuit 111 and the switching circuit 115 together generate an AC signal . . . that is

applied to the tank circuit 120 to create an inductive field for transferring power wirelessly to a secondary circuit.” *Id.* ¶ 19.

Based on Petitioner’s argument and evidence, we are persuaded that Baarman teaches the recited base unit of claim 12. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

ii. Element 12.2: “positioning structure”

Element 12.2 of claim 12 recites “a positioning structure provided on at least one of said base unit and said target unit for removably positioning said second inductive element at a predetermined orientation and distance relative to said first inductive element.” For this limitation, Petitioner cross-references its discussion of claim element 1.1, and asserts that “Partovi-002 discloses positioning structures provided on at least one of the primary unit (*base unit*) and the secondary unit (*target unit*) for removably positioning the secondary inductive element at a predetermined orientation and distance relative to the first inductive element.” Pet. 35. As an example, Petitioner asserts that “Partovi-002 proposes a method of ‘automatic’ alignment using ‘magnets centered on the primary and the secondary coil,’” where “[t]he magnets produce a force that brings the receiving unit into alignment with the secondary coil of the charging pad to enable efficient wireless inductive power transfer.” *Id.* at 17 (discussing element 1.1) (citing Ex. 1005 ¶ 135, Fig. 13); *see also id.* at 35–36 (discussing element 12.2) (citing Ex. 1005 ¶¶ 135–141). According to Petitioner, “[t]he magnetic alignment method ensures that the secondary inductor coil is positioned within at least a ‘coil radius’ of the primary inductor coil.” *Id.* at 17–18 (citing Ex. 1005 ¶ 135).

As another example, Petitioner asserts that “Partovi-002 suggests that ‘the primary can be incorporated into a shape such as a cup,’” where “[a] mobile device can be placed into the cup standing on end and the receiver could be built-in to the end of the mobile device . . . or on the back or circumference of the device.” Pet. 18 (discussing element 1.1) (citing Ex. 1005 ¶ 85); *see also id.* at 36 (discussing element 12.2) (citing Ex. 1005 ¶¶ 85–87). Relying on the declaration testimony of Dr. Szepesi, Petitioner further asserts that “[t]he secondary inductor would thus be advantageously positioned within a predetermined distance of the primary inductor when the mobile device is mechanically mated within the cup-shaped base unit.” *Id.* at 18 (discussing element 1.1) (citing Ex. 1003 ¶ 115).

Petitioner contends that an ordinarily skilled artisan “would have recognized that positioning the secondary inductive element in a close, predetermined arrangement relative to the primary inductive element (as suggested by Partovi-002) would have improved the magnetic coupling and efficiency of power transfer from the primary circuit (*base unit*) to the secondary circuit (*target unit*).” Pet. 19 (discussing element 1.1); *see also id.* at 36 (discussing element 12.2). Petitioner adds that an ordinarily skilled artisan “would have been further motivated by Partovi-002’s suggestions to implement magnetic and mechanical structures that achieve a predetermined position/alignment of the primary and secondary inductors so as to provide convenient, user-friendly methods of relative positioning performed quickly and with a reduced likelihood of user error.” *Id.* at 19 (discussing element 1.1); *see also id.* at 37 (discussing element 12.2). Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 19 (discussing

element 1.1) (citing Ex. 1003 ¶¶ 116–117); *see also id.* at 36–37 (discussing element 12.2) (citing Ex. 1003 ¶ 160).

Patent Owner makes the same arguments as it does for claim 1 (specifically, claim element 1.1). *See* PO Resp. 10–14. For the reasons given above with respect to claim 1, Patent Owner’s arguments do not undermine Petitioner’s showing for claim 12. *See supra* Part III.F.3.a.ii (discussing element 1.1).

Accordingly, on the record before us, we are persuaded that Petitioner’s proposed combination of Baarman and Partovi-002 teaches the recited positioning structure of claim 12. We also are persuaded that Petitioner’s proffered reasoning for modifying Baarman’s system to include Partovi-002’s positioning system is sufficient to support the legal conclusion of obviousness. *See In re Kahn*, 441 F.3d at 988.

iii. Element 12.3: “switch element”

Element 12.3 of claim 12 recites “a switch element configured for selectively applying a time varying electric current to said first inductive element to produce a time varying magnetic field, said time varying magnetic field inducing an electric current in said second inductive element.” For this limitation, Petitioner asserts that “Baarman discloses a ‘*switch element*’ (e.g., switching circuits 115/318 or one or both of switches 116) configured for selectively applying a time varying electric current to the primary inductor (*first inductive element*) to produce a time varying magnetic field that induces an electric current in the secondary inductor (*second inductive element*).” Pet. 37 (citing Ex. 1004 ¶¶ 19, 23,

Figs. 1, 4; Ex. 1003 ¶ 161). Petitioner cross-references its analysis for claim element 1.2. *Id.*

Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim 1 (*see supra* Part III.F.3.a.ii), we are persuaded that Baarman teaches the recited switch element of claim 12. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

iv. Elements 12.4, 12.5: “control circuit”

Lastly, claim 12 recites “a control circuit configured for monitoring at least one parameter indicative of an efficiency of power transfer from said base unit to said target unit, and automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit.” Petitioner designates this limitation as elements 12.4 and 12.5, without explanation. Pet. 37. We interpret the Petition as designating the “monitoring” aspect of the limitation as element 12.4 and the “automatically adjusting” aspect of the limitation as element 12.5.

Regarding the limitation as a whole, Petitioner contends that “Baarman discloses a ‘**control circuit**’ (e.g., primary controller 110/310) configured for ‘monitoring’ and ‘automatically adjusting’ as recited in Elements [12.4]-[12.5].” Pet. 37 (citing Ex. 1004 ¶¶ 19, 23, Figs. 1, 3A–3D; Ex. 1003 ¶¶ 162–163). Petitioner cross-references its analysis for claim elements 1.3 and 1.4. *Id.*

Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim elements 1.3 and 1.4 (*see supra*

Part III.F.3.a), we are persuaded that Baarman teaches the recited control circuit of claim 12. Patent Owner does not dispute Petitioner's analysis for this limitation. *See generally* PO Resp.

h. Dependent Claims 13 and 14

Claims 13 and 14 depend from claim 12 and recite similar limitations as claims 2 and 3, respectively. Accordingly, for claims 13 and 14, Petitioner relies on its discussion of claims 2 and 3. Pet. 38. Patent Owner does not separately dispute Petitioner's analysis for claims 13 and 14. On this record, and for the reasons given above for claims 2 and 3, we are persuaded by Petitioner's showing for the recited limitations of claims 13 and 14. *See supra* Parts III.F.3.b–c.

i. Dependent Claim 15

Claim 15 depends from claim 14 (which depends from claim 12) and recites “a load circuit coupled to said first inductive element, and where said parameter comprises a current or voltage associated with said load.” For this limitation, Petitioner provides two alternative arguments.

For one argument, Petitioner cross-references its analysis for claim 4, and asserts that “the R-C circuit R11-C17 (***load circuit***) in the primary is coupled to the primary coil (***first inductive element***) in the tank circuit, especially since the voltage on R11-C17 provides a measure of the current in the tank circuit (which includes the primary coil).” Pet. 38 (citing Ex. 1004, Figs. 1, 3D). Petitioner further asserts that “[t]he voltage on R11-C17 is the rectified peak tank current voltage (***said parameter***), which provides the I_SENSE current measurement to the primary controller, and which

comprises a current or voltage associated with the R11-C17 (***load circuit***).” *Id.* Petitioner adds that “[t]he measured secondary current and voltage are also associated with the R11-C17 load circuit for the reasons previously described in [regard to] Claim 4.” *Id.* at 39.

For its other, alternative argument, Petitioner asserts that “Baarman’s secondary ‘load’ (e.g., load 216 or load 424) provides a ‘***load circuit***’ coupled to the primary coil (***first inductive element***) based on magnetic coupling that results between the primary and secondary coils when the system achieves inductive power transfer.” Pet. 38 (citing Ex. 1004 ¶¶ 19–20, Figs. 2, 4). Petitioner further asserts that “[t]he measured secondary current and voltage values (***at least one said parameter***) indicate the current provided to the load and the voltage to the load, respectively.” *Id.* (citing Ex. 1004 ¶¶ 33–35, Fig. 4). According to Petitioner, “[t]he measured secondary current and voltage values are therefore associated with the secondary load (e.g., LOAD 424).” *Id.* at 39.

For both arguments, Petitioner additionally cross-references its analysis for claim elements 1.3 and 1.4. *Id.* at 38–39.

Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim elements 1.3 and 1.4, as well as claim 4, (*see supra* Parts III.F.3.a, III.F.3.d), we are persuaded that Baarman teaches the recited limitation of claim 15. Patent Owner does not dispute Petitioner’s analysis for this limitation. *See generally* PO Resp.

j. Dependent Claim 16

Claim 16 depends from claim 15 and recites “said control circuit automatically selectively adjusts said characteristic based on a comparison

of said measured current or voltage to a constant reference value.” For this limitation, Petitioner cross-references its analysis of claim 5. Pet. 39. Petitioner asserts that “Baarman, through its incorporation of Baarman-392 . . . , discloses that over-current and over-voltage states are detected by comparing the measured current or voltage levels in the secondary to a predetermined, constant reference value.” *Id.* (citing Ex. 1012 ¶¶ 35–36). Petitioner also asserts that “Baarman further discloses that ‘the peak detector on the primary circuit is able to sense the over-voltage/over-current condition and act accordingly.’” *Id.* (citing Ex. 1005 ¶ 38). In addition, Petitioner asserts that “Baarman, through its incorporation of Baarman-392, expands on this disclosure, explaining that the primary can act by ‘mak[ing] appropriate adjustments to the frequency to correct the over-voltage or over-current state by reducing the power supplied to the secondary coil.’” *Id.* (citing Ex. 1012 ¶¶ 14, 34, 37, 45–46). According to Petitioner, “Baarman thus discloses a control circuit that automatically selectively adjusts the frequency (*said characteristic*) based on the over-current/over-voltage conditions detected from the comparison of the measured current/voltage to a constant reference value.” *Id.* at 39–40. Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 40 (citing Ex. 1003 ¶¶ 171–173).

Patent Owner makes several arguments. For example, Patent Owner argues that “Baarman’s ‘over-current’ and ‘over-voltage’ mechanism . . . does not satisfy the claims as a whole. . . . because Baarman does not describe using the ‘over-current’ and ‘over-voltage’ mechanism to adjust a characteristic of the time varying electric current to ‘maximize an efficiency of power transfer,’ as required by claim[] . . . 16.” PO Resp. 18.

Petitioner responds that claim 16 does not recite that “the adjustment of the characteristic based on the comparison . . . must be used to ‘maximize an efficiency of power transfer.’” Pet. Reply 27. Petitioner asserts that “when Patent Owner wanted to recite a particular purpose to the adjustment of the characteristic, it explicitly recited as such in the claim (*i.e.*, claim element [1.4]),” which recites “automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an efficiency of power transfer from said base unit to said target unit.” *Id.* at 27–28. Petitioner further asserts that “claim 16 [does not] recite any purpose or requirement for the . . . adjustment.” *Id.* at 28.

Patent Owner counters that “Petitioner is wrong that ‘claim 16 [does not] recite any purpose or requirement for the comparison or adjustment,’” and that “claim 16, contrary to Petitioner’s assertion, requires that the ‘comparison of said measured current or voltage to a constant reference value’ is part of the ‘control circuit . . . automatically adjusting at least one characteristic of said time varying electric current responsive to . . . maximize an efficiency of power transfer.’” PO Sur-reply 12–14. As support, Patent Owner asserts that “[c]laim 12 recites that the ‘control circuit’ is responsible for ‘adjusting at least one characteristic of said time varying electric current . . . to maximize an efficiency of power transfer,’” and that “[c]laim 16 more specifically requires that the adjustment is made ‘based on a comparison of said measured current or voltage [of the load circuit of claim 15] to a constant reference value.’” *Id.* at 14.

We agree with Patent Owner. Claim 12 recites “a control circuit configured for . . . automatically adjusting at least one characteristic of said time varying electric current responsive to said parameter to maximize an

efficiency of power transfer from said base unit to said target unit.” That is, claim 12 requires adjusting a characteristic to maximize an efficiency of power transfer.

Claim 15, which depends indirectly from claim 12, recites “where said parameter comprises a current or voltage associated with said load.” Thus, claim 15 requires a control circuit configured for automatically adjusting at least one characteristic of the time varying electric current responsive to a current or voltage associated with the load to maximize an efficiency of power transfer from the base unit to the target unit.

Claim 16, which depends from claim 15, recites “wherein said control circuit automatically selectively adjusts said characteristic based on a comparison of said measured current or voltage to a constant reference value.” Based on our reading of the claim language, we determine that claim 16 further limits claim 15’s adjusting a characteristic *responsive to a current or voltage* by requiring adjusting the characteristic *based on a comparison of the current or voltage to a constant reference value*. As Patent Owner contends, claim 16 requires a control circuit that (1) automatically selectively adjusts at least one characteristic of the time varying electric current (2) based on a comparison of the current or voltage associated with the load to a constant reference value (3) to maximize an efficiency of power transfer from the base unit to the target unit. *See* PO Sur-reply 14.

Turning to the asserted prior art, we note that Petitioner does not dispute Patent Owner’s contention that “Baarman does not describe using the ‘over-current’ and ‘over-voltage’ mechanism to adjust a characteristic of the time varying electric current to ‘maximize an efficiency of power

transfer.” See PO Resp. 18. Indeed, Petitioner asserts that “Baarman teaches, via its incorporation of Baarman-392, comparing sensed (measured) voltage/current to a predetermined level (*‘constant reference value’*) **to detect an ‘over-voltage or an over-current situation.’**” Pet. Reply 27 (emphasis in bold added). Petitioner further insists that “[t]he claims recite no such requirement” that “the adjustment of the characteristic based on the comparison in claim 16 must be used to ‘maximize an efficiency of power transfer.’” *Id.*

On the record before us, we are not persuaded that Baarman teaches the recited limitation of claim 16.

k. Dependent Claims 19–22

As discussed above, we determine that Petitioner has shown by a preponderance of the evidence that claims 19–22 would have been obvious over Flowerdew and Jang. See *supra* Part III.C.2.e. Because the ground based on Flowerdew and Jang is dispositive as to challenged claims 19–22, we need not reach the ground based on Baarman and Partovi-002 as to these claims. See *SAS*, 138 S. Ct. at 1359; *Bos. Sci. Scimed*, 809 F. App’x at 990. Accordingly, we do not reach Petitioner’s arguments that claims 19–22 would have been obvious over Baarman and Partovi-002.

4. Summary

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–5 and 12–15 would have been obvious over Baarman and Partovi-002. Petitioner has not, however, demonstrated by a preponderance of the evidence that claim 16

would have been obvious over Baarman and Partovi-002. We do not reach whether claims 8–11, 19–22, and 28 would have been obvious over Baarman and Partovi-002 because we determine that claims 8–11 and 28 are anticipated by Flowerdew (*see supra* Part III.B.2), and that claims 19–22 would have been obvious over Flowerdew and Jang (*see supra* Part III.C.2.e).

G. Obviousness over Baarman, Partovi-002, and Partovi-413

Petitioner asserts that claims 6, 7, 17 and 18 of the '537 patent would have been obvious over Baarman, Partovi-002, and Partovi-413. Pet. 43–47. Patent Owner opposes. PO Resp. 10–14. For the reasons explained below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 6, 7, 17, and 18 would have been obvious over Baarman, Partovi-002, and Partovi-413.

1. Analysis of Claims 6, 7, 17, and 18

We discuss claims 6, 7, 17, and 18 of the '537 patent.

a. Dependent Claim 6

Claim 6 depends from method claim 1 and recites “producing said time varying magnetic field with a DC to DC type switching mode power supply circuit.” As discussed above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that independent claim 1 would have been obvious over Baarman and Partovi-002. *See supra* Part III.F.3.a.

For claim 6, Petitioner asserts that “Baarman’s primary side circuit uses half-bridge ‘switching circuit’ (e.g., switching circuits 115/318).” Pet. 43. Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* (citing Ex. 1003 ¶¶ 192–197). Dr. Szepesi testifies that Baarman’s circuit “uses a buck switching regulator circuit 312 (see Fig. 3C) to generate the supply voltage for the primary control circuit 310,” which, according to Dr. Szepesi, is a DC-DC converter topology of switch mode power supplies. Ex. 1003 ¶¶ 192, 196.

Under an alternative theory, Petitioner relies on Partovi-413, which teaches that “[i]n switching mode power supplies used today, the common geometries used are boost buck, flyback, boost, or a variation of these types.” Ex. 1006 ¶ 246 (cited by Pet. 43). Dr. Szepesi testifies in his declaration that a flyback circuit is an example of a DC-DC type switching mode power supply. Ex. 1003 ¶ 193 (cited by Pet. 43).

Petitioner contends that “a [person of ordinary skill in the art] would have recognized that implementing Baarman’s inductive power supply using a DC-DC switching-mode power supply topology (e.g., flyback . . .) was an ordinary, non-innovative option at the time . . . , and would have been motivated to implement the power supply in this manner.” Pet. 45; *see also id.* at 45–46. Petitioner asserts that the ordinarily skilled artisan “would have looked to flyback, buck, boost, and buck-boost topologies since they were known to produce time-varying electric currents through a primary inductor.” *Id.* at 45; *see also id.* at 43 (citing Ex. 1006 ¶ 246). Petitioner also asserts that “modifying Baarman to use a switching mode power supply topology like those suggested by Partovi-413 would have involved the mere use of a known circuit topology for a similar purpose (an inductive wireless

power transfer system) to produce predictable results.” *Id.* at 45. Petitioner adds that the ordinarily skilled artisan “would have understood that use of DC-DC switching mode power supply topologies as suggested in Partovi-413 was consistent with Baarman’s explanation that ‘[t]he illustrated adaptive inductive power supply 300 is merely exemplary, . . . and the present invention may be implemented with essentially any inductive power supply that can be modified to provide inductive power at varying duty cycles.’” *Id.* at 45–46 (quoting Ex. 1004 ¶ 21). Petitioner relies on the declaration testimony of Dr. Szepesi. *Id.* at 73–75 (citing Ex. 1003 ¶¶ 193–197).

Patent Owner makes essentially the same arguments as it does for claim 1 (specifically, claim element 1.1). In particular, responding to Petitioner’s argument proposing to combine Baarman, Partovi-002, and Partovi-413, Patent Owner asserts that, “tellingly absent, is any analysis of how there is **any** benefit in the combination[] over and above what Baarman already teaches.” PO Resp. 10. Patent Owner further asserts that Petitioner’s “allegation of benefits of . . . substituting the circuit topologies of Baarman with the circuit topologies of Partovi-413[] amounts to an unsupported assumption that a [person of ordinary skill in the art] would have seen some benefit from indiscriminately applying all . . . inductive power transfer circuit topologies to Baarman’s inductive power transfer system.” *Id.* at 13. Patent Owner adds that Petitioner “fails to compare the inductive power transfer . . . circuit topologies disclosed by Baarman with the Petition’s proposed combinations including . . . the circuit topologies of Partovi-413 or identify any affirmative reason a [person of ordinary skill in the art] would have had to make the proposed modifications.” *Id.* at 13–14.

According to Patent Owner, Petitioner’s “failure to show that a [person of ordinary skill in the art] *would have been motivated* to make its proposed combination is established by the Petition’s failure to articulate any benefit of that combination over and above what Baarman already teaches.” *Id.* at 12.

For reasons similar to those given above with respect to claim 1, Patent Owner’s arguments do not undermine Petitioner’s showing for claim 6. *See supra* Part III.F.3.a. Specifically, that Baarman and Partovi-413 both describe mechanisms for providing alternating current flow to a coil and that the use of Partovi-413’s flyback topology was a known way to do that is the very reason for combining Baarman and Partovi-413. As discussed above, Petitioner need not show that implementing Baarman’s system with Partovi-413’s flyback topology to provide alternating current flow to a coil would have been “an ‘improvement’ in a categorical sense.” *See Intel*, 61 F.4th at 1381. Rather, Petitioner need only show that Partovi-413’s flyback topology would have been a “suitable option” for implementation in Baarman’s system. *See id.* Patent Owner does not dispute that an ordinarily skilled artisan would have recognized that using any of Partovi-413’s topologies would have provided alternating current flow to a coil in systems like Baarman’s system. *See generally* PO Resp.

Based on the record before us, we are persuaded that Petitioner’s proposed combination of Baarman, Partovi-002, and Partovi-413 teaches the recited step of claim 6. We also are persuaded by Petitioner’s proffered reasoning for modifying the combination of Baarman and Partovi-002 to include the flyback topology of Partovi-413.

b. Dependent Claim 7

Claim 7 depends from claim 6 and recites “utilizing said first inductive element as a primary energy storage component in a DC to DC conversion process of said DC to DC type switching mode power supply circuit.” For this step, Petitioner asserts that in a flyback topology, “the time-varying magnetic field is produced by switching a DC input to the primary inductor (*first inductive element*), thereby generating a time-varying current through the inductor.” Pet. 46. According to Petitioner, “[t]he primary inductor (*first inductive element*) thus provides the primary energy storage component (e.g., storing energy in magnetic fields) in the DC-DC conversion process of such DC-DC type switching mode power supply circuits.” *Id.* at 46–47. Petitioner relies on Dr. Szepesi’s declaration testimony as support. *Id.* (citing Ex. 1003 ¶¶ 198–199). Dr. Szepesi testifies in his declaration that “in DC to DC type switching regulators, of the types considered by Partovi-413, there are two energy storage elements, an inductor and a capacitor.” Ex. 1003 ¶ 199. We note this testimony is consistent with the teaching in Partovi-413 that “the current through the primary coil stores energy in this coil” during the time that the transistor is closed. Ex. 1006 ¶ 247 (discussing Figure 26).

Patent Owner makes essentially the same arguments as it does for claim 6. *See* PO Resp. 14 (“[T]he Petition fails to establish a motivation to combine . . . Baarman with Partovi-002 and Partovi-413.”). Based on Petitioner’s argument and evidence, and for the reasons given above with respect to claim 6, we are persuaded that Petitioner’s proposed combination of Baarman, Partovi-007, and Partovi-413 teaches the recited step of claim 7.

c. Dependent Claims 17 and 18

Claim 17 depends from system claim 12 and recites a similar limitation as method claim 6. Claim 18 depends from claim 17 and recites a similar limitation as method claim 7. As discussed above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that independent claim 12 would have been obvious over Baarman and Partovi-002. *See supra* Part III.F.3.g. With respect to claims 17 and 18, Petitioner relies on its discussion of claims 6 and 7. Pet. 47. Patent Owner makes essentially the same arguments as it does for claim 6. *See* PO Resp. 14 (“[T]he Petition fails to establish a motivation to combine . . . Baarman with Partovi-002 and Partovi-413.”). Our analysis for claims 6 and 7 applies to claims 17 and 18. Accordingly, based on the record before us, and for the reasons given above regarding claims 6, 7, and 12, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 17 and 18 would have been obvious over Baarman, Partovi-002, and Partovi-413.

2. Summary

In view of the foregoing, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 6, 7, 17, and 18 would have been obvious over Baarman, Partovi-002, and Partovi-413.

IV. CONCLUSION

We determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–22 and 28 of the '537 patent are unpatentable as follows.¹²

References	35 U.S.C. §	Claims	Claims Shown Unpatentable	Claims Not Shown Unpatentable
Baarman, Partovi-002	103	1–5, 8–16, 19–22, 28	1–5, 12–15 ¹³	16
Baarman, Partovi-002, Partovi-413	103	6, 7, 17, 18	6, 7, 17, 18	
Flowerdew	102	1, 2, 8–11, 28	1, 2, 8–11, 28	
Flowerdew, Jang	103	3–5, 12–16, 19– 22	3, 12–16, 19– 22	4, 5
Flowerdew, Partovi-413	103	6, 7	6, 7	
Flowerdew, Jang, Partovi-413	103	17, 18	17, 18	
Overall Outcome			1–22, 28	

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

¹³ We do not reach whether claims 8–11, 19–22, and 28 are unpatentable based on this ground because we determine that claims 8–11 and 28 are unpatentable based on the ground of anticipation by Flowerdew, and that claims 19–22 are unpatentable based on the ground of obviousness over Flowerdew and Jang.

V. ORDER

In consideration of the foregoing, it is hereby
ORDERED that claims 1–22 and 28 of the '537 patent are held
unpatentable; and

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

PETITIONER:

Scott T. Jarratt
Andrew S. Ehmke
Calmann J. Clements
Haynes and Boone, LLP
scott.jarratt.ipr@haynesboone.com
andy.ehmke.ipr@haynesboone.com
calmann.clements.ipr@haynesboone.com

PATENT OWNER:

Brett Cooper
BC Law Group, P.C.
bcooper@bc-lawgroup.com

Robert A. Auchter
Auchter PLLC
robert@auchterlaw.com