

Petitioner's Demonstratives

Anker Innovations Ltd. v. Powermat Technologies Ltd.

Case No. IPR2024-00996

U.S. Patent No. 8,626,461

November 18, 2025



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Overview of the '461 Patent, the Instituted Grounds, and the Disputed Issues

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

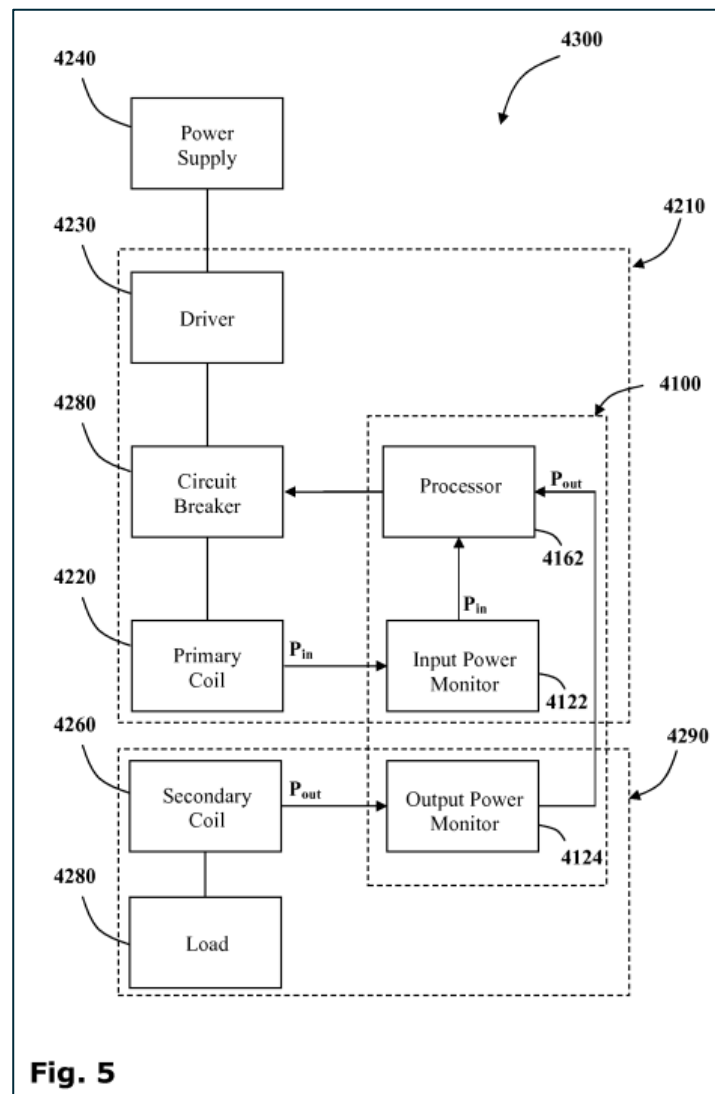


U.S. Patent No. 8,626,461 (“the ‘461 patent”)

The input power monitor **4122** is configured to measure the input power provided by the primary coil **4220** and communicates this value to the processor **4162**. The output power monitor **4124** is configured to measure the output power P_{out} received by the secondary coil **4260** and communicates this value to the processor **4162**.

The processor **4162** is configured to receive the values of the input power P_{in} and the output power P_{out} and to calculate an index of power-loss. The index of power loss indicates how much power is leaking from the inductive couple. The index of power-loss may be the efficiency quotient Q which is the ratio between them, P_{out}/P_{in} , which is an indication of the efficiency of the inductive coupling. Alternatively the index of power loss may be the efficiency differential Δ which is the difference between P_{out} and P_{in} .

EX1001, 13:15-29.



Pet., 2-4; EX1003, ¶¶25-26.

U.S. Patent No. 8,626,461 (“the ‘461 patent”)

Reference is now made to FIG. 7 showing a flow diagram of a method for monitoring the efficiency of power transmission by an inductive power outlet according to a further embodiment of the present invention. The method includes the following steps:

- a) measuring the input power delivered to a primary coil;
- b) measuring the output power received by an electric device;
- c) communicating the input power to a processor;
- d) communicating the output power P_{out} to the processor;
- e) determining an index of power-loss, such as an efficiency quotient Q or efficiency differential Δ ;
- f) optionally, disconnecting the primary coil from the power supply, for example if the efficiency quotient Q is below a threshold value (f1) or the efficiency differential Δ is above a threshold value (f2), thereby preventing power leakage.

EX1001, 15:44-60.

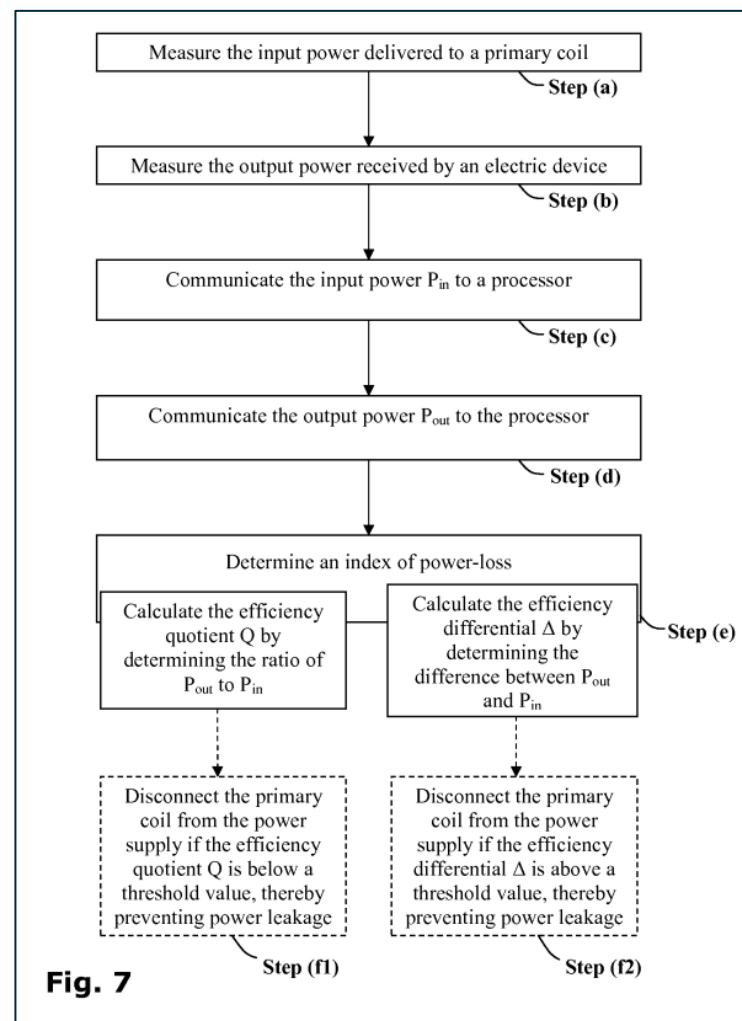


Fig. 7

Pet., 2-4; EX1003, ¶¶25-26.

U.S. Patent No. 8,626,461 (“the ‘461 patent”)

Independent Claim 13:

13. An inductive power outlet comprising at least one primary coil, for inductively coupling with a secondary coil wired to an electric load, the inductive power outlet further comprising an efficiency monitor comprising:

- at least one input power monitor configured to measure input power received by the primary coil from the power supply;

- at least one signal detector configured to detect signals carrying data pertaining to output power received by the secondary coil;

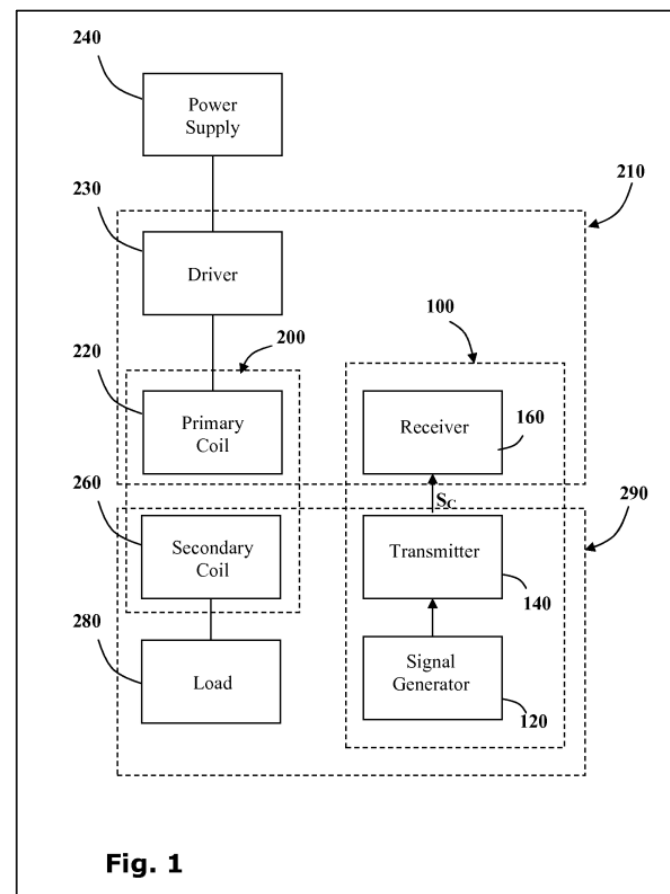
- at least one processor configured to receive data pertaining to the input power and the output power, the processor further configured to determine an index of power-loss indicative of the efficiency of an inductive coupling between the primary coil and the secondary coil;

wherein the index of power-loss comprises at least one of:

- an efficiency quotient Q , defined as the ratio of the output power to the input power; and

- an efficiency differential Δ , defined as the difference between the output power and the input power.

EX1001, 21:52-22:19.



Instituted Grounds and Disputed Issues

Ground	Claims	Basis for Rejection
1A	13-16, 18	§102 – Olson
1B	17	§103 – Olson in view of Stevens
2	13-18	§103 – Stevens in view of Olson
3	13-18	§103 – Stevens in view of Jin

Disputed Issues

- **Claim Constructions**
 - “measure input power received by the primary coil from the power supply” (13.1)
 - “data pertaining to output power received by the secondary coil” (13.2)
- **Ground 1A** – Olson’s anticipation of elements [13.1]-[13.4], [14], [15.2]
- **Ground 1B** – Motivations to combine Olson in view of Stevens (claim 17)
- **Ground 2**
 - Motivations to combine Stevens in view of Olson
 - Stevens-Olson combination’s satisfaction of elements [13.1]-[13.4], [15.2]
- **Ground 3**
 - Motivations to combine Stevens in view of Jin
 - Stevens-Jin combination’s satisfaction of elements [13.1]-[13.4], [15.2]

Issue 1:

*Claim Construction – “measure input power received by the primary coil”
(Element [13.1])*

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

PO’s and Dr. Mercier’s Implicit Construction:

[13.1] at least one input power monitor configured to ^{directly} measure
input power ^{only} received by the primary coil from the power
supply;

Reply, 2

Example of PO’s Argument Applying Implicit Construction:

Current measure block 226 therefore measures current into multiple other components other than the primary coil of Olson. In other words, current measure block 226 does not measure current and/or power “received by the primary coil from the power supply,” but instead measures power into the twelve volt power supply 216, which powers multiple components other than the primary coil.

POR, 20 (quoting EX2003, ¶179)

This measurement is not the same, for example, due to losses in components such as the electrical drive unit, as discussed in Stevens. Stevens explicitly states that losses “inevitably occur in the power transfer system” and affect power measurements. Ex. 1005 at 19:13-15.

POR, 53 (quoting EX2003, ¶151)

Legal Precedent:

IQRIS Techs. LLC v. Point Blank Enters., 130 F.4th 998, 1003-1004 (Fed. Cir. 2025) (“[W]e are not inclined to import limitations ... into the claimed invention.”)

Reply, 7

Powermat's Construction is Inconsistent with the '461 Patent's Description of Power Provided to the Primary Coil

'461 Patent, FIG. 2c:

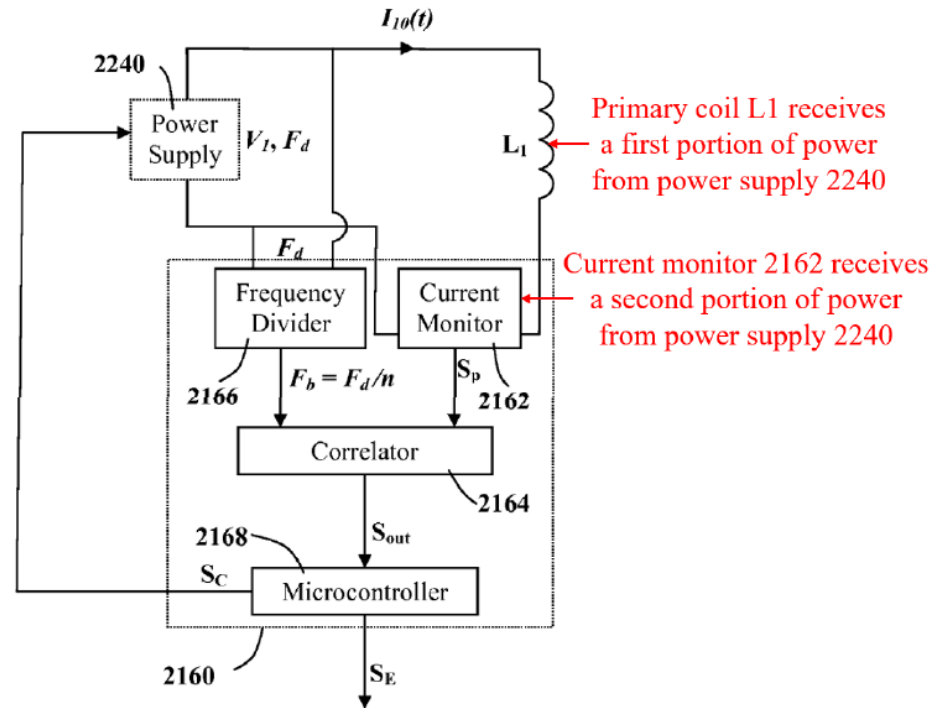


Fig. 2c

EX1001, FIG. 2c; Reply, 4

'461 Patent Specification—
Equation for “input power $P_1(t)$
provided to the primary coil L_1 ”:

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

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

EX1001, 9:38-43, Reply, 5

Powermat's Construction is Inconsistent with the '461 Patent's Description of Power Provided to the Primary Coil

Dr. Woods:

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 L_1 . That is, $V_1(t)$ as used in the input power equation *overestimates* the power received by primary coil L_1 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 L_1 , 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

PO never cross-examined Dr. Woods on his reply declaration testimony

EX1017, ¶14 (Reply, 5)

Element [13.1] Allows for Negligible and Predictable Power Losses in Characterizing the Input Power Received by the Primary Coil

Dr. Woods:

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

EX1017, ¶16 (Reply, 6)

Dr. Mercier:

Q. Can the measurement of input power in this claim limitation include negligible power losses?

MR. NASH: Objection. Form.

THE WITNESS: Let me just think about this for a moment. I haven't offered an opinion on exactly that in my report. Let me just think for a moment.

So the claims need to be read in light of the specification by a POSITA who has knowledge of how to design things like this. And 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, 45:14-25 (Reply, 6)

Q. How would you define negligible?

A. That depends on context and design goals and things like this. So that's -- there's no kind of one definition. It's really context and application dependent.

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.

EX1018, 46:15-22 (Reply, 6)

Issue 2:

Claim Construction – “data pertaining to output power received by the secondary coil” (Element [13.2])

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

PO’s and Dr. Mercier’s Implicit Construction:

[13.2] at least one signal detector configured to detect signals
a direct measure of
carrying data pertaining to output power received by the
only
secondary coil;

Reply, 7

Example of PO’s Argument Applying Implicit Construction:

Further, power goes through the secondary coil through electronics 26 and potentially “therapy module 28” before going to “rechargeable power source 24. Ex. 1004 Fig. 2, ¶ [0050]. Power measurements at rechargeable power source 24 are therefore different than power measurements “received by the secondary coil” because power is transferred to other components between the secondary coil and the rechargeable power source, where Olson states voltage is measured.

POR, 31 (quoting EX2003, ¶93); Reply, 7 (quoting POR, 31)

Legal Precedent:

IQRIS Techs. LLC v. Point Blank Enters., 130 F.4th 998, 1003-1004 (Fed. Cir. 2025) (“[W]e are not inclined to import limitations ... into the claimed invention.”)

Reply, 7

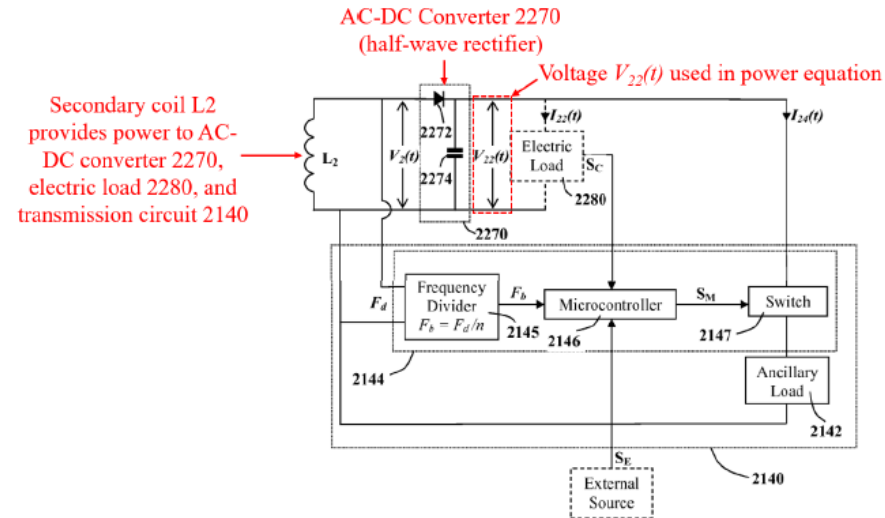
The '461 Patent Lacks Support for Directly Measuring Power Received Only by the Secondary Coil

Dr. Woods:

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").

EX1017, ¶¶22-23; Reply, 8-9



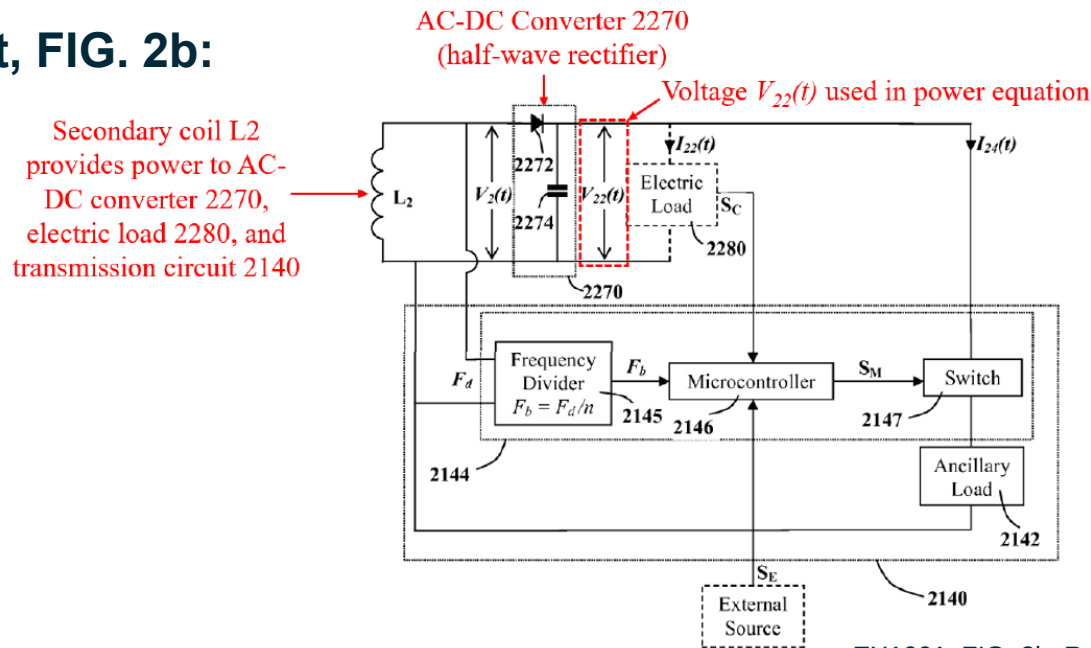
EX1001, FIG. 2b; Reply, 9-10.

No power measurement circuitry disclosed

EX1001, FIG. 2b; Reply, 9

Powermat's Construction is Inconsistent with the '461 Patent's Description of Total Power Drawn by the Secondary Coil

'461 Patent, FIG. 2b:



EX1001, FIG. 2b; Reply, 9-10.

'461 Patent Specification—Equation for “total power P_2 drawn by the secondary coil L_2 ” based on rectified voltage (not coil voltage)

The electric load 2280 which is coupled to the secondary coil L_2 —either directly or via the AC-DC converter 2270—draws a load current I_{22} . The power P_{22} provided to the load 2280 is given by the scalar product of the voltage V_{22} and the load current I_{22} . When the ancillary load 2144 is connected, an additional ancillary current i_{24} is also drawn. Thus, with the ancillary load 2144 connected, the total power P_2 drawn by the secondary coil L_2 is given by:

$$P_2(t) = \vec{V}_{22}(t) \bullet [\vec{I}_{22} + \vec{i}_{24}(t)]$$

EX1001, 9:26-35, FIG. 2b; Reply, 10

Powermat's Construction is Inconsistent with the '461 Patent's Description of Total Power Drawn by the Secondary Coil

Dr. Woods:

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.

EX1017, ¶26; Reply, 11.

Rectifier Efficiency

Rectifier efficiency is the ratio of output DC power to the input AC power. ***For a half-wave rectifier, rectifier efficiency is 40.6%.***

EX1024; Reply, 11.

← PO never cross-examined Dr. Woods on his reply declaration testimony

Supporting Evidence (Byjus.com—“How Diodes Work as a Rectifier”):

Disadvantages of Half Wave Rectifier

- Ripple production is more
- Harmonics are generated
- Utilization of the transformer is very low
- The efficiency of rectification is low

Powermat's Construction is Inconsistent with the Breadth of “Data Pertaining to Output Power”

Dr. Woods:

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”)

EX1017, ¶20 (Reply, 8)

Collins English Dictionary:

pertain *vb* (often foll. by *to*) **1** to have reference or relevance: the notes pertaining to the case **2** to be appropriate: *the product pertains to real user needs* **3** to belong (to) or be a part (of) [Latin *pertinere*]

EX1022 (Reply, 8)

American Heritage Dictionary:

per·tain (pər-tān′) *intr.v.* -tained, -tain·ing, -tains **1.** To have reference or relevance; relate: evidence that pertains to the accident. **2.** To belong as an adjunct, part, holding, or quality: *skills that pertain to engineering.* **3.** To be fitting or suitable: *conduct that pertains to an officer.* [Middle English *pertenen*, *pertainen* < Old French *partenir* < Latin *pertinēre* : *per-*, *per-* + *tenēre*, to hold; see **ten-** in App. I.]

EX1023 (Reply, 8)

Element [13.2] Allows for Negligible and Predictable Power Losses in Characterizing the Output Power Received by the Secondary Coil

Dr. Woods:

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.

EX1017, ¶27 (Reply, 11)



PO never cross-examined Dr. Woods on his reply declaration testimony

Dr. Mercier:

Q. Can the signal's carrying data pertaining to output power received by the secondary coil include negligible power losses?

MR. NASH: Objection to form.

THE WITNESS: I think that's fair to say. This claim language is looking at the output power received by the secondary coil, which is kind of very clearly defined in the specification of this patent.

If there are other things that are negligible, like they simply just don't matter to that power calculation, then, if they happen to be in there and they're negligible, yeah, I think that's fine.

If -- if there's additional power in there that's not negligible, then that's a different consideration.

EX1018, 47:6-20 (Reply, 11)

Issue 3:

Olson (Ground 1A)—Anticipation of Element [13.1] ("at least one input power monitor configured to measure input power received by the primary coil from the power supply")

Olson's FIG. 14 Charger Provides an Input Power Monitor that Measures Input Power Received by the Primary Coil

Olson:

[0074] Current measure block 226 measures current to 12 volt power supply 216. Current measured by current measure block 226 is used in the calculation of power in along with the voltage of batteries 160. As noted above, power in is used in the calculation of efficiency of power transfer and/or charging efficiency to determine, in part, the best location of external antenna 52 and/or rotating core cup assembly 92.

These values are obtained by telemetry from implanted medical device 16. The power in is gauged by the power generated by charging unit 50 and is determined by multiplying the voltage of the internal voltage of charging unit 50, e.g., the voltage of a battery or batteries internal to charging unit 50, by the current driving external antenna 52.

EX1004, [0074]-[0075]; Pet., 15.

Inductive Power Outlet

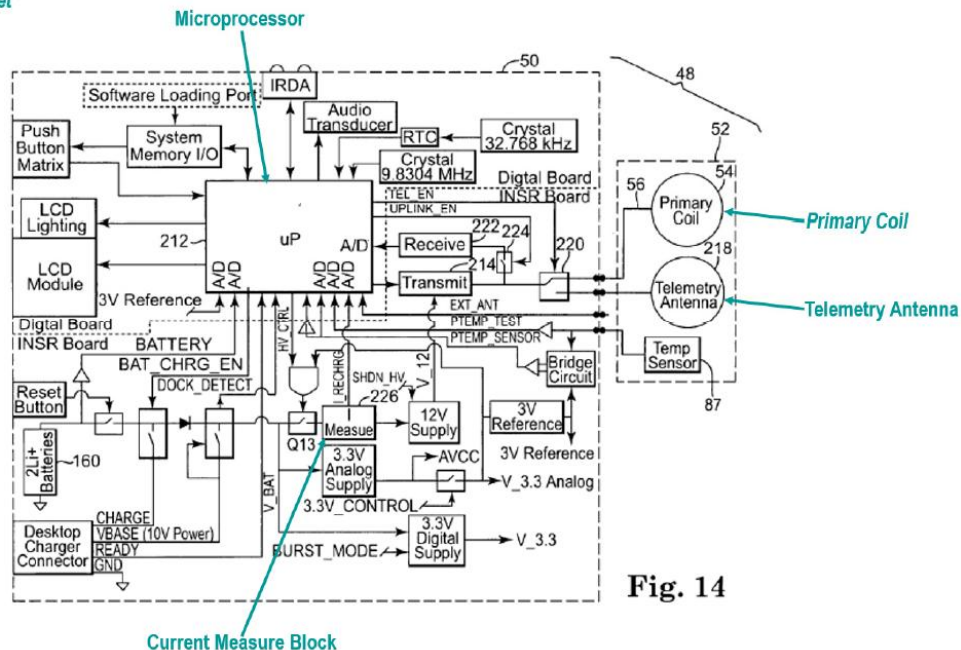


Fig. 14

EX1004, FIG. 14; Pet., 16.

Dr. Woods:

42. Olson discloses Element [13.1]. Olson discloses the use of a current measure block 26 that, in connection with microprocessor 212, provides the claimed input power monitor. For example, Olson's "[c]urrent measure block 226" measures current to the "primary coil 54" from the power supply 216 EX1004, [0071]-[0078]. FIG. 13, FIG. 14; *above*, Element [13.P]. Olson teaches that the

EX1003, ¶42; Pet., 15.

Any Power Losses Included in Olson's Input Power Measurement are Inconsequential

Dr. Woods:

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.*

EX1017, ¶41; Reply, 16.

PO never cross-examined
Dr. Woods on his reply
declaration testimony

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.

EX1017, ¶43; Reply, 16.

Olson's Para. [0112] Configuration Provides Direct "Coil-to-Coil" Measurements of Input Power Received Only by the Primary Coil Consistent with PO's Interpretation

Olson:

[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.e., the power transmitted by primary coil 54. While energy efficiency can be measured at other locations in external antenna 52 and/or implantable medical device 16, for purposes of some embodiments of the present invention it is preferred that efficiency is measured coil-to-coil, i.e., from primary coil 54 to secondary coil 34.

EX1004, [0112]; Pet., 12, 15-16.

Dr. Woods:

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.

EX1017, ¶45; Reply, 17.



PO never cross-examined Dr. Woods
on his reply declaration testimony

Issue 4:

Olson (Ground 1A)—Anticipation of:

- **Element [13.2]** ("at least one signal detector configured to detect signals carrying data pertaining to output power received by the secondary coil") and
- **Element [15.2]** ("the inductive power receiver further comprising at least one output power monitor for measuring output power received inductively by the secondary coil from the primary coil")

Olson's FIG. 14 Charger Provides a Signal Detector that Detects Signals Carrying Data Pertaining to Output Power Received by the Secondary Coil (Element [13.2])

Olson:

[0075] Rotating core cup assembly 92 is rotated in external antenna 52 for better lateral alignment of primary coil 54 and secondary coil 34. A feedback mechanism is used to determine the best rotation of core cup assembly 92. External charging device 48 can determine whether the current position of rotating core cup assembly 92 is optimally aligned for energy transfer and/or charging. External charging device 48 measures the power out of external charging device 48 divided by the power into external charging device 48. This calculation is a measure of the efficiency of external charging device 48. The power out is gauged by the power induced in implantable medical device 16 and is determined by multiplying the voltage of rechargeable power source 24 by the charging current in implantable medical device 16. These values are obtained by telemetry from implanted medical device 16. The power in is gauged by the power generated by charging unit 50 and is determined by multiplying the voltage of the internal voltage of charging unit 50, e.g., the voltage of a battery or batteries internal to charging unit 50, by the current driving external antenna 52.

EX1004, [0075]; Pet., 17.

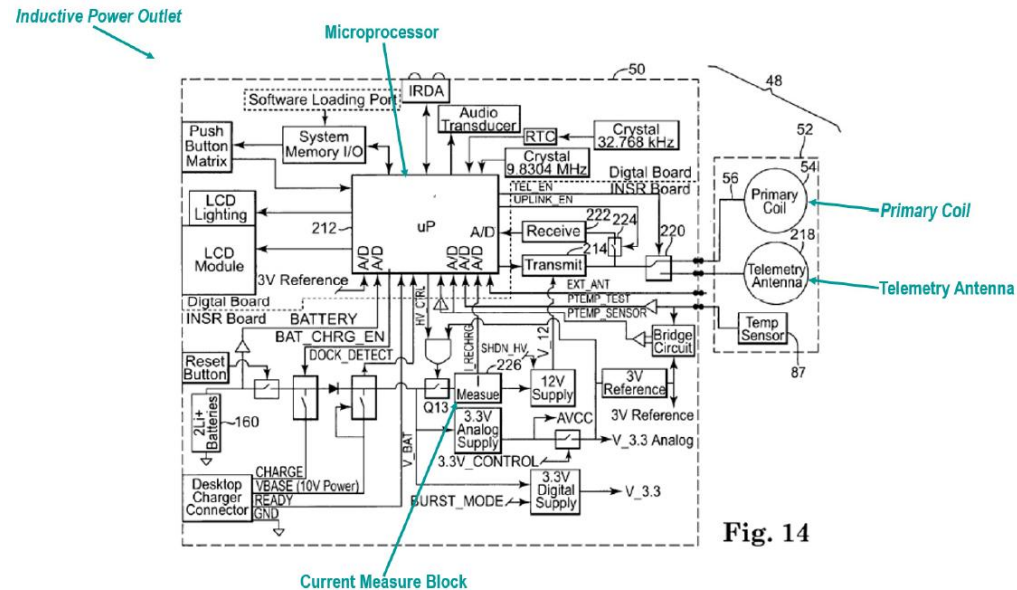


Fig. 14

Dr. Woods:

EX1004, FIG. 14; Pet., 16.

45. Olson discloses Element [13.2]. For example, Olson teaches a signal detector that operates like the signal detector of the '461 patent. For example, Olson describes a "telemetry antenna 218" (e.g., a signal detector) that is configured to detect data signals from the wireless electric device 16. EX1004, [0072]-[0075] ("by telemetry"), FIG. 14, *see also* [0052] ("to obtain information from implantable medical device 16"). As such, the microprocessor 212 receives "by telemetry" measurement data pertaining to "the power induced in implantable device 16" (e.g., via the telemetry antenna 218). EX1004, [0072], [0075], FIG. 14, *see also* EX1004 [0052].

EX1003, ¶45; Pet., 29

Olson Discloses an Output Power Monitor for Measuring Output Power Received Inductively by the Secondary Coil (Element [15.2])

Olson:

48. This calculation is a measure of the efficiency of external charging device 48. The power out is gauged by the power induced in implantable medical device 16 and is determined by multiplying the voltage of rechargeable power source 24 by the charging current in implantable medical device 16.

EX1004, [0075]; Pet., 23.

Dr. Woods:

54. Olson discloses Element [15.1] including the claimed output power monitor. As I have described in Elements [13.P] and [13.4], Olson discloses that “efficiency is measured coil-to-coil, i.e., from the primary coil 54 to the secondary coil 34”—and in particular “by dividing the power in, i.e., the power received by secondary coil 34, by the power out, i.e., the power transmitted by primary coil 54.” EX1004, [0112]. Accordingly, Olson describes that an output power monitor at implantable medical device 16 measures both “the charging current” induced at the secondary coil and “the voltage of the rechargeable power source 24,” that are multiplied to provide a measurement of power at the secondary coil. EX1004, [0075] (“by multiplying the voltage of rechargeable power source 24 by the charging current in implantable medical device 16”), *see also* [0112]. This measurement

EX1003, ¶54; Pet., 23.

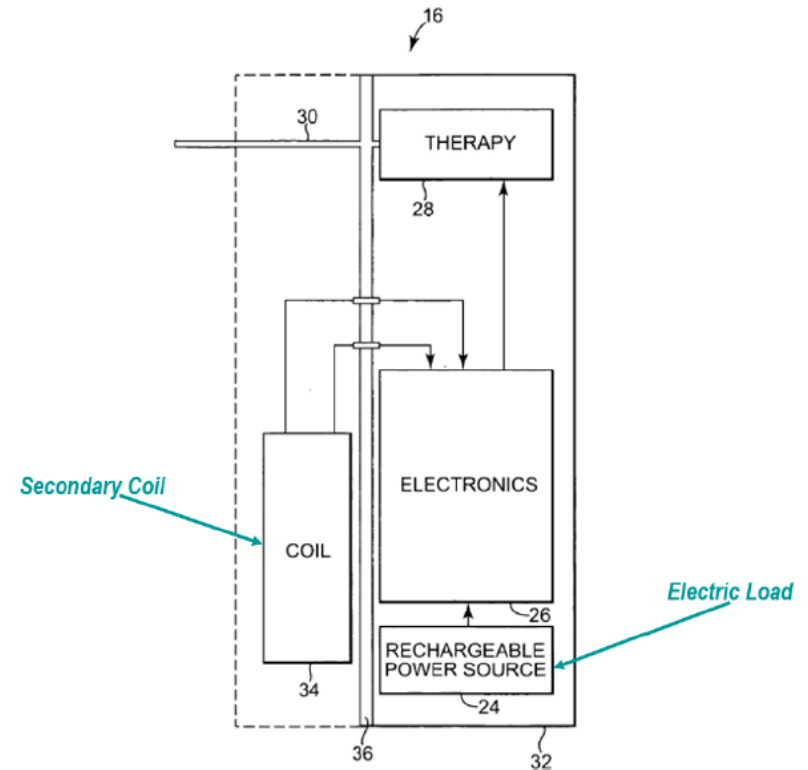


Fig. 2

EX1001, FIG. 2; Pet., 14.

Any Power Losses Included in Olson's Output Power Measurement are Inconsequential

Dr. Woods:

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].

PO never cross-examined Dr. Woods on his reply declaration testimony

EX1017, ¶148; Reply, 18.

Olson's Para. [0112] Configuration Provides Direct "Coil-to-Coil" Measurements of Output Power Received Only by the Secondary Coil

Olson:

[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.e., the power transmitted by primary coil 54. While energy efficiency can be measured at other locations in external antenna 52 and/or implantable medical device 16, for purposes of some embodiments of the present invention it is preferred that efficiency is measured coil-to-coil, i.e., from primary coil 54 to secondary coil 34.

EX1004, [0112]; Pet., 17, 23-24.

Dr. Woods:

54. Olson discloses Element [15.1] including the claimed output power monitor. As I have described in Elements [13.P] and [13.4], Olson discloses that “efficiency is measured coil-to-coil, i.e., from the primary coil 54 to the secondary coil 34”—and in particular “by dividing the power in, i.e., the power received by secondary coil 34, by the power out, i.e., the power transmitted by primary coil 54.” EX1004, [0112]. Accordingly, Olson describes that an output power monitor at

EX1003, ¶154; Pet., 24.

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

EX1017, ¶49; Reply, 19.

Issue 5:

Olson (Ground 1A)—Anticipation of Claim 14 ("at least one circuit-breaker configured to disconnect the primary coil from the power supply")

Olson Discloses a Circuit-Breaker Configured to Disconnect the Primary Coil from the Power Supply

Claim 14: The inductive power outlet of claim 13 additionally comprising at least one circuit-breaker configured to disconnect the primary coil from the power supply.

Dr. Woods:

50. Olson discloses Element [14]. For example, Olson teaches two examples of a circuit breaker that is configured to disconnect the primary coil from the power supply. In a first example, Olson teaches that an “electronically controllable switch 220” serves as a circuit-breaker configured to disconnect the primary coil 54 from the 12V power supply:

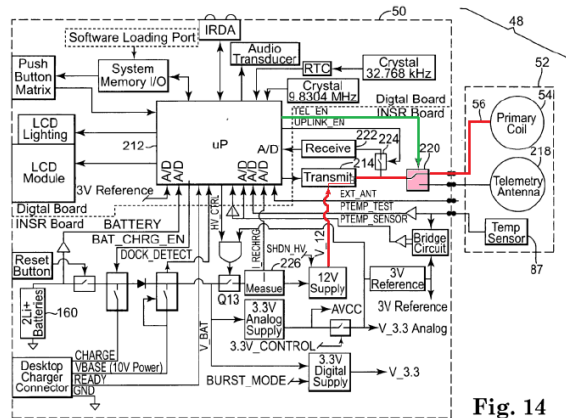


Fig. 14

EX1004, FIG. 14 (color added), [0072] (“Drive selection is done by electronically controllable switch 220”).

51. The microprocessor 212 provides a control signal to the switch 220, which can selectively disconnect the primary coil 54 and thereby break the connection between the power supply and the primary coil 54. EX1004, [0072]. In a second example, Olson describes control circuitry/control logic that switches off energy transfer from the primary coil 54 in the event too much heat is generated (e.g., due to inefficient power transfer). EX1004, [0085], [0105], [0110]. This disconnection of the primary coil 54 is disclosed in the context of Olson teaching that “heat may be generated” as energy is transferred from primary coil 54 to secondary coil 34. EX1004, [0105], [0110]. Olson explains that a temperature

EX1003, ¶51; Pet., 21.

- PO has never disputed that Olson’s electronically controllable switch is a “circuit-breaker.”
- PO submitted no expert testimony disputing Petitioner’s mappings.

Olson's Disclosure of an Electronically Controllable Switch Encompasses an Electromechanical Switch to Disconnect the Primary Coil from the Power Supply

Dr. Woods:

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

EX1017, ¶51; Reply, 21.

Issue 6:

Motivations to Combine Olson with Stevens (Ground 1B, Claim 17)

The Olson-Stevens Combination Would Have Rendered Claim 17 Obvious

Claim 17: The inductive power receiver of claim 15 wherein the transmitter comprises: an ancillary load selectively connectable to the secondary inductive coil, a modulator for modulating a bit-rate signal with an input signal to create a modulated signal, and a switch for intermittently connecting the ancillary load to the secondary inductive coil according to the modulated signal.

Stevens:

It will be appreciated that instead of RFID, any suitable communication link can be used to permit each secondary device to communicate its power requirement information to the primary unit. For example, infrared or ultrasound communication could be used. Alternatively, each secondary device could vary the load it imposes on the primary unit to communicate the power requirement information. For example, each secondary device could impose a dummy load representing the amount of power required by its actual load. In this technique, all the secondary devices in the power-requiring state can impose their respective dummy loads simultaneously, so that the primary unit can directly derive the sum of the power requirements of all the secondary devices in one measurement. Alternatively, the dummy load may represent a total load from the secondary device including the amount of power required by the actual load and any friendly parasitic load of the secondary device/host object.

EX1005, 39:27-35; Pet., 35.

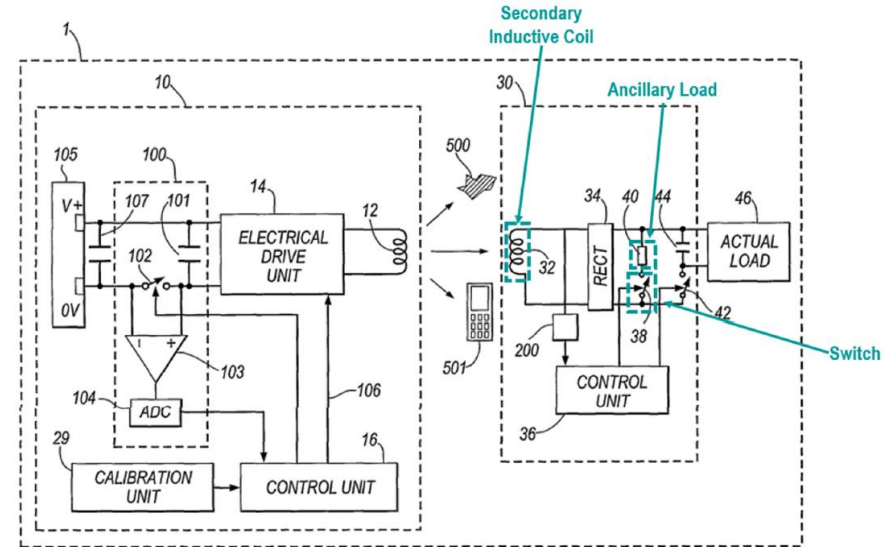


Fig.4

EX1005, FIG. 4; Pet., 36.



PO has never disputed that Stevens discloses the additional features recited in claim 17.

The Olson-Stevens Combination Would Have Rendered Claim 17 Obvious

Dr. Woods:

66. There are several rationales that would have prompted a POSITA to implement Olson's charging unit (e.g., charging unit 50) with Stevens' suggestion for communicating power information to the primary unit by varying the imposed load using a dummy load, thereby modulating a bit-rate signal, to achieve known benefits. For example, these reasons would have led a POSITA to use Stevens' load-modulation scheme in lieu of Olson's telemetry-based communication to achieve known benefits for various predictable designs.

EX1003, ¶166; Pet., 35.

The Petition and Dr. Woods Articulated Multiple Motivations to Combine:

1. Reduce the size and complexity of Olson's charging devices.
2. Reduce component costs by eliminating the need for a separate telemetry coil.
3. Addresses known problems (e.g., size, complexity, costs, need for communication) using a known technique (Stevens's load modulation) according to established functions. *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023).

EX1003, ¶¶67-70; Pet., 30-33.

PO has never disputed/
acknowledged any of
the specific motivations →

PO's Non-Combinability Arguments Disregard Substantial Similarities in Olson's and Stevens's Systems

Dr. Woods (1st Decl.):

65. Stevens and Olson are similar to one another. For example, both illustrate concepts related to power outlet devices having a "primary coil" for inductively coupling with a "secondary coil" of a wireless electric device for recharging a battery. EX1005, 17:7-18:28, 21:13-24:16, 38:5-39:35, 33:1934:15, FIGS. 1, 4, 9 and 12; EX1004, [0050]-[0054], [0072]-[0078], FIGS. 2-3 and 14. Stevens provides additional details regarding a number of conventional options used in such wireless charging devices. Stevens provides details regarding such a conventional transmitter for an inductive power receiver, and also teaches that "each secondary device could vary the load it imposes on the primary unit to communicate the power requirement information." EX1005, 39:27-35. Stevens teaches the conventional practice of the secondary device using "a dummy load" (e.g., an ancillary load) representing the amount of power required by its actual load, and Stevens teaches dynamically altering the load to provide information of the secondary device to the primary unit including using a number of "bits." EX1005, 30:34-31:6.

EX1003, ¶65; Pet., 30.

Dr. Woods (2nd Decl.):

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].

EX1017, ¶53; Reply, 23.



PO never cross-examined
Dr. Woods on his reply
declaration testimony

Issue 7:
*Motivations to Combine Stevens with Olson (Ground 2) and
Stevens with Jin (Ground 3)*

The Petition Articulated Multiple Reasons to Apply Olson's Suggestion for Calculating a Power Transfer Efficiency Ratio in Combination with Stevens (Ground 2)

Olson:

[0076] The ratio of power out divided by power in can be scaled displayed to patient 18, or a medical professional or other person adjusting rotatable core cup assembly 92 or positioning external antenna 52. For example, the available efficiency can be divided into separate ranges and displayed as a bar or as a series of lights. The separate ranges can be linearly divided or can be logarithmic, for example.

EX1004, [0076]; Pet., 46.

Dr. Woods:

77. As a first reason, a POSITA would have been motivated to implement Olson's suggestion (determining the index of power-loss using an efficiency quotient, as described above) in Stevens' system because Olson's efficiency measure ("[t]he ratio of power out divided by power in") advantageously "works not only at high charging or power transfer levels but also at reduced charging levels, as for example, when charging at reduced levels toward the end or beginning of a charging cycle." EX1004 [0076]-[0077]. A POSITA would have readily recognized that

78. As a second reason, a POSITA would have been motivated to implement Olson's suggestion for determining the index of power-loss using an efficiency quotient in Stevens' system because Olson expressly suggests it was "an important measure of effectiveness," especially where the efficiency is measured "coil-to-coil." EX1004, [0111]-[0112]. Based on my review, a POSITA would have

79. As a third reason, a POSITA would have been motivated to modify Stevens' system to include Olson's suggestion (determining an index of power loss between a primary and secondary coil that includes a ratio of the output power and input power) for purposes of improved detection of a parasitic load, especially in instances where the magnitude of the power transferred is relatively low, by comparing this quotient value with a threshold value. EX1005, 2:8-20, 38:34-39:6.

EX1003, ¶¶76-79; Pet., 37-39.

Patent Owner never addressed the Petition's specific motivations to combine.

The Petition Articulated Multiple Reasons to Apply Jin's Suggestion for Calculating a Power Transfer Efficiency Ratio in Combination with Stevens (Ground 3)

Jin:

[0093] Then, the coupling condition between the coils was judged using transmission efficiency as a parameter. Although the relation between transmission efficiency and coupling coefficient between the coils is not simple, there is a quite strong correlation between the transmission efficiency and coupling coefficient if the same test condition is applied.

[0094] Transmission efficiency =(effective current value of secondary side x effective voltage)/(effective current value of primary side x effective voltage)

EX1006, [0093]-[0094]; Pet., 56.

Petition & Dr. Woods:

First, a POSITA would have been motivated to do so because Jin expressly notes that using this efficiency measure (a ratio of the output power to the input power) advantageously provides a “strong correlation between the transmission efficiency and coupling coefficient.” [0093]-[0094], EX1003, ¶106. Here,

Second, a POSITA would have been motivated to implement Jin's suggestion (e.g., for determining a “transmission efficiency” ratio) in Stevens's system in order to improve the reliability of signal transmission between the coils. EX1006, [0112]; EX1003, ¶107.

Finally, both Stevens and Jin are directed to wireless charging systems whose designs were specifically concerned with power transfer efficiency. *Supra*, Sections V.B.1, V.D.1. A POSITA would have been sufficiently skilled and would Pet., 56-57; EX1003, ¶¶106-108.

Patent Owner never addressed the Petition's specific motivations to combine.

PO's Non-Combinability Arguments Disregard Substantial Similarities between Stevens's and Olson's Systems

Patent Owner's first argument: Stevens and Olson are directed to different goals, because Stevens describes determining whether a parasitic load is present and Olson describes improving power transfer. [POR, 48-49]

Dr. Woods Reply Testimony:

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.

EX1017, ¶¶55-56; Reply, 25-26.

Patent Owner elected to never cross-examine Dr. Woods after his reply testimony.

PO's Non-Combinability Arguments Disregard Substantial Similarities between Stevens's and Olson's Systems

Patent Owner's **second** argument: Olson's efficiency "ratio" is incompatible with Stevens' technique for identifying parasitic loads. [POR, 48-49]

Dr. Woods Reply Testimony:

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.

Patent Owner elected to never cross-examine Dr. Woods after his reply testimony.



EX1017, ¶57; Reply, 26.

Issue 8:

Stevens Grounds (Grounds 2-3)—Obviousness of Element [13.1] ("at least one input power monitor configured to measure input power received by the primary coil from the power supply")

Stevens' Power Measurement Unit Provides an Input Power Monitor that Measures Input Power Received by the Primary Coil

Stevens:

The primary unit 10 in the Figure 1 system also comprises a power measurement unit 100 connected to the control unit 16. The power measurement unit 100 performs a measurement of the electrical power drawn by the electrical drive unit 14, on receipt of a signal provided by the control unit 16. The power measurement unit 100 provides an output representative of the electrical power drawn by the electrical drive unit 14 to the control unit 16. The power drawn by the electrical drive unit 14 is representative of the power drawn by the primary coil 12 and hence also the power drawn by all the secondary devices 30 plus other losses.

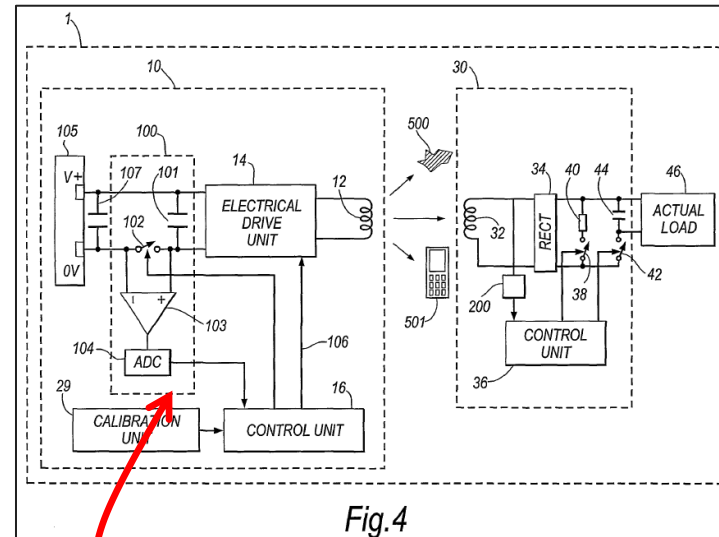
In step S2, with all of the secondary devices in the no-load state, the power measurement unit 100 in the primary unit measures the power drawn by the secondary devices from the primary unit. In step S3, the control unit 16 in the primary unit determines, in dependence upon the power measured in step S2, whether to restrict or stop the inductive power supply from the primary unit.

The power measurement unit 730 in the primary unit also measures the power being drawn by the secondary devices from the primary unit, as in step S22 in Fig. 11. Then, the control unit 720 determines, in dependence upon the measured power and the sum

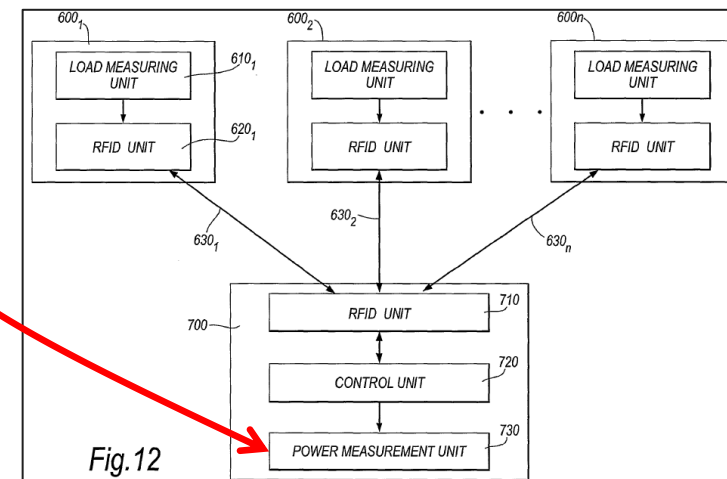
EX1005, 18:4-11, 19:4-8, 38:34-36, FIG. 4, FIG. 12

Dr. Woods:

85. Stevens discloses Element [13.1]. For example, Stevens teaches a power measurement unit 100/730. EX1005, 21:22-23, 38:34-39:6, FIG. 4, FIG. 12. The power measurement unit “provides an output representative of the electrical power drawn by the electrical drive unit 14 to the control unit 16.” EX1005, 18:7-9, see also EX1005, Abstract, 4:27-5:3. “The power drawn by the electrical drive unit 14 is representative of the power drawn by the primary coil 12.” EX1005, 18:4-11; see also EX1005, 22:15-23, 32:32-33:8, 38:9-14.



Input
Power
Monitor



Stevens' Input Power Measurement Corresponds to and Reflects the Actual Power Received by the Primary Coil

Dr. Woods:

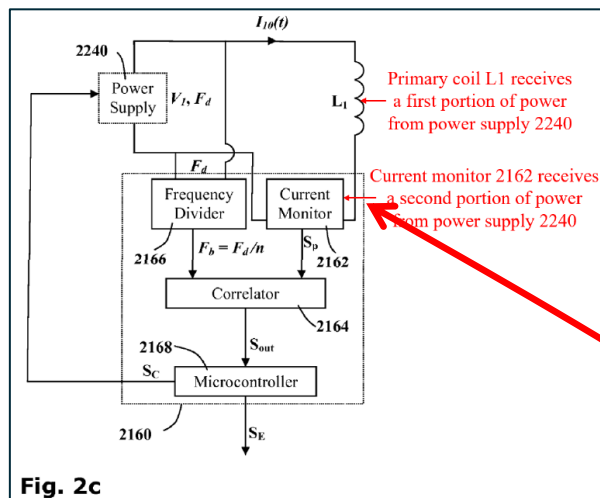
58. Neither Powermat nor Dr. Mercier refutes the Petition's showing that the Stevens-Olson combination provides all limitations of the Challenged Claims and renders each such claim obvious. The arguments relating to the Stevens-Olson combination to Elements [13.1]-[13.4] and [15.2] are all rooted in 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.*

PO never cross-examined Dr. Woods on his reply declaration testimony

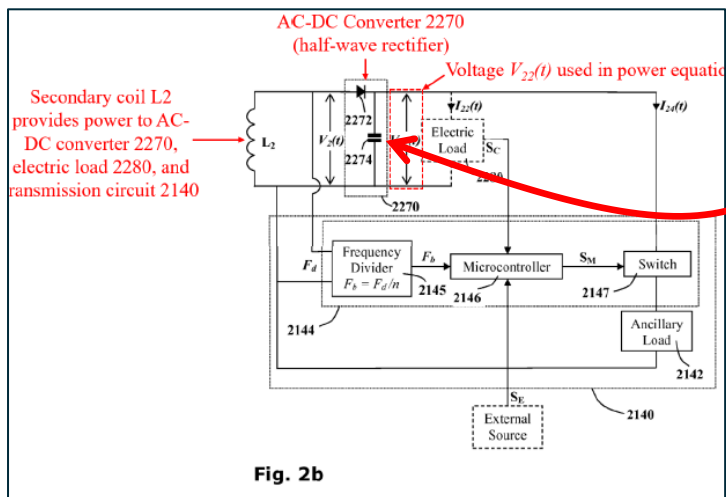
EX1017, ¶158; Reply, 26-27.

Stevens's Power Losses are Inconsequential and Comparable to those Disclosed in the '461 Patent

'461 Patent:

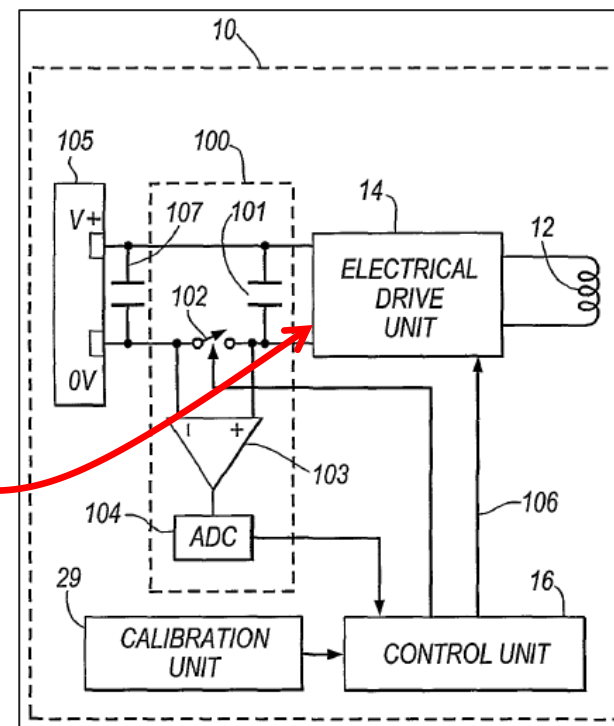


EX1001, FIG. 2c; Reply, 4



EX1001, FIG. 2b; Reply, 9-10

Stevens:



Negligible
Power
Losses

Issue 9:

Stevens Grounds (Grounds 2-3)—Obviousness of:

- **Element [13.2]** (*"at least one signal detector configured to detect signals carrying data pertaining to output power received by the secondary coil"*) and
- **Element [15.2]** (*"the inductive power receiver further comprising at least one output power monitor for measuring output power received inductively by the secondary coil from the primary coil"*)

Stevens's Provides At Least One Signal Detector That Detects Signals Carrying Data Pertaining to Output Power (Element [13.2])

Stevens:

The features of the secondary device 600 are generally the same as those of the secondary device 30 in Figure 4 except that the elements 38, 40, 42, 44 and 200 may be omitted. Instead of these elements, each secondary device 600 comprises its own load measuring unit 610 and an RFID unit 620. The load measuring unit 610 measures the power being supplied to the actual load (46 in Fig. 4) of that secondary device. For example, the load measuring unit 610 may measure the current and/or voltage being supplied to the actual load 46 and may possibly integrate these measures over time for averaging purposes. For example, the averaging period may be ten seconds.

The RFID unit 620 in each secondary device is capable of communicating with the RFID unit 710 in the primary unit 700 using an RFID link 630. The load measure produced by the load measuring unit 610 in each secondary device is supplied to the RFID unit 620 in the device and then transmitted via the relevant RFID link 630 to the RFID unit 710 in the primary unit. For example, the RFID unit 710 may poll the RFID unit 610 in each of the secondary devices from time to time. In response, the RFID unit 620 that has been polled transmits its load measure. This load measure corresponds to the power requirement information of step S21 in Fig. 11.

EX1005, 38:16-32, FIG. 12; Pet., 58, 62.

It is also possible for the load measure produced by each secondary device to represent a total load from the secondary device including the amount of power required by the actual load and any friendly parasitic load of the secondary device/host object. If the actual load requires no power the load measure may change to represent only the friendly parasitic load.

EX1005, 39:9-12, Reply, 23; Pet., 58, 62.

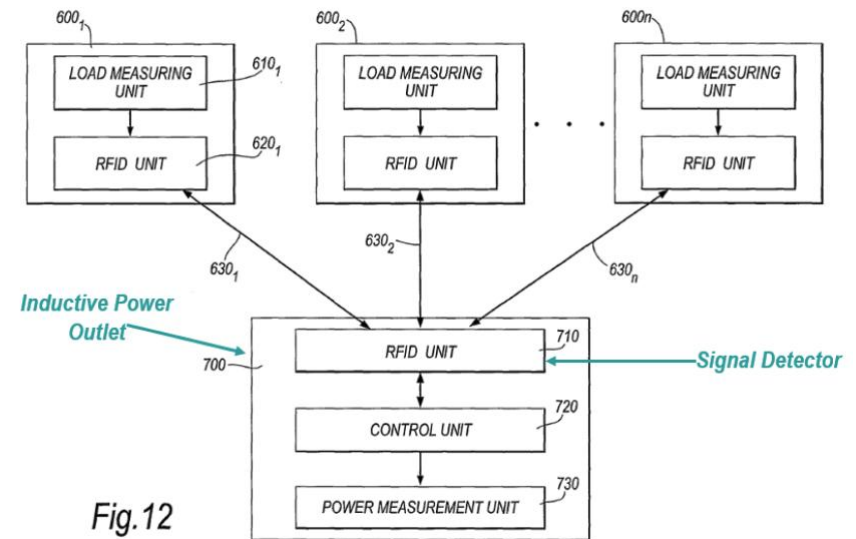


Fig.12

Dr. Woods:

86. Stevens discloses Element [13.2]. For example, Stevens discloses the “primary unit 700” as having “an RFID unit 710.” 38:9-14. Stevens teaches using RFID or “any suitable communication link” to permit the secondary device to communicate its power requirement information to the primary unit. See EX1005, 38:25-32, 39:24-35, FIGs. 4 (see reference numbers 40 and 38), 12. “The load measure produced by the load measuring unit 610 in each secondary device is supplied to the RFID unit 620 in the device and then transmitted via the relevant RFID link 630 to the RFID unit 710 in the primary unit”:

EX1003, ¶86; Pet., 42-43

Stevens's Output Power Measurement Corresponds to and Reflects the Actual Power Received by the Secondary Coil

Dr. Woods:

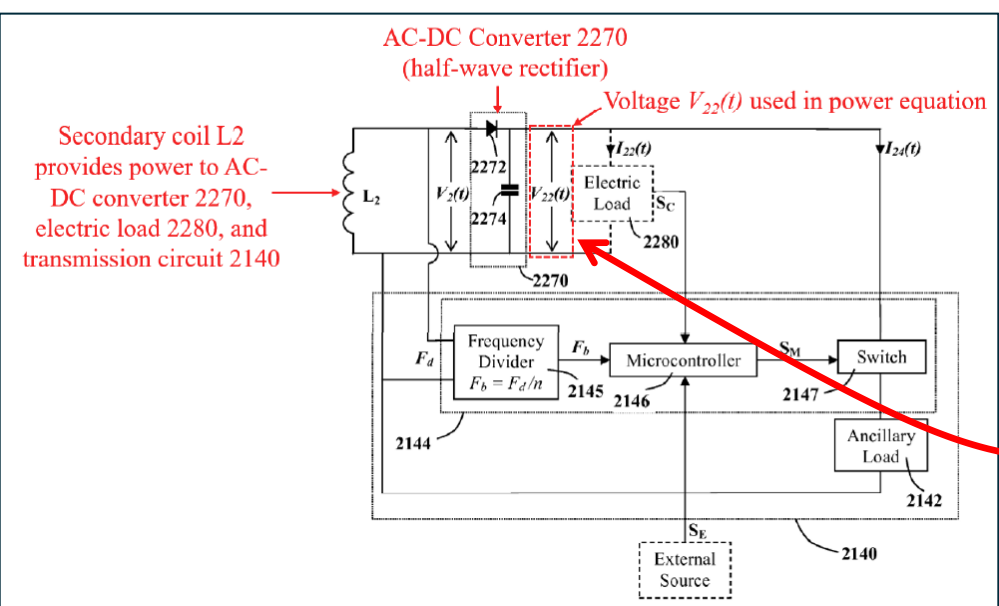
58. Neither Powermat nor Dr. Mercier refutes the Petition's showing that the Stevens-Olson combination provides all limitations of the Challenged Claims and renders each such claim obvious. The arguments relating to the Stevens-Olson combination to Elements [13.1]-[13.4] and [15.2] are all rooted in 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.*

PO never cross-examined Dr. Woods on his reply declaration testimony

EX1017, ¶158; Reply, 26-27.

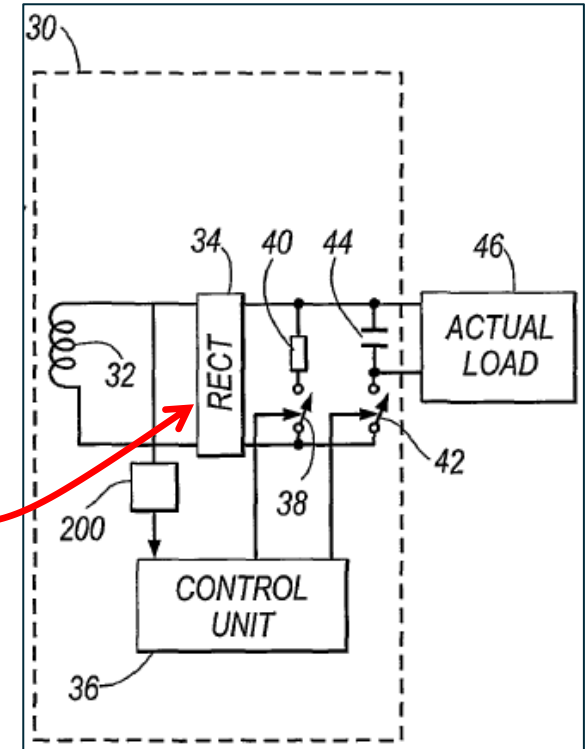
Stevens's Power Losses are Inconsequential and Comparable to those Disclosed in the '461 Patent

'461 Patent:



EX1001, FIG. 2c; Reply, 4.

Stevens:



EX1005, FIG. 4; Pet., 48; Reply, 26-27; EX1017, ¶158.

Negligible
Power
Losses

Stevens Provides At Least One Output Power Monitor including a Load Measuring Unit For Measuring Output Power (Element [15.2])

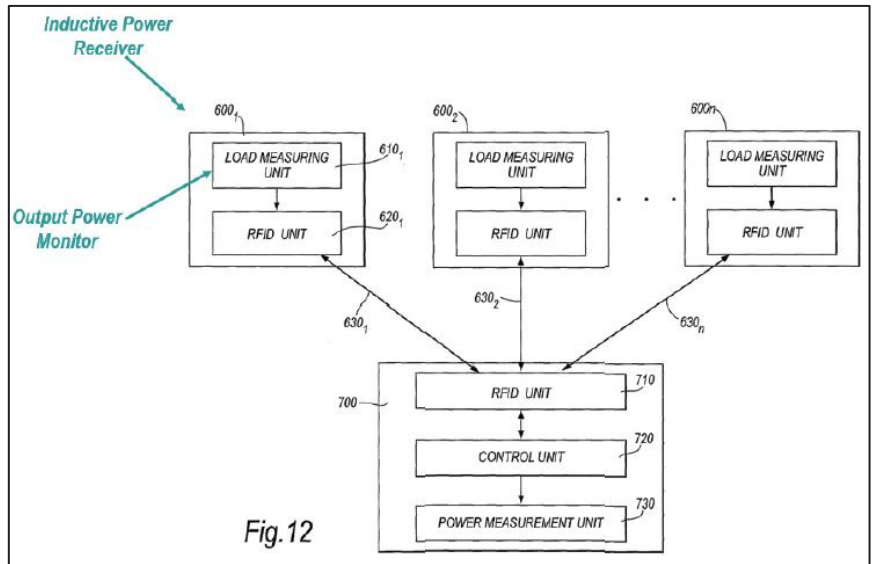
Petition and Dr. Woods:

93. Stevens discloses Element [15.2]. Stevens teaches the secondary device including a “load measuring unit 610”:

EX1005, FIG. 12 (annotated), 38:16-19 (“generally the same as those of the secondary device 30 in Figure 4”).

94. The load measuring unit 610 measures power being supplied to the actual load of the secondary device. EX1005, 38:19-20, FIG. 12. Based on my review of Stevens’ teachings, POSITA would have recognized that the power being supplied to the actual load corresponded to the power received by the secondary coil. See EX1005, 38:18-20, FIG. 4).

EX1003, ¶¶93-94; Pet., 48.



EX1005, FIG. 12; Pet., 62.

Issue 10:

Stevens Grounds (Grounds 2-3)—Obviousness of Elements [13.3]-[13.4]

("at least one processor configured to receive data pertaining to the input power and the output power, the processor further configured to determine an index of power-loss indicative of the efficiency of an inductive coupling between the primary coil and the secondary coil; wherein the index of power-loss comprises at least one of: an efficiency quotient Q , defined as the ratio of the output power to the input power; and an efficiency differential Δ , defined as the difference between the output power and the input power")

Stevens Discloses an “Index of Power-Loss” as an “Efficiency Differential” (Grounds 2-3)

Dr. Woods:

88. Stevens' control unit determines that “if the measured power from the power measurement unit 730 exceeds the sum of the load measures from the secondary devices by more than a shutdown threshold then the control unit 720 concludes that a substantial parasitic load must be present and places the primary unit in the shutdown mode.” EX1005, 38:34-39:6. Accordingly, Stevens suggests that the control unit 720 would determine an index of power-loss to compare to Steven's shutdown threshold value. EX1005, 38:34-39:6. For example, in the implementation where there is one secondary device (600₁), Stevens determines the difference between the power received by the secondary device 600₁ and the power transmitted by the primary unit 700 (an efficiency differential Δ), which is compared to Stevens's threshold value to identify when the primary unit 700 should be shut down. EX1005, 38:34-39:6.

[0072]-[0075] (“the charging current”), [0112] (“coil-to-coil”), FIG. 14. Olson also describes that the microprocessor should be configured to determine “a measure of the efficiency of external charging device 48,” which is the claimed type of index of power-loss indicative of the efficiency of an inductive coupling between the primary coil and the secondary coil. EX1004, [0075] (“divided by”), [0112] (“by dividing”), see also EX1004, [0072] (“controlled by microprocessor 212”), FIG. 14.

EX1003, ¶¶88-89; Pet., 44-46.

Stevens:

The power measurement unit 730 in the primary unit also measures the power being drawn by the secondary devices from the primary unit, as in step S22 in Fig. 11. Then, the control unit 720 determines, in dependence upon the measured power and the sum of the received load measures from the secondary devices, whether or not the power supply to the secondary devices should be restricted or stopped. In particular, if the measured power from the power measurement unit 730 exceeds the sum of the load measures from the secondary devices by more than a shutdown threshold, then the control unit 720 concludes that a substantial parasitic load must be present and places the primary unit in the shutdown mode, as in step S24 in Fig. 11.

EX1005, 38:34-39:6; Pet., 44.



PO does not dispute that Stevens discloses the claimed “index of power-loss”

Olson Discloses an “Index of Power-Loss” as an “Efficiency Quotient” (Ground 2)

Dr. Woods:

90. The Stevens-Olson combination provides Element [13.4] Olson teaches calculating “a ratio of power out divided by power in” as the claimed **efficiency quotient** as the **index of power-loss**. EX1004, [0076], *see also* [0074]-[0075] (“divided by”), [0112] (“efficiency is measured by dividing the power in, i.e., the power received by secondary coil 34, by the power out, i.e., the power transmitted by primary coil 54.”, *see above*, Element [13.3] and ¶49. Olson also teaches that this efficiency quotient advantageously “works not only at high charging or power transfer levels but also at reduced charging levels, as for example, when charging at reduced levels toward the end or beginning of a charging cycle.” EX1004 [0076]-[0077]. Olson teaches the efficiency quotient can be advantageously “scale displayed” to a user, which can be useful for repositioning the relative location of the primary/secondary devices. EX1004, [0076], [0074], *see also* [0112] (“measured coil-to-coil”).

EX1003, ¶59; Pet., 46-47.

Olson:

[0075] Rotating core cup assembly 92 is rotated in external antenna 52 for better lateral alignment of primary coil 54 and secondary coil 34. A feedback mechanism is used to determine the best rotation of core cup assembly 92. External charging device 48 can determine whether the current position of rotating core cup assembly 92 is optimally aligned for energy transfer and/or charging. External charging device 48 measures the power out of external charging device 48 divided by the power into external charging device 48. This calculation is a measure of the efficiency of external charging device 48. The power out is gauged by the power induced in implantable medical device 16 and is determined by multiplying the voltage of rechargeable power source 24 by the charging current in implantable medical device 16. These values are obtained by telemetry from implanted medical device 16. The power in is gauged by the power generated by charging unit 50 and is determined by multi-

plying the voltage of the internal voltage of charging unit 50, e.g., the voltage of a battery or batteries internal to charging unit 50, by the current driving external antenna 52.

[0076] The ratio of power out divided by power in can be scaled displayed to patient 18, or a medical professional or other person adjusting rotatable core cup assembly 92 or positioning external antenna 52. For example, the available efficiency can be divided into separate ranges and displayed as a bar or as a series of lights. The separate ranges can be linearly divided or can be logarithmic, for example.

EX1004, [0075]-[0076]; Pet., 46.

Jin Discloses an “Index of Power-Loss” as an “Efficiency Quotient” (Ground 3)

Jin:

[0093] Then, the coupling condition between the coils was judged using transmission efficiency as a parameter. Although the relation between transmission efficiency and coupling coefficient between the coils is not simple, there is a quite strong correlation between the transmission efficiency and coupling coefficient if the same test condition is applied.

[0094] Transmission efficiency =(effective current value of secondary side/effective voltage)/(effective current value of primary side x effective voltage)

EX1006, [0093]-[0094]; Pet., 60.

Dr. Woods:

systems such as Jin. Jin discloses the conventional practice of assessing an inductive coupling condition between coils “using a transmission efficiency as a parameter.” EX1006, [0093]. Jin teaches that the transmission efficiency should be determined according to a ratio of the output power to the input power: “Transmission efficiency =(effective current value of secondary side × effective voltage)/(effective current value of primary side x effective voltage).” EX1006, [0093]-[0094]. This efficiency measure advantageously provides a “strong correlation between the transmission efficiency and coupling coefficient.” [0093]-[0094].

EX1003, ¶113; Pet., 73.

THANK YOU