

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ANKER INNOVATIONS LTD.,
Petitioner,

v.

POWERMAT TECHNOLOGIES LTD.,
Patent Owner.

Case IPR2024-00996
Patent No. 8,626,461

SECOND DECLARATION OF DR. GARY L. WOODS

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I, Dr. Gary L. Woods, declare as follows:

I. INTRODUCTION AND SCOPE OF WORK

1. On August 13, 2024, I submitted a First Declaration in IPR2024-00996. See EX1003. I submit this Second Declaration for purposes of responding to Patent Owner's Response to Petition (POR) submitted on May 21, 2025 and the declaration testimony of Dr. Mercier (EX2003). In this Second Declaration, I provide additional analysis regarding the claims of U.S. Patent No. 8,626,461 (the '461 Patent) and the relied-upon prior art references.

2. My analysis is based upon my education, training, and experience in the relevant field, including my professional experience and additional experience working with persons of ordinary skill in the art as of the earliest alleged priority date of the '461 Patent. I am familiar with the technology described in the '461 Patent, and I am also familiar with the knowledge of a person of ordinary skill in the art (POSITA) with respect to this technology as of the earliest alleged priority date of the '461 Patent (March 22, 2007).

3. I am being compensated for my work in connection with this IPR proceeding at my standard hourly rate. My compensation is not in any way contingent on the substance of my opinions or the outcome of these proceedings.

II. EXPERIENCE AND MATERIALS CONSIDERED

4. My analysis set forth in this Second Declaration is based on my education, training, and experience as summarized in my First Declaration and detailed in my CV (*see* EX1003), as well as my review of the '461 Patent, its prosecution history, and the prior art references relied-upon in this IPR proceeding. I have also reviewed the Patent Owner's Preliminary Response to the Petition (POPR), the Patent Owner's Response to Petition (POR), each of the accompanying exhibits submitted with the POPR and POR, the Board's Decision Instituting IPR ("Institution Decision"), and the deposition transcript of Dr. Mercier (EX1018).

III. TECHNICAL DISCUSSION

5. The analysis provided in my First Declaration fully addresses why each and every feature of the Challenged Claims of the '461 Patent is provided in the prior art. I understand that Patent Owner and Dr. Mercier have considered my analysis and offered their own proposals, some of which are inconsistent with my analysis. I will address some of those points below. The fact that I do not address all of Patent Owner and Dr. Mercier's opinions should not be interpreted as agreement with them.

6. I have noted that the POR does not address, much less rebut, much of the analysis I provided in my First Declaration. Indeed, rather than squarely confronting the substantial evidence of unpatentability offered in my First Declaration, Patent Owner and Dr. Mercier sometimes mischaracterize my

testimony, the disclosure of the '461 Patent, and the cited prior art. As I previously explained with reference to the applied prior art, each of Grounds 1A, 1B, 2, and 3 renders obvious the Challenged Claims. I need not repeat that analysis here. Rather, this declaration is intended to respond to particular arguments presented in the POR and the testimony of Dr. Mercier, including testimony from the declaration submitted with Patent Owner's briefing (EX2003) and the testimony that he provided during his deposition (EX1018).

IV. CLAIM CONSTRUCTION

7. Patent Owner contends in the POR that it "has not asserted any claim constructions." POR, 1. I disagree. Closer review of Patent Owner's arguments in the POR, and Dr. Mercier's related declaration analysis, reveal that Patent Owner and Dr. Mercier in fact rely on several limitations that are not expressly recited anywhere in plain language of the claims to allege differences between the claimed subject matter and the prior art grounds presented in my First Declaration. In other words, although neither Patent Owner nor Dr. Mercier present formal claim constructions, they nonetheless inject additional limitations in the claims through implicit claim interpretations of certain claim elements. Based on my review, however, a POSITA would not have agreed with Patent Owner's implicit claim interpretations. The following sections address specific errors in Patent Owner's implicit interpretations of "at least one input power monitor configured to measure

input power received by the primary coil from the power supply” (Element [13.1]) and “at least one signal detector configured to detect signals carrying data pertaining to output power received by the secondary coil” (Element [13.2]).

A. The “at least one input power monitor configured to measure input power received by the primary coil from the power supply” (Element [13.1])

8. Patent Owner’s arguments on Element [13.1] in the POR, and Dr. Mercier’s related declaration testimony, implicitly interpret the phrase “at least one input power monitor configured to measure input power received by the primary coil from the power supply” to further require that “the at least one input power monitor ***directly*** measure input power, and (2) the measurement of input power be a measurement of the power received ***only*** by the primary coil and no other components. This is evident from assertions in the POR and declaration that Olson and Stevens allegedly fail to disclose the claimed “input power monitor” due to Olson’s and Stevens’s use in some implementations of current and voltage monitors that are not located directly at the primary coil. *See e.g.*, POR, 20 (contending that the claim element must exclude “measur[ing] current into ***multiple other components*** other than the primary coil”), 24 (arguing what type of measure “does not qualify” for this claim element, namely, the type voltage measurement where “[c]urrent flowing from the batteries to the current measure block 226 ***passes through multiple switches and a diode***”), 52-53 (arguing that Stevens’s “[p]ower

provided to the electrical drive unit is not the same as power received by the primary coil” and “[t]his measurement is different ‘due to *losses in components* such as the electrical drive unit”) (citing EX2003, ¶¶79, 82) (emphases added).

9. As I argued above, the embodiment in Olson is sufficient to meet the limitation of 13.1.

10. Based on my review of the claim language, the specification, and the file history, Patent Owner’s and Dr. Mercier’s implicit interpretation is improper as it unjustifiably imports unclaimed requirements that the input power monitor “directly” measure input power and that the input power be a measurement of the power received “only” by the primary coil. The specification of the ’461 Patent does not even disclose an embodiment in which both the voltage and current measurements used in calculating power received by the primary coil are performed directly at the primary coil. Powermat’s implicit interpretation is thus unsupported.¹ Certainly nothing in the specification of the ’461 Patent *mandates* that the input

¹ I have been informed that Powermat elected to forgo an opportunity to amend claim 13 to add the exact limitation that Powermat now seeks to import into the claim through an implicit claim interpretation. I can understand why Powermat is choosing to do so, because the specification does not appear to support the additional limitations that Powermat seeks to import.

power monitor must directly measure input power received only by the primary coil. Neither the specification nor file history contain any indication that the inventor intended to limit the scope of Element [13.1] in the manner urged by Patent Owner and Dr. Mercier. Given the absence of any clear intent in the specification or file history to further restrict the scope of “measure input power received by the primary coil,” a POSITA would not have read this claim phrase to require “directly” measuring the input power received “only” by the primary coil.

11. The preferred embodiments of the '461 Patent in fact align closely with the prior art embodiments criticized by Patent Owner and Dr. Mercier. Patent Owner's and Dr. Mercier's implicit interpretation would exclude these embodiments. For example, the specification characterizes “input power...provided to the primary coil” in connection with the circuitry depicted in FIG. 2c as including both the power delivered to the primary coil and the power lost across the current monitor connected to the primary coil . EX1001, 9:38-44, FIGs. 2a, 2c. The primary side of an inductive power transfer system is illustrated in FIG. 2c of the '461 Patent and defines a current loop between the power supply and the primary coil. As depicted below in FIG. 2c, this current loop includes a power supply 2240, a primary inductive coil L_1 , and a current monitor 2162:

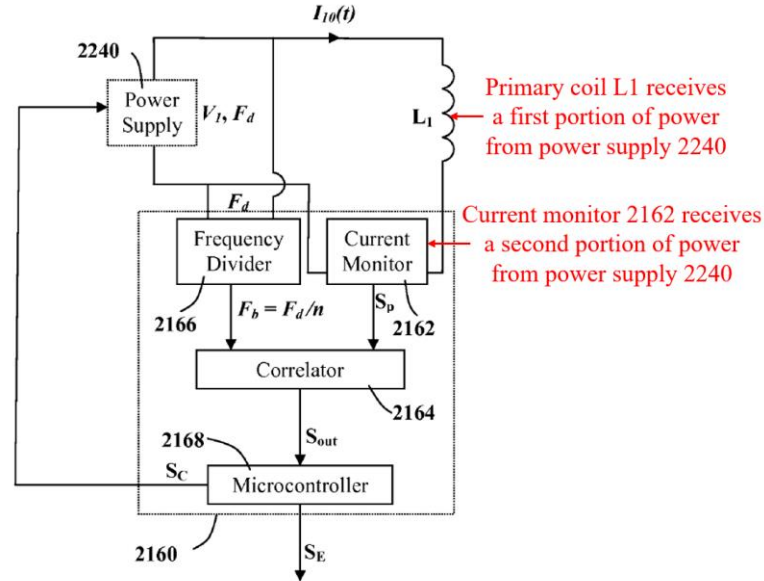


Fig. 2c

'461 Patent (EX1001), FIG. 2c (annotated)

12. The power supply 2240 is depicted in FIG. 2c as providing a voltage $V_1(t)$ across the series combination of primary inductive coil L_1 and current monitor 2162 because “V1” is depicted as the voltage across the power supply and the only other elements in the current loop are the current monitor and the primary inductive coil. EX1001, FIG. 2c. Kirchhoff’s Voltage Law is a fundamental rule of physics which provides that the sum of all voltages in a closed circuit must equal zero. EX1020. This means that in the circuit of FIG. 2c, the positive voltage $V_1(t)$ provided by the power supply 2240 must equal the voltage drop across **not only** the primary coil L_1 **but also the voltage drop across current monitor 2162** (i.e., the voltage $V_1(t)$ of the power supply minus the voltage drop across the primary coil and the voltage drop across the current monitor must be zero). The voltage drop

across the current monitor 2162 would ordinarily be quite small relative to the voltage drop across (and hence power received by) the primary coil, and therefore negligible, although this voltage drop would nonetheless be non-zero. Another fundamental rule of physics is that power is the product of voltage and current. EX1020, 24. The true power received by primary coil L_1 is therefore equal to the voltage drop across L_1 times the current $I_{10}(t)$ through coil L_1 , excluding the voltage drop across the current monitor 2162.

13. In the '461 Patent, the specification characterizes the power received by L_1 as *further including* the power delivered to the current monitor 2162. In particular, the specification describes the power $P_1(t)$ provided to the primary coil L_1 as including the voltage $V_1(t)$ of the power source times the current $I_{10}(t)$ through coil L_1 and every other circuit element in the current loop:

The input power $P_1(t)$ provided to the primary coil L_1 is given by:

$$P_1(t) = \vec{V}_1(t) \bullet \vec{I}_{10}(t)$$

where the primary voltage $V_1(t)$ oscillates at the driving frequency F_d which is determined by the power supply 2240.

EX1001, 9:38-42 (annotated).

14. The equation provided by the '461 Patent therefore only ***approximates*** the power provided to the primary coil L_1 based on the primary voltage $V_1(t)$, which is the voltage from the power supply 2240. The primary voltage $V_1(t)$ does ***not*** isolate the actual voltage drop across primary coil L_1 , because according to

Kirchoff's Voltage Law, the primary voltage $V_1(t)$ must be equal to the voltage drop across the current monitor plus the voltage drop across primary coil L1. That is, $V_1(t)$ as used in the input power equation **overestimates** the power received by primary coil L₁ since it further encompasses the voltage drop across current monitor 2162. Again, while the power loss introduced by current monitor 2162 is likely small relative to the power received by primary coil L₁, the power in equation $P_1(t)$ calculates a power that is not the same as the power actually received by the primary coil. This illustrates that the '461 Patent disregards negligible power losses in power calculations.²

15. I understand that Dr. Mercier testified in his deposition that the power consumed by the current monitor 2162 would represent a non-zero power loss, and I agree. *Id.*; EX1018, 24:1-14 (“[a]s it relates to a resistive-based current monitor, of course, there will always be losses...[a]s far as the magnetic sensor systems, I think same answer.”). Every current monitor located along a current loop produces some amount of power loss across that current loop. This example illustrates that the specification thus explicitly contemplates power measurements that correspond to

² As described further below with respect to circuitry on the secondary side of the system, the '461 Patent also disregards even larger, but predictable power losses that, like negligible losses, are inconsequential to the power calculation.

and reasonably reflect the power received by the primary coil, even if it is not a direct measurement of the power received only by the primary coil. *Id.*

16. I also agree with Dr. Mercier's deposition testimony that "engineers are practical people, generally, and if there's something in a circuit that has a negligible impact on it, then it's usually fair to ignore that." EX1018, 45:6-25; *generally id.*, 45:6-47:25. Dr. Mercier further explained in his deposition that what's negligible "depends on context and design goals and things like this. ... Generally, it's if something is present but doesn't materially impact a parameter that you care about, like efficiency or something like this. Then I would consider that to be negligible." *Id.*, 46:15-23. Dr. Mercier's declaration opinions, however, are inconsistent with his explanations in his deposition because he repeatedly points to inconsequential sources of power loss when addressing the prior art. EX1018, 23:8-29:7, 30:6-16, 33:7-22, 34:2-10, 36:23-37:22, 38:4-14, 43:15-25, 44:17-45:1, 46:16-47:3, 47:10-20. There are no perfect measurements in the real world, but if a measurement closely corresponds to and reasonably reflects a target physical parameter within a tolerance suitable for a given context/application, a POSITA would consider the measurement valid. Thus, in the context of the '461 Patent, the measurement of power received by a primary coil can include inconsequential power losses so long

as the measurement still corresponds to and reasonably reflects the actual power received by the coil.³

B. The “at least one signal detector configured to detect signals carrying data pertaining to output power received by the secondary coil” (Element [13.2])

17. Patent Owner’s arguments on Element [13.2] in the POR, and Dr. Mercier’s related declaration testimony, implicitly interpret the phrase “at least one signal detector configured to detect signals carrying data pertaining to output power received by the secondary coil” to further require that the signals carrying data pertaining to the output power specify *a direct measure* of the output power received by the secondary coil, and (2) the data to pertain to output power received *only* by the secondary coil and no other components. *See, e.g.*, POR, 30-31 (demanding that the claim phrase “received by the secondary coil” must exclude power measurements where “*power is transferred to other components* between the secondary coil and the rechargeable power source” (citing EX2003, ¶93)); 58-59 (arguing the claim language should implicitly exclude power measurements where “losses occur throughout the secondary device” (citing EX2003, ¶150)).

³ To be clear, however, the ’461 Patent always uses both voltage and current in its power calculations. The use of a voltage or a current alone (without the other) would be insufficient to determine the power received by a coil.

18. Dr. Mercier argues that the power received by the actual load in Stevens is not the same as the power received by the secondary coil because the circuit contains a rectifier and a load modulator in between the secondary coil and the load. 57:6-14, 57:20-58:4. However, the '461 patent itself discloses effectively the identical circuit in Fig. 2a & 2b (elements 2270 and 2142, respectively. EX1001, FIGs. 2a-2b. To the extent that the '461 patent illustrates an embodiment of the limitations of Claim 13.2, Stevens FIGs. 4, 12 also does.

19. Based on my review of the claim language, the specification, and the file history, Patent Owner's and Dr. Mercier's implicit interpretation is improper as it unjustifiably imports unclaimed requirements that the signal detector be configured to detect signals carrying data representing **direct measures** of output power and that the output power be a measurement of the power received **only** by the secondary coil. I have been informed that here, just as in Element [13.1], Powermat elected to forgo an opportunity to amend the claim to add the exact limitation that Powermat now seeks to import into the claim through an implicit construction. Again, I can understand why Powermat would not amend the claims to make explicit what it has implicitly imported because the specification would not support such amendments. As I describe in further detail below, the '461 Patent does not disclose any technique for directly measuring the power received by the secondary coil.

20. Before turning to the specification, however, I first note that Powermat appears to completely ignore the fact that Element [13.2] merely refers to signals carrying data “pertaining to” output power received by the secondary coil and does not describe any kind of location where the output power must be measured from. Element [13.2] does not even require that the data pertaining to the output power indicate an exact measure of the output power. Under the plain meaning of “pertaining to,” such data could include any data that is related to the output power. Simply put, no direct measure of output power is required, and there is no requirement that the output power is not also received by other circuit components. EX1022, 3 (“to have reference or relevance”); EX1023, 3 (“to have reference or relevance”)

21. The specification broadly describes data “pertaining to” power transmission to cover a range of parameters including “required operating voltage, current, temperature or power” and more. EX1001, 7:21-29. These represent a wide range of values that are more expansive than a “a direct measure” of the output power. The breadth of “pertaining to” certainly does not support Powermat’s demand in the POR for direct measurements of the power received by the secondary coil.

22. Much in the same way that Powermat’s implicit interpretation of Element [13.1] runs afoul of the specification’s preferred embodiments, so too does

its implicit interpretation of Element [13.2]. Indeed, Powermat's implicit interpretation is unsupported. For example, FIGs. 2a-2b of the '461 Patent disclose no circuitry for measuring output power received at the secondary coil L_2 at all. *See* EX1001, 8:60-10:37, FIGS. 2a-2b; EX1018, 49:19-50:2 (acknowledging that "[i]n Figures 2a through -d, there is not" circuitry for measuring output power). In Figs. 2a and 2b, in order to measure the output power directly as Powermat's construction demands, one would need to measure $V_2(t)$ and the current in the secondary coil, upstream of the AC-DC converter 2270 or rectifier 2272, respectively.

23. FIG. 5 provides a high-level block diagram of the system including output power monitor 4124, but the '461 Patent describes no underlying circuitry and provides no indication of how P_{out} is measured. EX1001, FIG. 5; EX1018, 52:14-53:9 ("no explicit schematic is shown").

24. Dr. Mercier touched on an issue in his deposition relating to FIG. 5 that further reveals the discrepancy between Powermat's implicit interpretation and the '461 Patent specification. Dr. Mercier conceded that FIG. 5 of the '461 Patent is a "block diagram" that "may not be indicative of exactly how" the circuit is implemented in practice. EX1018, 51:16-20, *see also id.*, 52:23-53:9 ("no explicit schematic is shown for how to do this explicitly for the secondary coil"). Thus, the FIG. 5 embodiment does not provide support for a direct measure of output power received by the secondary coil.

25. Similar to how the '461 Patent describes the input power measure as including some power losses, the specification also provides only an approximation to the power output received by the coil L_2 . The power delivered to any circuit element is the product of the voltage and current present at the circuit element. The specification states that “the total power P_2 drawn by the secondary coil L_2 is given by $P_{2(t)} = \vec{V}_{22}(t) \cdot [\vec{I}_{22}(t) + \vec{I}_{24}(t)]$ ”. This is the power downstream of AC/DC converter or rectifier 2270 (FIGs 2a, 2b, respectively), and further includes losses to transmission circuit 2140. EX1001, 9:26-37, FIG. 2a-2b; *generally id.*, 8:60-12:7. The quantity $V_{22}(t)$ is a rectified DC voltage that is related to but not equal to the AC voltage $V_2(t)$ present at the coil L_2 .

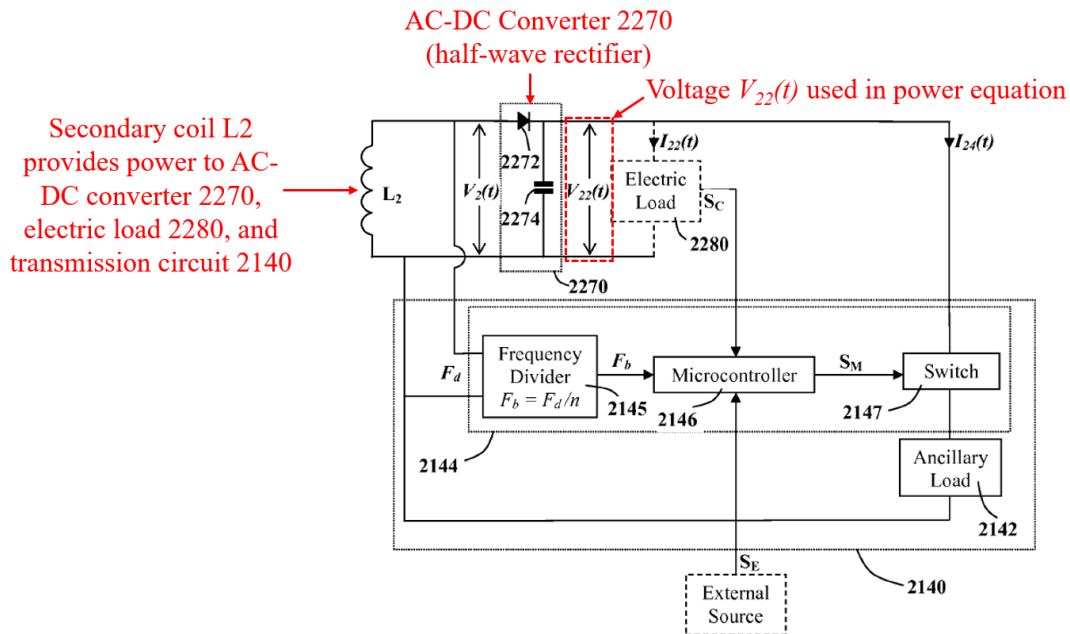


Fig. 2b

'461 Patent (EX1001), FIG. 2b (annotated)

26. A POSITA would have recognized that the AC-DC converter 2270 is a half-wave rectifier as shown in FIG. 2b. In circuit technologies, it is well understood that half-wave rectifiers are relatively inefficient because they pass only the positive half-wave portion of the AC waveform induced in the secondary coil L_2 as usable DC power. Moreover, in obtaining $V_{22}(t)$, there is a forward voltage drop across diode 2272 even during the positive half-wave cycles of the rectification process that produces further power loss losses. Even an ideal half-wave rectifier would achieve, at most, 50% power efficiency. The specification's equating the output of a half-wave rectifier with the total power drawn by the secondary coil L_2 demonstrates that a POSITA would have understood that even relatively large power losses can be tolerated and deemed inconsequential in the context of the '461 Patent.

27. Accordingly, a POSITA would recognize that the '461 Patent's power out equation merely **approximates** the power received by the secondary coil L_2 based on a voltage $V_{22}(t)$ that bears a relationship to the true voltage across coil L_2 , but that is nonetheless not the true coil voltage. This demonstrates that the '461 Patent contemplates that a direct measurement of power received by a coil is not required and the claimed "signals carrying data pertaining to output power received by the secondary coil" can be characterized by data that corresponds to and reasonably reflects the power received by the secondary coil. A POSITA would have understood

that inconsequential losses, including negligible or predictable losses, can be disregarded in characterizing the power received by a coil.

V. Ground 1A: Anticipation Based on Olson

28. My First Declaration provided an overview of Olson and explained in detail how Olson anticipates each of claims 13-16 and 18 of the '461 Patent. EX1003, ¶¶35-57. I offer additional remarks below in response to arguments presented in the POR and Dr. Mercier's declaration.

29. Olson discloses a wireless power supply for an implantable medical device. EX1004, Abstract. In Olson, overall efficiency is important because even the source of wireless power, the external charging device 48, is battery powered. EX1004, [0017]. Also, it is important that the implantable medical device 16 never receive too much power, even briefly, to prevent possible tissue damage to the carrier of the implanted device. *Id.* Olson discloses that the ideal measurement of power-transfer efficiency is to measure power into primary coil and power out of secondary coil. EX1004, [0112]. Dr. Mercier acknowledges that a POSITA would understand that certain losses can be made negligible. EX1018, 24:1-15.

30. A POSITA would have understood that an overall efficiency of a link in a circuit is the product of the efficiencies of each element in the link, and that the accuracy of measurement of the overall efficiency can be no better than the measurement of the efficiency of each element. Olson's detailed embodiment in Fig

14 uses a non-ideal but sufficiently accurate measurement of power received by the primary coil. EX1004, [0074]-[0075]. A POSITA would have understood that the application of efficiency measurements in Olson is important for ensuring patient safety, so therefore the power measurements are also important to be accurate. EX1004, [0017]. Olson's embodiment as shown in FIG. 14 is thus sufficient to meet the concomitant accuracy required for this application.

31. Dr. Mercier identifies non-idealities of measuring the power in the method proposed by Olson including, for example, switches and a diode upstream of current measurement block 226, and alleges that these elements render Olson's circuit incapable of measuring "input power" and "output power." A POSITA would have understood that switches would have negligible effect on the power delivered downstream of them. A POSITA also would have understood that the power loss in the diode in Olson's current path is small and predictable.

32. Dr. Mercier identifies other places that the power output of the current measurement unit 226 could go, allegedly adding inaccuracy to an efficiency measurement EX2003, ¶79 ("transmit block...electronically controllable switch...telemetry antenna") A POSITA would have understood that the power consumption of the switch and the telemetry antenna are or can be made negligible compared to the power transmission through the primary coil. The losses in these components are negligible under the same standard that Dr. Mercier uses to assert

that power losses across some components in the '461 patent are negligible (e.g., current monitor 2162, AC-to-DC converter 2270).

33. Other losses enumerated by Dr. Mercier arise from the 12V power supply (DC-DC converter) and the transmitter block 214. A POSITA would have understood that these losses are predictable, so a measurement of the power at the current measurement unit 226 as in Olson's FIG. 14 is sufficiently accurate to measure the input power received by the primary coil from the power supply. Olson explains that the power measurement of the FIG. 14 embodiment is sufficient to calculate power efficiency for the application. EX1004, [0074]. A POSITA would have understood that it is much easier to make a measurement of power received by the primary coil from the power supply at the current monitor 226 than elsewhere in the system. This is both because the measurement can be performed at lower voltage and because the noise at that node is lower than at other places in the circuit .

A. Olson Discloses Element [13.1]

34. As discussed above, Powermat made a flawed assumption that a “measure of input power received by the primary coil” from the power supply requires a **direct** measurement of power received **only** by the primary coil, in its argument that Olson fails to disclose Element [13.1]. See, e.g., POR, 18-21 (quoting EX2003, ¶79 (“Current measure block 226 therefore measures current into multiple other components other than the primary coil of Olson.”)), 22 (calling for “a current

monitor in series with the primary coil”), 22-24 (“Olson describes that voltage is not measured at the primary coil but at batteries 160; *supra*, §IV.A. Therefore, Olson’s ‘voltage’ measurement does not qualify as the ‘input power’ required by claim [13.1]”). It is simply not the case that Element [13.1] requires such a restrictive scope. It is clear that the “measure of input power received by the primary coil” instead encompasses measurements that correspond to and reasonably reflect the input power received by the primary coil, consistent with descriptions of the same in the ’461 Patent.

35. Olson discloses Element [13.1] for each of the reasons that I described in my First declaration and that are included in the Petition. Pet., 15-17; EX1003, ¶¶42-44. The actual language of Element [13.1] does not forbid Olson’s measurement of input power in the FIG. 14 embodiment. Nothing in Element [13.1] requires direct measurement of current and voltage at the primary coil. There is no requirement that Olson’s input power must depend on direct measurements of the current received only by primary coil 54 and the voltage across primary coil 54. The fact that Olson’s input power corresponds to and closely reflects the power received by the primary coil is sufficient to meet Element [13.1]. Olson calculates input power by multiplying “the internal voltage of charging unit 50” such as the voltage of batteries 160 or desktop charging device 162 by “the current driving external antenna

52” as measured by current measure block 226. EX1004, [0071]-[0075]; Pet., 15-17; EX1003, ¶¶42-44.

36. As I explained above, Olson demonstrates an embodiment that performs measurement of power delivered to the transmission coil with sufficient accuracy to be useful in the application of wireless power transfer. The product of the current measured by current measure block 226 and the voltage of batteries 160 or desktop charging device 162 represents the power received by the primary coil 54 from batteries 160 or desktop charging device 162.

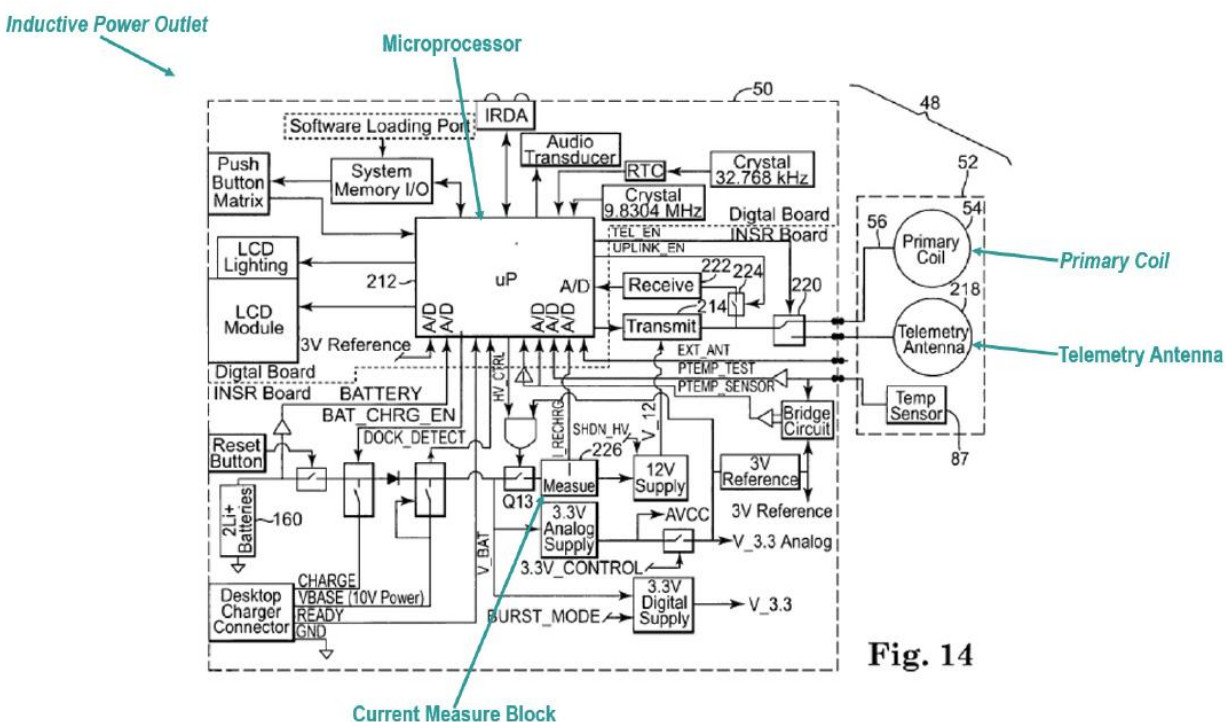


Fig. 14

EX1003, ¶43.

37. The ordinary understanding for measuring input power received by the primary coil is reflected in Olson’s disclosure. The “power in” measurement

described by Olson that is used for the calculation of “efficiency of power transfer” is significant, because a POSITA would have determined that this measurement is clearly a measure of the power received by the primary coil. Because the “power in” measurement corresponds to and closely reflects the power received by the primary coil 54, it is apparent that this measurement is representative of the power received by the primary coil.⁴ Pet. 15-16 and 19 (footnote 2); EX1003, ¶¶42-44.]. Power transfer can occur in an inductively coupled system like Olson’s by inductive transmission of electromagnetic energy from a primary coil to a secondary coil. During inductive transmission, current flowing through the primary coil generates a magnetic field that induces current in the secondary coil, thus transferring power from the primary coil to the secondary coil. An efficiency of inductive power transmission relates to how much power from the primary coil is received by the secondary coil, with greater efficiency corresponding to higher power transfer ratios and lower power loss ratios. EX1004, [0057] (“achieve efficient inductive coupling

⁴ Based on Olson’s characterization of the “power out” measurement being used for the calculation of “efficiency of power transfer,” it is clear that a “power out” measurement corresponds to and closely reflects the power received by the secondary coil in the implantable device. Pet. 15-16 and 19 (footnote 2); EX1003, ¶44; *infra*, §III.B; Element [13.2].

between primary coil 54 ... and secondary coil 34”), [0077] (“[u]sing efficiency as a measure of effective coupling”); *see also id.*, [0002]-[0004], [0016], [0019], [0115].

38. A POSITA would have recognized Olson’s implementations involving indirect “power in” measurements to correspond to and closely reflect the power received by the primary coil 54, which is evident by the fact that Olson applies its power in measurements in its power transfer efficiency calculation. Olson’s “power in” measurement closely resembles the power received by primary coil 54, and this would have been clear to a POSITA. A sufficiently accurate measurement of power provided to the primary coil 54 is important for obtaining an accurate and reliable calculation of the energy transfer efficiency, which is a parameter that Olson values highly. EX1004, [0047], [0077]. For example, Olson explains that “[t]he higher the efficiency of energy transfer, the more energy can be transferred while at the same time limiting the heating of surrounding components and tissue.” EX1004, [0017], *see also id.*, [0115].

39. It is clear that Olson achieves the objectives expressly articulated in paragraphs [0017] and [0115] by measuring input power with current measure block 226, meaning that current measure block 226 achieves high measurement accuracy when the input power received by the primary coil is measured from the location of current measure block 226. This includes using reliable power transfer efficiency

metrics to determine whether and/or how to regulate power provided to the secondary device and avoid over-heating that risks harming the patient if too much power is delivered. EX1004, [0017] (“the efficiency at which energy is transcutaneously transferred is crucial”; “amount of heating of surrounding tissue, if excessive, can be deleterious”), [0115]. If the “power in” and “power out” measurements did not correspond to and closely reflect the power received by the primary and secondary coils, respectively, Olson’s circuit would not accurately reflect the efficiency of energy transfer and this would risk the negative side effects of poor energy transfer, which include injury to the patient.

40. In Olson’s implementations where the “internal voltage of charging unit 50” such as the “voltage of batteries 160” is used to determine the input power received by the primary coil, voltage losses across circuit elements on the current pathway are inconsequential under the definition advanced by Dr. Mercier. EX1004, [0074]-[0075], EX1018, 18-25, 40-41. As described above, Dr. Mercier conceded that a measurement of input power meets Element [13.1] even when the measurement includes “negligible” power losses, and Dr. Mercier defined negligible power losses as those that do not “materially impact a parameter that you care about, like efficiency.” EX1018, 40-41. In his deposition, Dr. Mercier conceded that both (1) small (and therefore inconsequential) power losses, and (2) larger power losses that are but predictable and therefore still inconsequential are “negligible.” EX1018,

24 (regarding current monitor 2162, “[a]s it relates to a resistive-based (*sic*) current monitor...there will always be power losses,” “[a]s far as the magnetic sensor systems, I think same answer.”) 34 (regarding DC-to-DC converter 2270, “there are ways to design it such that its power loss is negligible relative to the overall power consumed by the system”). Patent Owner’s attempt to characterize the power losses in Olson’s circuit as anything but inconsequential is without merit.

41. For example, Olson expressly discloses that an input power value can be calculated by multiplying an “internal voltage of charging unit 50” such as the voltage of batteries 160” by a current measured by current measure block 226. EX1004, [0074]-[0075]. Olson also explains that this input power value is used to calculate an “efficiency of power transfer,” a parameter that is very important to Olson’s teachings. *Id.* Because Olson explains that the current measured by current measure block 226 and the voltage of batteries 160 can be used to generate an accurate measure of efficiency, Olson’s disclosure makes clear that power losses incorporated in these values are inconsequential. *Id.*

42. Furthermore, the circuit elements between the batteries 160 and the primary coil 54 of Olson include switches, a forward diode, and a power converter, all of which yield inconsequential power losses. My opinion here is corroborated by multiple references describing inconsequential power losses of these circuit elements. EX1019, 1-5 (explaining that it is beneficial to design diodes to minimize

forward voltage, and that “excessive” forward voltage is often due to manufacturing defects), EX1020 1-12 (explaining that even non-ideal switches have low internal resistance when closed). A POSITA would have understood that Olson’s circuit depicted in FIG. 14 can be designed so that accurate measurements of “efficiency of power transfer” can be performed despite the power losses associated with the circuit elements between batteries 160 and primary coil 54. *Id.*

43. In FIG. 14, current measure block 226 is an effective proxy for the true current received by primary coil 54, and the voltage of batteries 160 or the desktop charger 162 corresponds to and closely reflects the voltage across primary coil 54, because an inconsequential amount of power is lost on intervening circuit elements between batteries 160/desktop charger 162, and the primary coil 62. There are three switches along the current pathway, each of which is associated with an exceedingly small amount of power loss, because these switches are designed to conduct current well when closed. The forward diode on the current pathway also has very low power loss, because forward diodes are designed to conduct current in the forward direction. The “12V Supply” 216 is associated with power losses, but these power losses can be known and factored into calculation of the input power. The same is true for the transmit block 214 which includes an H-bridge circuit. Some nonzero amount of power is lost, but the losses can be easily accounted for. Moreover, a POSITA would have understood the 12 V Supply (a DC-DC converter) and the

transmit block 214 to represent inconsequential losses analogous to the losses introduced by the half-wave rectifier 2270 in the '461 Patent. *Supra*, §IV.B.

44. Even if Powermat's implicit construction for Element [13.1] is taken at face value to require direct measurement of the power received only by the primary coil, Olson still discloses this feature in the implementation that is described in paragraph [0112] of the specification. Olson expressly discloses that an efficiency of energy transfer can be determined based on a ratio of "the power received by secondary coil 34" to "the power transmitted by primary coil 54." EX1004, [0112]. This, in the context of the '461 Patent, means that the power "transmitted" by the primary coil 54 sufficiently corresponds to the input power "received" by the primary coil 54. Any internal power loss through the primary coil 54 is inconsequential in this implementation. Dr. Mercier acknowledged at his deposition that the '461 Patent's description of "measur[ing] the input power **provided** by the primary coil 4220" is equivalent to measuring the input power **received** by the primary coil. EX1018, 50:18-51:5. The external device therefore includes an input power monitor that performs a direct measurement of the input power received by the primary coil 54 in at least some embodiments.

45. Olson explains in paragraph [0112] that "it is preferred" for "some embodiments of the present invention" to measure efficiency of energy transfer "coil-to-coil...from primary coil 54 to secondary coil 34," which indicates direct

measurement of input and output power. EX1004, [0112]. Paragraph [0112] therefore provides a clear option of implementing an input power monitor to directly measure “the power transmitted by primary coil 54,” which a POSITA would have understood to include directly measuring the voltage across and current through primary coil 34 according to conventional approaches. *Id.* Even if it is argued by Powermat that Olson’s disclosure in paragraph [0112] does not represent a direct measure of power received by the coils, then paragraph [0112]’s description of “coil-to-coil” measurements would only underscore a POSITA’s understanding that indirect measurements containing inconsequential power losses can suffice if the measurements correspond to and closely reflect the power received by each of the primary and secondary coils.

B. Olson Discloses Element [13.2]

46. As discussed above (*supra*, §IV.B) Powermat implicitly interprets Element [13.2] to require that the signal detector be configured to detect signals carrying data pertaining to a **direct** measure of output power received **only** by the secondary coil in asserting that Olson somehow does not disclose Element [13.2]. *See, e.g.*, POR, 29-30 (“Petitioner fails to address how the ‘power induced in implantable medical device’ in Olson is **necessarily the same** as “output power **received by** the secondary coil.”), 30 (asserting that Olson “includes no detail of **how or where** either voltage or current measurement is performed”)); *supra*, §II.B. These

arguments are without merit for many of the same reasons I described above in my analysis of Element [13.1]. *Supra*, §§III.A, V.A; Pet. 17, EX1003, ¶45.

47. For example, Olson’s “telemetry antenna 218” provides a **signal detector**, because telemetry is widely known to involve radiofrequency (RF) and/or other kinds of wireless signals, and antennas are well-known detectors that can register such signals. EX1004, [0072]-[0075], FIG. 14; Pet. 17. Olson expressly discloses that the “power induced in implantable medical device 16” represents an **output power** value used to determine an efficiency of power transfer, and this value is “obtained by telemetry.” EX1004, [0074]-[0075]. Current through a primary coil 54 of an external device *induces* current flowing in a secondary coil 34 within the implantable medical device 16 in the power transfer system of Olson. EX1004, [0050], [0052]-[0055], FIG. 3. The “power induced in implantable medical device 16” clearly represents the output power received by the secondary coil 34. Olson’s description of the “power induced in implantable medical device 16” is therefore just another way to refer to the power received by secondary coil 34. *Id.*

48. Even if Powermat argues that the “power induced in implantable medical device 16” is not the same as the output power received by the secondary coil 34 (which I would not agree with), any difference between these two power measures would be inconsequential, similar to the output power measurement described by the ’461 Patent. As discussed above (*supra*, §IV.B), the plain language

of [13.2] recites a signal detector configured to receive data “*pertaining to*” output power received by the secondary coil. There is no requirement in the claim language that the signal detector must receive data indicating a “direct measure” of the output power, or that the output power measured must “only” be received by the primary coil. *Id.* The evidence is compelling that the signal received by Olson’s telemetry antenna 218 carries data “*pertaining to*” the output power received by the secondary coil, because data pertaining to the output power could include a range of relevant parameters. This is especially true because the secondary coil 34 inductively draws power from primary coil 54 for the entire implantable device 16. EX1004, [0050], [0052]-[0055], FIG. 3. Olson’s signal carries, at a minimum, data that corresponds to and closely reflects the input power received by the secondary coil 34 to obtain an accurate, reliable measurement of power transfer efficiency as Olson proclaims its system achieves. EX1004, [0016]-[0019], [0115].

49. Olson’s paragraph [0112] discloses the option of a direct measurement of output power. The disclosure in this paragraph confirms that Olson contemplated a conventional option of determining the output power to calculate energy transfer efficiency based on the power received by the secondary coil 34—and even based on a direct measure of this power. EX1004, [0112] (“Efficiency of energy transfer is an important measure of the effectiveness of energy transfer from primary coil 54 of external antenna 52 *to secondary coil 34*. Efficiency is measured by dividing the

power in, i.e., *the power received by secondary coil 34*, by the power out [I]t is preferred that efficiency is *measured coil-to-coil*, i.e., from primary coil 54 *to secondary coil 34*.”) (emphasis added).⁵

C. Olson Discloses Elements [13.3]-[13.4]

50. Powermat’s arguments in relation to Elements [13.4]-[13.4] is largely based on its erroneous assumptions that Olson fails to disclose the recited features in Elements [13.1]-[13.2]. For example, Powermat asserted that “[b]ecause Olson fails to disclose ‘input power’ and ‘output power’ in the first place, Olson further fails to disclose” Elements [13.3]-[13.4]. POR, 31-39; EX2003, ¶¶95-102. This is

⁵ Olson’s paragraphs [0074]-[0076] consistently uses the terms “power in” and “power out,” but paragraph [0112] flips this terminology in one self-evident instance. Even then, paragraph [0112] is consistent with paragraphs [0074]-[0076] in that they describe the same dividend and divisor for the efficiency quotient—with [0112] clarifying that “the power *received by secondary coil 34*” (the “power out” measure according to paragraphs [0074]-[0076]) should be divided by “the power *transmitted by primary coil 54*” (the “power in” measure according to paragraphs [0074]-[0076]). This conventional practice in Olson is also consistent with the preferred embodiment of the efficiency quotient Q in the ’461 patent. EX1003, ¶49.

not true, because Olson discloses the claimed “input power” and “output power” for at least the reasons discussed that I discussed above in my analysis of Elements [13.1]-[13.2], and that were described in my First Declaration. EX1003, ¶¶42-45. Furthermore, as I described in my analysis, Olson expressly discloses the claimed “at least one processor configured to receive data pertaining to the input power and the output power,” where the processor “determine[s] an index of power-loss” exactly as claimed. *Id.* Olson describes a microprocessor (e.g., microprocessor 212) that receives input power and output power values and determines an efficiency of power transfer by “dividing” the power received by the secondary coil by the power received by the primary coil.⁶ EX1004, [0071]-[0078], [0112], FIG. 14.

⁶ The efficiency of power transfer requires a “calculation” in Olson’s system.

EX1004, [0074]. Microprocessor 212 receives signals from current measure block 226 and receive block 222, and these signals include measurements used in the determination of power in and power out. From these disclosures, a POSITA would have understood that Olson’s microprocessor 212 performs a power transfer efficiency calculation. Decision, 27-28 (“Patent Owner does not suggest that there is another component ...”).

D. Olson Discloses Element [14]

51. Olson anticipates claim 14 for each of the reasons that I described in my First Declaration. EX1003, ¶¶50-52. Powermat assumes that Olson's electronically controllable switch 220 could not be "a [circuit-breaker] device that is designed to prevent damage to an electrical circuit by turning off, or disconnecting, when excessive current flows through the circuit-breaker." POR, 37-38. I note that Powermat has presented no evidence to support this position. Regardless, Powermat's assumption is false. A POSITA would have known that a conventional option for implementing an electronically controllable switch like the one disclosed in Olson before the Critical Date of the '461 Patent would include an electromechanical switch (e.g., a relay). Electromechanical switches selectively form or sever electrical connections among components on either side of the switch by physically connecting or disconnecting conductors from either side of the switch according to an electronic control signal. A POSITA would have understood Olson's teaching of an electronically controllable switch 220 to include the option of using an electromechanical switch, which can be used even in high-frequency applications. EX2021, 3-4

E. Olson Discloses Element [15.2]

52. Powermat does not refute the overwhelming evidence in the Petition and in my First Declaration demonstrating that Olson discloses Element [15.2].

Powermat argues that Olson lacks sufficient detail about the location of current/voltage measurements in implantable medical device 16. However, this is misguided because Olson explicitly describes that power transfer efficiency is determined based on “the power received by secondary coil 34” as part of a “coil-to-coil” measurement. EX1004, [0112]; EX1003, ¶54; Pet. 23-24 and 19 (footnote 2). A POSITA therefore would have understood Olson’s implantable medical device to include an output power monitor that measures “power received by secondary coil 34” in a way that meets Element [15.2]. Powermat’s arguments also do not hold water because these arguments erroneously imply a requirement for direct measurement of the secondary coil’s voltage and current, which is unsupported by and inconsistent with the ’461 Patent’s own disclosure. *Supra*, §IV.B.

VI. Ground 1B: Obviousness Based on Olson in view of Stevens (Claim 17)

53. Powermat asserts that “Stevens is not directed to the efficiency of energy transfer as described in Olson, but instead towards the detection of unwanted parasitic loads,” and also contended that “a POSITA would not be motivated to use Stevens’s dummy loads in Olson’s charging unit.” POR, 43-45. EX2003, ¶¶111-116. As discussed in the first declaration, a POSITA would have been motivated to implement communication according to Stevens’ suggested load modulation scheme to reduce the size and complexity of Olson’s charging devices. EX1003, ¶67. Furthermore, detecting unwanted parasitic loads as described by Stevens is not

meaningfully different from Olson's concern with power transfer efficiency. In fact, the goals of detecting unwanted parasitic loads and determining power transfer efficiency broadly overlap, and they are certainly compatible with each other. Stevens expressly discloses an option of calculating a power transfer efficiency based on a difference between power transmitted by the primary unit and power received by the secondary device(s) to detect unwanted parasitic loads. EX1005, 38:34-39:12 ("if the measured [primary] power ... exceeds the sum of the load measures"); *see also id.*, 25:25-31; 27:13-25, 32:12-30, 37:17-28, 39:8-12, FIGs. 4 and 12. This functionality would be valuable in implantable medical implants like Olson's. A nearby parasitic load (such as adjacent tissue in the patient) could pose a threat to apply too much heat to the patient. EX1004, [0017].

54. According to Stevens, "each secondary device 600 comprises its own load measuring unit 610" that produces a "load measure" indicative of power delivered to a load of the secondary device. EX1005, 38:16-32, FIGs. 4, 12. The primary unit (analogous to Olson's external charging device) includes a "power measurement unit 730" that measures the power "drawn by the secondary devices from the primary unit" and a control unit 720 determines a difference between the power delivered by the primary unit and the power consumed by the total load on the secondary unit. EX1005, 38:34-39:6. It is clear that the "difference between the power delivered by the primary unit and the power consumed by the total load on

the secondary unit” represents an index of power transfer efficiency consistent with both Olson and the ’461 Patent. This is because the difference relates the power transferred by the primary unit to the power received by the secondary unit, as most of the difference can be accounted for in energy losses in the power transfer itself. The total load value encompasses power consumed by the parasitic load, which means that this difference does not merely reveal the presence of a parasitic load as Powermat argues. Stevens’s dummy load is obvious to implement in Olson’s system to signal measurements or other information pertaining to the power received by the secondary coil of the implantable medical device 16 to the external charging device as an alternative to RFID or other signaling techniques. EX1005, 39:24-35 (“instead of RFID”); 30:34-31:6.

VII. Ground 2: Obviousness Based on Stevens in view of Olson (Claims 13-18)

A. A POSITA Would Have Been Motivated to Combine Stevens and Olson

55. According to Powermat, the goals of Olson and Stevens are incompatible because Olson is directed to “‘improving power transfer to an implanted medical device’ using positional or frequency adjustments” and Stevens is “directed to determination of whether a substantial parasitic load is present and restricting or stopping a power supply accordingly.” POR, 48-51; EX2003, ¶¶127-136. This is not true, because Olson and Stevens both contemplate situations where

energy transfer must be stopped for safety reasons or to prevent damage, and describe embodiments for determining an efficiency of energy transfer. This overwhelming overlap in the goals of Stevens and Olson would provide a POSITA with even more reason to combine these references.

56. Olson discloses that during energy transfer to protect the circuitry of the implantable medical device and protect the safety of the patient, “it is preferable to limit the temperature of external antenna 52.” EX1004, [0017], [0085]. This would have been apparent to a POSITA, because it is deleterious for implantable medical devices to thermally damage the tissues of the patients in which they are implanted. To help account for this problem, Olson explains that “external charging device 48 incorporates temperature sensor 87” that “can be used to determine the temperature of external antenna 52.” EX1004, [0104]. Olson also explains that “as temperature sensor 87 approaches or reaches preset limits, control circuitry can take appropriate action such as limiting the amount of energy transferred.” EX1004, [0105]. Monitoring energy transfer efficiency as taught by Olson is simply another way to gauge situations where temperature may be high.

57. Because allegedly the “ratio format is less desirable for evaluating parasitic load” and “[p]arasitic loads are better evaluated as absolute values,” Powermat asserts that a POSITA would not have implemented Stevens’s power transfer system with Olson’s efficiency calculation. POR, 50-51; EX2003, ¶¶134-

136. This is not true. A POSITA would have understood that a ratio of output power to input power is just as valuable as a difference between input power and output power. It is apparent that when a parasitic load is still present the ratio will be smaller and when a parasitic load is not present the ratio will be larger. A POSITA would have understood the selection of either a ratio or a difference to be an obvious design choice according to the needs of a given application, but a quotient would still permit Stevens to compare a power transfer efficiency to a threshold to determine when to restrict or stop power transfer. *Id.*; Pet., 37-39; EX1003, ¶¶75-80; *supra*, §VI.

B. The Stevens-Olson Combination Provides Elements [13.1]-[13.4] and [15.2]

58. Neither Powermat nor Dr. Mercier refutes the Petition's showing that the Stevens-Olson combination provides all limitations of the Challenged Claims and renders each such claim obvious. The arguments relating to the Stevens-Olson combination to Elements [13.1]-[13.4] and [15.2] are all rooted in an erroneous and overly narrow claim interpretations that would require direct measurements of the power received only by the respective primary and secondary coils. *Supra*, §§II.A-II.B. The input power and output power measurements performed in the combination closely correspond to and reflect the actual power received by the coils. The Stevens-Olson combination provides Elements [13.1]-[13.4] and [15.2] under any reasonable claim interpretation. *Id.*

VIII. Ground 3: Obviousness Based on Stevens in view of Jin (Claims 13-18)

A. A POSITA Would Have Been Motivated to Combine Stevens and Jin

59. Similar to its attacks on the Stevens-Olson and Olson-Stevens combinations in Grounds 1B and 2, Powermat argues that it would not have been obvious to combine Stevens and Jin 2. POR, 66-69. Just as I described above, Stevens is not merely “concerned with determining parasitic loads,” but rather Stevens is concerned with many things including efficiency of energy transfer. Stevens also describes embodiments for determining efficiency that incorporate parasitic loads. *Supra*, §§VI, VII.A. Combining Stevens and Jin would have been obvious for each of the multiple reasons described in the Petition and in my first declaration. Pet., 56-57; EX1003, §§104-108.

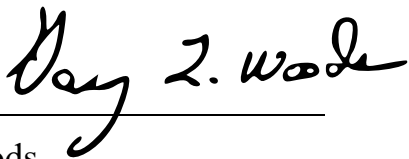
B. The Stevens-Jin Combination Provides Elements [13.1]-[13.4], [15.2]

60. Powermat seeks to distinguish the Stevens-Jin combination from the conventional features recited in Elements [13.1]-[13.4] based on its overly narrow claim interpretations, just as in previous grounds. *Supra*, §§IV.A-IV.B. But for the reasons that I have described above and in my First Declaration, the input power and output power measurements performed in the combination closely correspond to and reflect the true power received by the coils, and these interpretations are unsupported by the intrinsic evidence. Under any reasonable claim interpretation, the Stevens-Jin combination provides Elements [13.1]-[13.4] and [15.2]. *Id.*

IX. CONCLUSION

61. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code.

Dated: 08/20/2025

By: 
Dr. Gary L. Woods