Paper No. 1

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEVRO CORP.,
Petitioner,

v.

BOSTON SCIENTIFIC NEUROMODULATION CORP.
Patent Owner.

IPR No. IPR2018-00141

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,644,933

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Nevro Corp. ("Petitioner") submits this petition for *inter partes* review ("IPR") of claims 1, 4, 34, 35, 40, and 48 (the "Challenged Claims" or "Claims") of U.S. Patent No. 8,644,933 (the "'933 patent" or "'933") (Ex.1001), assigned to Boston Scientific Neuromodulation Corporation ("PO"). As explained below, there is a reasonable likelihood that at least one of the Claims is unpatentable over the presented prior art—none of which was previously considered by the Office—and accordingly, the Board should institute trial and cancel the Claims as obvious under §103[1].

I. IDENTIFICATION OF CHALLENGED CLAIMS AND GROUNDS OF UNPATENTABILITY

Petitioner challenges claims 1, 4, 34, 35, 40, and 48 of the '933 patent. These claims are unpatentable based on the §103 grounds identified below—none of which is redundant:

Ground 1: U.S. Patent No. 7,286,881 ("Schommer," Ex.1004) in view of the knowledge of a person of ordinary skill in the art ("POSA") renders obvious claims 1, 4, 34, 35, and 40; and

Ground 2: Schommer (Ex.1004) in view of U.S. Patent Application Publication

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[1] Section cites are to 35 U.S.C. or 37 C.F.R. as the context indicates. All emphasis/ annotations added, unless otherwise noted.

No. 2004/0164708 ("Veselic," Ex.1005) renders obvious claim 48.

In support of the proposed grounds of rejection, the Declaration of technical expert Dr. Mark Kroll is attached as Ex.1003. Dr. Kroll is a professor of biomedical engineering, and has over 25 years of experience researching or developing implantable medical devices and systems. Ex.1003¶¶1-20.

II. OVERVIEW OF THE '933 PATENT

A. The '933 Patent

The '933 patent is generally directed to an implantable medical device containing a battery that can be recharged through a patient's skin using an external charger, which also has a rechargeable battery. Ex.1001, 2:42-45. Known implantable medical devices include pacemakers, defibrillators, cochlear stimulators, "microstimulators," retinal stimulators, muscle stimulators, spinal cord stimulators, cortical and deep brain stimulators, occipital nerve stimulators, and other neural stimulators. Ex.1001, 1:22-36. The '933 patent acknowledges that it was well-known that implantable medical devices had rechargeable batteries that could be recharged transcutaneously (*i.e.*, through the patient's tissue) using an external charger that "produces a magnetic field to ultimately induce a current in a coil in the implant." Ex.1001, 1:52-61. The induced current is then used to charge the implant battery. *Id*. The '933 patent points out that this recharging process, however, generates heat and if the external charger gets too hot, it could burn the patient. Ex.1001, 1:61-63. The external charger includes a battery charging circuit, which the ’933 patent acknowledges was available in the art (Ex.1001, 3:63-67), for recharging its battery and the ’933 patent notes that the overheating problem is exacerbated if this external battery is also being recharged because then two batteries are being recharged at the same time. Ex.1001, 1:64-2:5.

The ’933 patent purports to address the heat generation problem by disclosing “charging algorithms implementable in an external charger” which the patent states are able to “control[] the charging of both an external battery in the external charger and an implant battery in an implantable medical device. . . . in a manner considerate of heat generation.” Ex.1001, 2:42-49. These charging algorithms, which are designed to ensure both batteries are charged in a manner considerate of heat generation, are portrayed by the ’933 patent as the allegedly novel aspect of patent:

> [T]he inventors have noticed that the transmitter circuit 68 in the coil controller 24 is subject to heating during creation of the magnetic charging field. ***The inventors have also noticed that additional heat can be generated in the coil controller 24 if the external battery 64 too requires charging***…. [and] the coil controller 24 can get excessively hot. Because the coil controller 24 can be held against a patient's skin … ***the risk of injury during simultaneous charging*** of the external battery 64 and the implant battery 86 is problematic.

> FIGS. 4-11 disclose various ***charging algorithms in which implant battery charging and external battery charging are controlled to prevent overheating*** the coil controller 24.

Ex.1001, 4:43-61; *see also id*., 1:58-2:8, 2:46-49, Abstract. As explained further below (§II.B), the patentee also stressed this same aspect of the purported invention during prosecution by stating that while the prior art showed a charging algorithm that made two independent determinations that each battery (in the charger and in the implanted device) needed to be charged, the ’933 patent claims are different because they require a simultaneous, dual determination (not independent determinations) about whether each battery needs to be recharged. Ex.1002, 109.

In Figures 4-11, the ’933 patent discloses various embodiments of the allegedly novel charging algorithms for controlling the charging of both the external and implant batteries. Ex.1001, 4:59-62, 5:6-13. The initial steps of each of the disclosed embodiments of the algorithm are the same, and include “ask[ing] whether either or both of the external battery 64 or the implant battery 86 require charging.” Ex.1001, 5:29-37. Then, based on the determination of which, if any, batteries need to be recharged, the appropriate charging circuitry in the external charger is enabled.

For example, if the implant battery does not require charging, but the external charger battery requires charging, then the battery charging circuit is enabled to charge the external battery, while the transmitter, used to charge the implant battery, is disabled. Ex.1001, 5:54-58. On the other hand, if the implant battery requires charging, but the external battery does not require charging, then the battery charging circuit is disabled and the transmitter is enabled to charge the implant battery. Ex.1001, 5:61-65. The ’933 patent also discloses a number of different algorithms that can be implemented if it is determined that both the external and implant batteries require charging in a manner considerate of heat generation, such as first charging one battery and then charging the other, charging the two batteries in an alternating fashion, and charging the two batteries simultaneously. *See* Ex.1001, 6:10-9:50. If during recharging, the temperature of the external charger exceeds a safe value, then charging of the external and implant batteries can be modified to reduce the amount of heat generated by the charging process. Ex.1001, 10:22-28. *See also* Ex.1003¶¶21-25.

B. Overview of the Prosecution History

The application that led to the ’933 patent was filed on May 29, 2012 and claims priority to U.S. Application 12/471,626 (“’626 application”) (issued as U.S. Patent No. 8,214,042), which was filed on May 26, 2009. Ex.1001, 1:9-12. For purposes of this proceeding, Petitioner assumes the ’933 patent’s priority date is May 26, 2009.

During prosecution of the ’933 patent, the applicant disclaimed certain subject matter from the scope of the claims when it distinguished the pending claims over U.S. Patent No. 7,177,691 ("Meadows," Ex.1006). Ex.1002, 85, 87. The Examiner had rejected pending claim 1—which was the sole pending independent claim and issued as claim 1—over Meadows, finding that the external charger disclosed in Meadows can determine when the battery in the implanted device requires charging and when the external charger's battery requires charging. Ex.1002, 86. The Examiner found that because Meadows' external battery must be fully charged before the implanted device's battery is charged, Meadows teaches that while charging of the external battery is enabled, charging of the implant battery is disabled and, once the external battery is fully charged, charging of the external battery is then disabled and charging of the implanted battery is enabled. Ex.1002, 86-87. The Examiner found that these disclosures from Meadows anticipated claim 1. *Id*.

In response, the applicant emphasized the last limitation of claim 1 and argued that its claims were distinguishable over Meadows:

> control circuitry for implementing an algorithm to ***controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that <u>both</u> the external battery and the implant battery require charging.***
>
> As explained by Applicant in the parent case, Meadows doesn't ***<u>simultaneously</u> determine*** whether *<u>both</u>* the external battery and the

> implant battery require charging, ***and then take steps based on that determination***.

Ex.1002, 109 (emphasis in first paragraph and on "both" in original). Applicant further argued that while Meadows' external charger can charge the external battery when it requires charging and can charge the implanted battery when it requires charging, those "***charging determinations are independent of one another***." *Id*. The applicant explained that, unlike Meadows, the pending claims "determine whether both batteries need charging and take an action based on this ***dual determination***" and "decid[e] per an algorithm which of the battery charging circuit and/or the transmitter to enable to charge the external battery and/or the internal battery." *Id*.

The applicant further explained that Meadows' disclosure that the external charger can recharge the implant battery once the external battery is fully charged "***does not disclose or imply*** that it had been determined that ***both*** batteries 277 and 180 required charging; that the external battery was charged first ***based on that determination***; and now that the external battery is charged, the implant battery will now be charged." *Id*. The Examiner subsequently allowed the claims. Ex.1002, 121-24. *See also* Ex.1003¶¶26-29.

III. PERSON OF ORDINARY SKILL IN THE ART

The applicable POSA would have had (1) at least a bachelor's degree in electrical or biomedical engineering, or equivalent coursework, and (2) at least one year of experience researching or developing implantable medical devices. Ex.1003¶¶12-18.

IV. CLAIM CONSTRUCTION UNDER §42.104(b)(3)

For purposes of IPR, "[a] claim in an unexpired patent . . . shall be given its broadest reasonable construction in light of the specification of the patent in which it appears." §42.300(b). Claim terms are generally given their ordinary and customary meaning as understood by a POSA at the time of the invention in light of the intrinsic evidence unless a patentee acts as his own lexicographer or disavows the full scope of the claim term. *See Info-Hold, Inc. v. Applied Media Techs.*, 783 F.3d 1262, 1265-66 (Fed. Cir. 2015); *Typhoon Touch Techs., Inc. v. Dell, Inc.*, 659 F.3d 1376, 1381 (Fed. Cir. 2011) ("[T]he patentee is bound by representations made and actions that were taken in order to obtain the patent."). The proper constructions of the Claims include the constructions of certain terms, as noted below. For terms not specifically construed, Petitioner interprets them for purposes of this review in accordance with their plain and ordinary meaning under the broadest reasonable interpretation ("BRI") standard applicable here. Because the standard for claim construction at the PTO is different than that used in litigation (*see Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2146 (2016); MPEP §2111), Petitioner expressly reserves the right to argue in litigation different constructions for any term, as appropriate to that proceeding.

A. "implementing an algorithm to controllably enable…" (claims 1, 4) / "programmed to control…" (claims 34, 35, 40, 48)

Term	Petitioner's Proposed Construction
implementing an algorithm to controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery require charging (cls. 1, 4)	decide per an algorithm to enable the battery charging circuit and the transmitter based on the simultaneous, dual determination (and not independent determinations) that both the external battery and the implant battery require charging
programmed to control the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging (cls. 34, 35, 40, 48)	control per a program the battery charging circuit and the transmitter based on the simultaneous, dual determination (and not independent determinations) that both the external battery and the implant battery require charging

Petitioner's proposed constructions are consistent with the intrinsic evidence. In parallel district court proceedings, PO ignores the intrinsic evidence—including the narrowing statements applicant made during prosecution to overcome prior art—and instead attempts to improperly broaden the claims by construing both of the terms to merely require "regulat[ing] charging" of both the external and implant batteries "when the control circuitry determines that both . . .

require charging":

Term	PO's Construction in Litigation
implementing an algorithm to controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery require charging (cls. 1, 4)	plain and ordinary meaning; alternatively, implementing an algorithm to regulate the charging of both the external battery in the external charging components and an implant battery in the microstimulator through the transmitter when the control circuitry determines that both the external battery and the implant battery require charging
programmed to control the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging (cls. 34, 35, 40, 48)	plain and ordinary meaning; alternatively, programmed to regulate the charging of both the external battery in the external charging components and an implant battery in the microstimulator through the transmitter when the control circuitry determines that both the external battery and the implant battery require charging

See Ex.1007, 16-17. For the reasons detailed below, Petitioner's proposed constructions are the correct constructions. Because PO's interpretation is broader than Petitioner's and because under the BRI standard the Board is not bound by

PO's prosecution disclaimer which generally only binds the PO,[2] this Petition nevertheless shows how the prior art discloses and/or renders obvious the challenged claims under both Petitioner's and PO's interpretations. Ex.1003¶32.

The plain language of these claim limitations require "controllably enabl[ing]" and "controlling" the "battery charging circuit and the transmitter ***in the event that the control circuitry determines*** that both" the external and implant batteries require charging. Thus, according to the plain language, the battery charging circuit and transmitter are "controllably enable[d]" or "control[led]" based on a determination made by the control circuitry that both the external and implant batteries require charging.

The applicant further clarified the scope of these claim limitations during prosecution of the '933 patent. As explained above (§II.B), the applicant

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[2] Under *Tempo Lighting Inc. v. Tivoli, LLC*, 742 F.3d 973 (Fed. Cir. 2014), the PTO has "no obligation to accept a claim construction proffered as a prosecution history disclaimer, which generally only binds the patent owner." *Id*. at 978. In *Tempo*, the Federal Circuit ultimately affirmed the Board's finding of a disclaimer, but only because the disclaimer was made in conjunction with claim amendments made during the original examination of the patent, a situation not present here. *Id*. at 977.

distinguished prior art Meadows by explaining that, unlike the requirements of the ’933 patent claims, Meadows does not first make a simultaneous, dual determination that both the external and implant batteries require charging, and then take steps (*e.g.*, controllably enable or control the battery charging circuit or transmitter) based on that determination:

> As explained by Applicant in the parent case, ***Meadows doesn't simultaneously determine whether <u>both</u> the external battery and the implant battery require charging, and then takes steps based on that determination***. Meadows therefore doesn't anticipate claim 1.
>
> *   *   *
>
> Nowhere does Meadows determine whether both batteries need charging and take an action ***based on this dual determination***, let alone for the purpose of deciding per an algorithm which of the battery charging circuit and/or the transmitter to enable to charge the external battery and/or the internal battery.

Ex.1002, 109.[3] Thus, to overcome prior art, the applicant clearly stated that these terms require taking an action (*e.g.*, controllably enable or control the battery

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[3] While applicant made this argument with respect to pending claim 1—which issued as claim 1—the applicant noted that its argument applies to all claims. Ex.1002, 108 (“Claims 3-8, 12-28, and 36-48 have been temporarily withdrawn,

charging circuit or transmitter) based on the ***simultaneous, dual determination*** that both the external battery and the implant battery require charging.[4] *Typhoon Touch*, 659 F.3d at 1381. In doing so, the applicant clearly disclaimed coverage of systems, like Meadows', that charge the external battery and internal battery based ***independent*** determinations that they require charging. *See* Ex.1002, 109 (explaining Meadows is distinguishable because Meadows' "charging determinations are independent of one another"). Thus, Petitioner's proposed constructions, which are consistent with applicant's statements during prosecution, should be adopted.[5]

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but will automatically reenter the case upon allowance of a generic claim. . . . [S]hould the independent claims be patentable over the prior art, narrower dependent claims would also necessarily be patentable.").

[4] Applicant also made substantially the same argument to gain allowance of claims in a parent application. Ex.1008, 30-31; *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1306-07 (Fed. Cir. 2007) ("We have held that a statement made by the patentee during prosecution history of a patent in the same family as the patent-in-suit can operate as a disclaimer.").

[5] As noted above, under the BRI standard the Board is not bound by PO's

B. "control circuitry for implementing an algorithm to controllably enable…" (claims 1, 4) / "control circuitry programmed to control …" (claims 34, 35, 40, 48)

Petitioner has argued in district court that these terms are means-plus-function elements under 35 U.S.C. §112, ¶ 6. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1350-51 (Fed. Cir. 2015). While the claims may not be limited to the narrower means-plus-function construction under the BRI standard applicable here, even if these elements were construed under the BRI to be "means-plus-function" elements limited to specifically disclosed algorithms within the '933 patent's specification, the prior art cited herein discloses structures or equivalents therefor that would invalidate the challenged claims. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (claim terms need only be construed to the extent necessary to resolve the case) Ex.1003¶33. Thus, to the extent, these terms are construed under the BRI to be means-plus-function elements, they are limited to algorithms disclosed in the '933 patent, as identified below.

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prosecution history disclaimer, and it may adopt a broader construction for this proceeding. *See Tempo*, 742 F.3d at 978.

Term	**Petitioner's Identification of Corresponding Function and Structure If Term Is Subject to §112, ¶6**
control circuitry for implementing an algorithm to controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery require charging (claims 1, 4)	Function: controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery require charging Structure: microcontroller 60 in Fig. 3A or alternative hardware disclosed in 11:20-24 implementing steps 100 in Figs. 4, 5, 6A, 7A, 8A, 9-11 and described in 4:59-6:15 followed by one of the disclosed alternatives: steps 110 in Fig. 4, steps 120 in Fig. 5, steps 130 in Fig. 6A, steps 140 in Fig. 7A, steps 150 in Fig. 8A, steps 160 in Fig. 9, steps 175-179 in Fig. 10, and steps 185-189 in Fig. 11, and all accompanying text

Term	Petitioner's Identification of Corresponding Function and Structure If Term Is Subject to §112, ¶6
control circuitry programmed to control the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging (claims 34, 35, 40, 48)	Function: control the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging Structure: microcontroller 60 in Fig. 3A or programmable alternatives disclosed in 11:20-24 programmed with steps 100 in Figs. 4, 5, 6A, 7A, 8A, 9-11 and described in 4:59-6:15 followed by one of the disclosed alternatives: steps 110 in Fig. 4, steps 120 in Fig. 5, steps 130 in Fig. 6A, steps 140 in Fig. 7A, steps 150 in Fig. 8A, steps 160 in Fig. 9, steps 175-179 in Fig. 10, and steps 185-189 in Fig. 11, and all accompanying text

V. THE CHALLENGED CLAIMS ARE OBVIOUS

A. Ground 1: Schommer and a POSA's Knowledge Render Obvious Claims 1, 4, 34, 35, and 40

1. Overview of Schommer (Ex.1004)

Schommer issued on October 23, 2007 and is prior art to the '933 patent under at least §102(b). Ex.1003¶34. Schommer is directed to a system for charging a rechargeable power source within an implantable medical device with an external charger. *E.g.*, Ex.1004, 6:60-66. The external charger charges the implanted device's rechargeable power source through the external charger's primary charging coil, which inductively energizes the implanted device's secondary coil that is connected to the rechargeable power source. *Id*. The external charger 48 also has its own batteries 160 that are rechargeable through the use of a desktop charging device 162 that is connected to a wall outlet. Ex.1004, 13:61-14:7. *See also* Ex.1003¶47.

The external charger 48 is "controlled by microprocessor 212," which, for example, drives transmit block 214 with an oscillating drive signal. Ex.1004, 14:29-30, 14:34-35. Transmit block 214 subsequently supplies a suitable signal that is then driven to the primary coil 54 through switch 220 to charge the implantable device's battery. Ex.1004, 14:25-35. When charging the external charger's batteries 160, the microprocessor 212 enables (or closes) switch SW1[6], so that the power received from the desktop charging device can be transmitted to batteries 160. Ex.1004, Fig. 14; Ex.1003¶48. Annotated Figure 14 (below) is a block diagram of the external charger's circuitry. Ex.1004, 14:28-29. The red path

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[6] Although the green-outlined elements Petitioner labels as SW1 and SW2 in Figure 14 are not numbered or labeled, a POSA would have understood that SW1 and SW2 are "electronically controllable switch[es]," like switch 220, which uses a similar symbol to represent a switch, and because the symbol used for SW1 and SW2 (like switch 220) was commonly used at the time to represent a switch. Ex.1004, 14:33-34; Ex.1003¶48.

out of microprocessor 212 shows the circuitry path when the implanted device's battery is recharged and the green path out of microprocessor 212 shows the circuitry path when the external charger's battery is recharged. Ex.1003¶48.

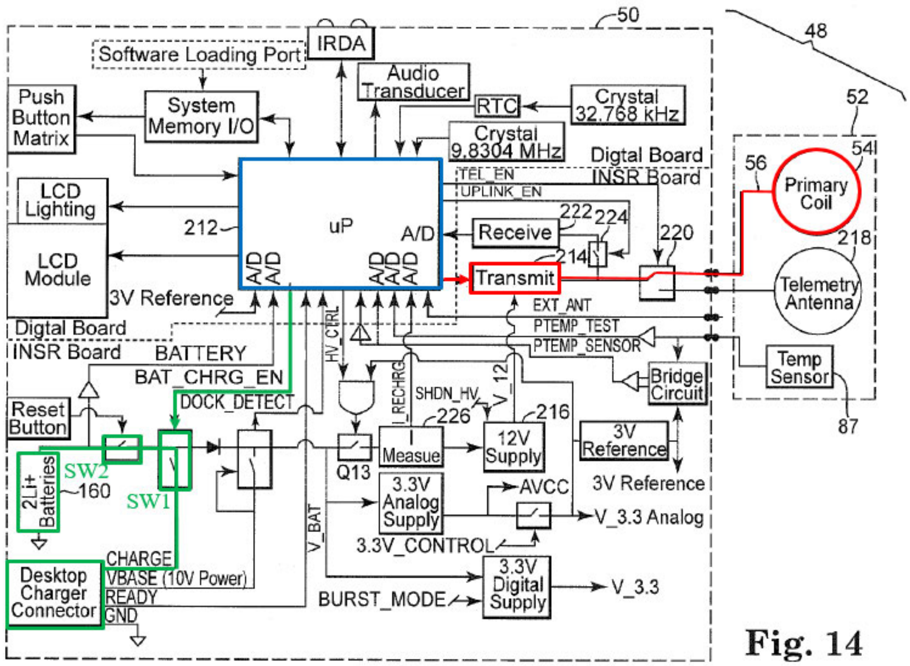

Fig. 14

When a charging process begins, the external charger goes through a number of checks. *E.g.*, Ex.1004, Fig. 15. As shown in Table 3 below, such checks include checking the battery status of the external charger and the battery status of the implantable medical device to determine if either or both need recharging. *E.g.*, Ex.1004, 15:65-16:14.

TABLE 3

Event	Screen/Message
Telemetry Failure	(See Messages From Table 2)
Implantable Medical Device Battery Low	Device Battery Low
External Charger Battery Low	Charger Battery Low
External Charger Battery Depleted	Recharge Charger
External Charger Recharge Complete	External Charger Recharge Complete
Implantable Medical Device Will Not Provide Therapeutic Result Until Recharged: Therapy Unavailable/Sleep Mode	Recharge Device
Antenna Disconnect	Connect Antenna

If it is determined that the external charger battery and/or implanted battery need charging, the external charger executes the associated action, *i.e.*, "Recharge Charger" and/or "Recharge Device." Ex.1004, 15:65-16:14. *See also* Ex.1003¶49.

Like the '933 patent, Schommer recognizes that when an implanted battery is being recharged, heat may be generated beyond acceptable limits and injure the patient. Ex.1004, 16:19-24. Accordingly, Schommer discloses monitoring the temperature at the external coil to avoid injuring the patient due to the heat generation that can be caused by the charging process. Ex.1004, 16:19-44, 20:34-41. If the temperature at the external coil exceeds a predetermined limit, the external charger's "[c]ontrol circuitry . . . can then limit the energy transfer process in order to limit the temperature which external antenna 52 imparts to patient 18. As temperature sensor 87 approaches or reaches preset limits, control circuitry can take appropriate action such as limiting the amount of energy transferred, e.g., by limiting the current driving primary coil 54, or limiting the time during which energy is transferred . . . ." Ex.1004, 20:53-63. *See also* Ex.1003¶50.

2. Claim 1

a) [1.preamble]: "An external charger for interfacing with an implantable medical device"

Schommer discloses an external charging device 48 that can be used to charge a rechargeable battery in an implantable medical device 16. Ex.1004, 6:23-26 ("[T]he present invention provides ***a charger for an implantable medical device having a rechargeable power source*** and a secondary charging coil operatively coupled to the rechargeable power source."), 10:10-18 ("***Rechargeable power source 24 can be charged while implantable medical device 16 is in place in a patient through the use of external charging device 48***."); *see also, e.g., id.*, 1:7-9 ("This invention relates to ***implantable medical devices and, in particular, to energy transfer devices, systems and methods for implantable medical devices***."), 1:58-60, 4:44-56, 6:60-66 ("[T]he present invention provides ***a system for charging***. . . . An external charger has a primary charging coil capable of inductively energizing the secondary coil when externally placed in proximity of the secondary coil."), 14:9-14, Fig. 3.

Schommer also discloses that the external charger device 48 and implantable medical device 16 can communicate with each other via telemetry. *See, e.g.,* Ex.1004, 9:52-60 ("Implantable medical device 16 also has internal telemetry coil

44 configured in conventional manner ***to communicate through external telemetry coil 46 to . . . charging unit 50*** or other device in a conventional manner in order to both program and control implantable medical device and to externally obtain information from implantable medical device 16 once implantable medical device has been implanted."), 10:21-25 ("Antenna 52 may also optionally contain external telemetry coil 46 which may be operatively coupled to charging unit 50 if it is desired ***to communicate to or from implantable medical device 16 with external charging device 48***.").

Thus, to the extent the preamble is limiting, Schommer discloses "an external charger" (*e.g.*, external charger 48) "for interfacing" (*e.g.*, charging or communicating via telemetry) with "an implantable medical device" (*e.g.*, implantable medical device 16). Ex.1003¶¶51-52.

b) [1.a]: "a battery charging circuit for controlling the charging of an external battery in the external charger"

Schommer discloses that the external charging device 48, which consists of a charging unit 50 and external antenna 52 (Ex.1004, 10:12-14, Figs. 13-14), includes rechargeable batteries that can be recharged using a "desktop charging device":

> Desktop charging device 162 can charge and/or ***recharge batteries 160 in charging unit 50***, preferably by inductive coupling using coil 167 positioned in desktop charging device 162 and coil 168 positioned within charging unit 50. ***Once charged and/or recharged, batteries***

> ***160*** can provide the power through internal circuitry 166 and cable 56 to external antenna 52.

Ex. 1004, 14:3-9; *see also id*., 8:25-27, Fig. 13. As shown in Figure 13 below, the desktop charging device 162 connects to an AC power source, such as a standard wall outlet, and can be configured as a cradle that receives charging unit 50 to recharge the external charger's batteries 160. Ex.1004, 13:64-67; Ex.1003¶53.

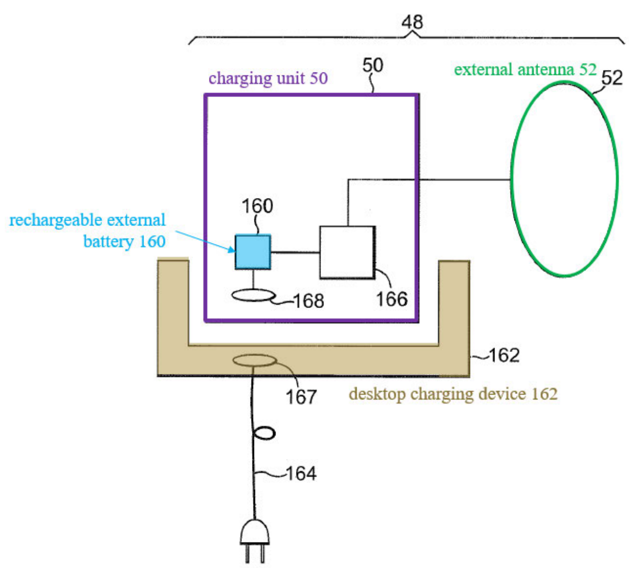

Fig. 13

As illustrated in Figure 14 below, the "Desktop Charger Connector" receives power from desktop charging device 162 and transfers that power via the "CHARGE" line to batteries 160 when switches SW1 and SW2[7] are closed.

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[7] Although switch SW2 is open in Figure 14, a POSA would have understood based on Figure 14 and Schommer's disclosure that external batteries 160 can be

Ex.1003¶54. Switch SW1 is controlled by a program stored within microprocessor 212, which "control[s]" all of the circuitry in the external charger. Ex.1004, 14:25-26; Ex.1003¶56. That program can send a signal through "BAT_CHRG_EN" line to close switch SW1, so that the power received from desktop charging device 162 can be transmitted to and charge external batteries 160. Ex.1003¶56.

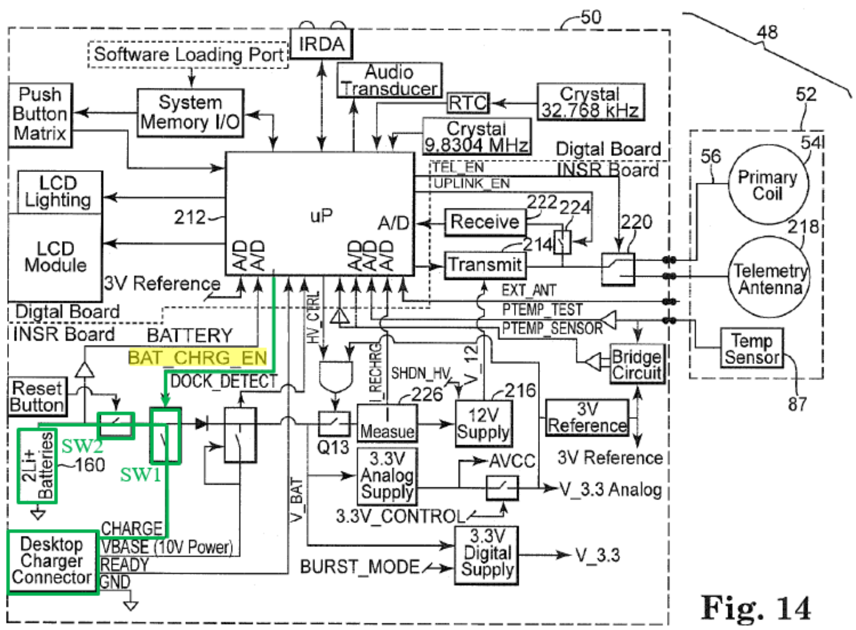

Fig. 14

Thus, Schommer discloses "a battery charging circuit" (*e.g.*, at least "CHARGE" line, SW1, SW2, "BAT_CHRG_EN" line, and program in

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recharged, that switch SW2 would remain closed unless and until the "Reset Button" is pressed to disconnect the battery from the battery charging circuit. Ex.1003¶55.

microprocessor 212 that controls SW1) for "controlling the charging of an external battery" (*e.g.*, controlling charging of batteries 160 by, for example, closing or opening SW1) in the "external charger" (*e.g.*, external charging device 48). Ex.1003¶¶53-57.

c) [1.b]: "a transmitter for controlling a wireless transmission to the implantable medical device, wherein the wireless transmission provides power to charge an implant battery in the implantable medical device"

Schommer discloses a "transmit block 214," which includes an H-bridge circuit. Ex.1004, 14:26-28. A program in the microprocessor 212 controls the control and timing signals that the microprocessor 212 transmits to the H-bridge circuit in transmit block 214, which then "drives primary coil 54" in external antenna 52 with a charging current through switch 220 "for power transfer and/or charging" of the implanted medical device's rechargeable battery:

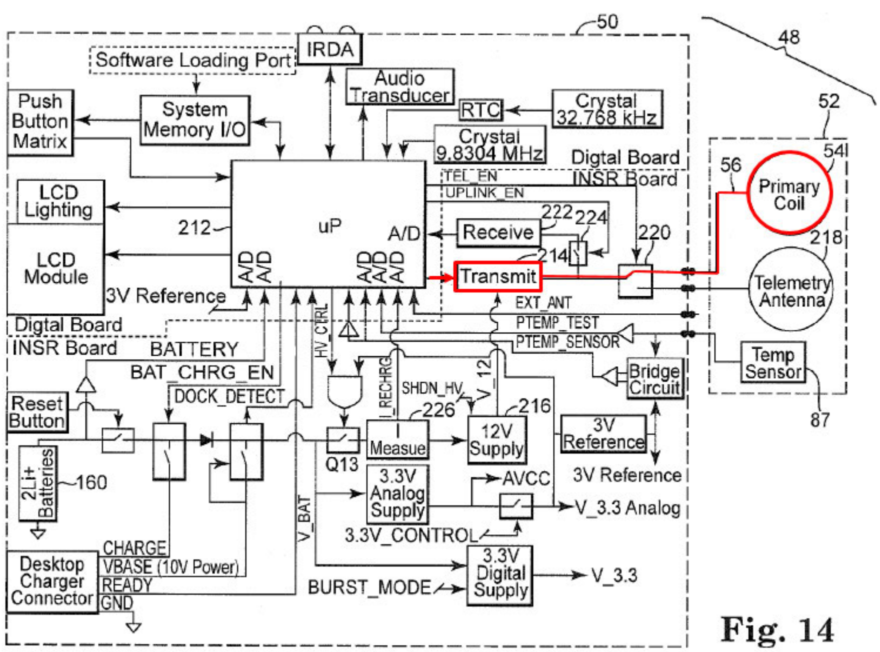

Fig. 14

Ex.1004, 14:26-36; Ex.1003¶¶58-60; *see also* Ex.1004, 6:47-53, 7:22-26 ("[T]he present invention provides a method of ***transcutaneous energy transfer to a medical device implanted in a patient*** . . . ***using an external power source*** having a primary coil . . . ."), 7:33-40 ("[T]he present invention provides a method of ***charging a rechargeable power source of a medical device implanted in a patient*** having a secondary charging coil . . . ***using an external charger having a primary charging coil*** . . . ."), 10:10-18 ("***Rechargeable power source 24 can be charged while implantable medical device 16 is in place in a patient through the use of external charging device 48***. . . . Charging unit 50 contains the electronics necessary to drive primary coil 54 with an oscillating current in order to induce current in secondary coil 34 when primary coil 54 is placed in the proximity of secondary coil."), 14:9-14 ("Since charging unit 50 is not, in a preferred embodiment, coupled directly to the line voltage source of AC power, ***charging unit 50 may be used with external antenna 52 to transfer power and/or charge implanted medical device 16*** while desktop charging device 162 is coupled to a line voltage source of AC power."), Fig. 3. And, as was well-known, "[r]echarging the implant battery by [such] magnetic induction…allows the implant battery to be charged wirelessly and transcutaneously (i.e., through the patient's tissue)." Ex.1001, 1:58-61.

Thus, Schommer discloses "a transmitter for controlling" (*e.g.*, transmit block 214 and program in microprocessor 212 that controls signals driven to transmit block 214) for "a wireless transmission to the implantable medical device" (*e.g.*, driving the primary coil 54 with charging current that is received through the patient's skin by the implanted device's secondary coil 34) "wherein the wireless transmission provides power to charge an implant battery in the implantable medical device" (*e.g.*, to charge the implantable device's battery 24). Ex.1003¶¶58-60

d) [1.c]: "control circuitry for implementing an algorithm to controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery require charging"

As explained above (§IV.A), the proper construction of "implementing an algorithm to controllably enable the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery require charging" is "decide per an algorithm to enable the battery charging circuit and the transmitter based on the simultaneous, dual determination (and not independent determinations) that both the external battery and the implant battery require charging." And the claim limitation requires "control circuitry" to implement the algorithm. Schommer discloses this limitation and/or renders it obvious based on Schommer's teachings and a POSA's knowledge. Schommer also discloses this limitation and/or renders it obvious even if it is determined that this limitation is a means-plus-function term limited to the ’933’s disclosed algorithms.[8] Ex.1003¶61.

Schommer provides a flow chart in Figure 15 that illustrates an “exemplary charging process.” Ex.1004, 15:27-28. The charging process begins by performing various start-up checks on the external charger, such as whether the antenna is connected. Ex.1004, 15:28-43. If the start-up checks are successful, the system then performs various telemetry checks to ensure telemetry with the implantable medical device 16 is successful. Ex.1004, 15:45-58. Thereafter, “charge events” are checked and “[i]f no charge events are noted, the actions indicated in Table 3 are executed.”[9] Ex.1004, 15:65-67. *See also* Ex.1003¶¶62-63.

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[8] Explanations regarding Schommer’s disclosure of the ’933’s corresponding algorithms are in the footnotes to this section.

[9] The “first initial step” of the ’933’s disclosed algorithm involves the microcontroller determining if the external charger is plugged into an external power source, such as a wall socket. Ex.1001, 5:17-20. If it is not, then the external battery cannot be recharged and the implant battery is recharged, as needed. Ex.1001, 5:21-22. A POSA would have understood that Schommer’s microprocessor 212 can determine whether the external charger is plugged into an

TABLE 3

Event	Screen/Message
Telemetry Failure	(See Messages From Table 2)
Implantable Medical Device Battery Low	Device Battery Low
External Charger Battery Low	Charger Battery Low
External Charger Battery Depleted	Recharge Charger
External Charger Recharge Complete	External Charger Recharge Complete
Implantable Medical Device Will Not Provide Therapeutic Result Until Recharged: Therapy Unavailable/Sleep Mode	Recharge Device
Antenna Disconnect	Connect Antenna

As shown in Table 3, both the battery status of the external charger's battery and the battery status of the implantable medical device's battery are checked. It would have been obvious to a POSA that one way to implement Table 3 is to

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external power source (*e.g.*, cradled in desktop charging device 162 that is plugged into a wall socket) because Figure 14 shows that the microprocessor has direct connections to Desktop Charger Connector. Ex.1003¶64. Therefore, the microprocessor can detect when the external charger is receiving power from an external power source via Desktop Charger Connector. Ex.1003¶64. In addition, Schommer expressly discloses that if the external charger is not plugged into an external power source, then the implant battery is recharged using external rechargeable batteries 160. Ex.1004, 14:17-22; Ex.1003¶64.

perform all of the checks in Table 3 ***before*** charging (or a "charge event") begins. Ex.1004, 15:65-67, 16:16-18 ("If a charge event occurs, then the process checks to determine if charging is complete [block 140]. Once charging is complete, the process terminates [block 142]."); Ex.1003¶65. A POSA would have been motivated to do so because it provides full system context before any action is taken rather than taking actions based on partial information. Ex.1003¶65. Thus, in the case where the "External Charger Battery Depleted" and "Implantable Medical Device Will Not Provide Therapeutic Result Until Recharged" conditions both occur, the external charger has made a ***dual determination*** that both the external and implanted batteries need to be recharged.[10] Ex.1003¶66.

Although Schommer does not expressly disclose that the Table 3 checks necessarily occur ***simultaneously***, as required under the proper construction of the challenged claims (§IV.A), it would have been obvious and well within the capability of a POSA to do so. Ex.1003¶67. For example, Schommer discloses that the external charger device uses telemetry to communicate with the implantable medical device and allows the external charger device to monitor the

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[10] Accordingly, Schommer discloses the '933 patent's initial steps 100 of determining whether either or both of the external battery and implanted battery require charging. Ex.1001, 5:29-31; Ex.1003¶70.

implanted battery's charging status. *See*, *e.g.*, Ex.1004, 9:52-60 ("Implantable medical device 16 also has internal telemetry coil 44 configured . . . ***to externally obtain information*** . . . once implantable medical device [16] has been implanted."), 10:21-25 ("Antenna 52 may also optionally contain external telemetry coil 46 which may be operatively coupled to charging unit 50 if it is desired to ***communicate to or from implantable medical device 16 with external charging device 48***."), 14:60-61 ("If telemetry checks are successful, external charging device 48 is able to ***monitor…charging status***."), 14:66-67. And, according to Schommer, whether telemetry between the external charger and the implantable medical device is successful is checked before the checks listed in Table 3 are performed. Ex.1004, 15:45-67.

Given Schommer's disclosure that the external charger can obtain battery status via telemetry (*e.g.*, Ex.1004, Table 3, 14:60-61), a POSA would have known that one way of obtaining that battery status could be by sending the implantable medical device 16 a message querying for its battery status and receiving the battery status information from the implantable medical device 16. Ex.1003¶67. The battery status information would, for example, comprise a message indicating whether the implanted battery requires charging or a measured voltage of the implanted battery that the external charger can then compare to a stored voltage representing, *e.g.*, the voltage level at which the implanted battery can power the implanted medical device. Ex.1003¶67. With that information, the external charger can determine that the implanted battery requires charging if the received measured voltage is lower than the stored voltage. Ex.1003¶67. The ’933 patent acknowledges that such telemetry for communicating the implanted battery’s voltage data was well-known. Ex.1001, 5:43-53 (“…Such a means of back telemetry from the microstimulator . . . is well known . . . .”).[11]

At the same time that the external charger device is obtaining the implanted battery’s status via telemetry, the external charger device can check the battery status of its own battery (*e.g.*, by measuring the battery’s voltage and comparing it a stored voltage representing, *e.g.*, the voltage level at which the external battery can charge the implanted battery). Ex.1004, 14:46-48 (“Current measured by

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[11] The ’933 explains that an “exemplary” method of determining whether the implanted and external batteries need charging is by measuring the voltage of those batteries and comparing them to “some capacity threshold voltage.” Ex.1001, 5:29-37. As discussed herein, Schommer at a minimum renders obvious receiving via telemetry the implanted battery’s voltage and comparing that voltage to a stored voltage to determine whether the implanted battery needs charging. Ex.1003¶¶67, 70.

current measure block 226 is used in the ***calculation of*** power in along with the ***voltage of batteries 160***.”); Ex.1003¶68. The ’933 patent again acknowledges that any well-known analog-to-digital circuitry—such as “A/D” in microprocessor 212 connected to the “BATTERY” line in Schommer’s Figure 14—can be used to determine the external battery’s voltage and/or its relation to a threshold voltage.[12] Ex.1001, 5:38-42. Checking the status of both the external and internal batteries at the same time would have provided full system context before initiating any charge events and improved the efficiency of Schommer’s charging system by reducing the amount of time it takes to check the conditions listed in Table 3 and beginning a needed charge event. Ex.1003¶69.

When the external charger determines that the “External Charger Battery

[12] As discussed (*see supra* n.11), an “exemplary” method of determining whether the implanted and external batteries need charging is by measuring the voltage of those batteries and comparing them to “some capacity threshold voltage.” Ex.1001, 5:29-37. As discussed herein, Schommer at a minimum renders obvious measuring the voltage of the external battery and comparing that voltage to a stored voltage to determine whether the external battery needs charging. Ex.1003¶¶68, 70.

Depleted" and "Implantable Medical Device Will Not Provide Therapeutic Result Until Recharged" conditions have occurred, it will execute the actions corresponding to those conditions in Table 3, *i.e.*, "Recharge Charger" and "Recharge Device," respectively. Ex.1004, 15:65-16:14; Ex.1003¶71. As shown in Figure 14 (annotated below), to charge external batteries 160, the microprocessor 212 implements the algorithm or program associated with the "Recharge Charger" action to close switch SW1 via the "BAT_CHRG_EN" line—which a POSA would have understood to stand for "battery charge enable"—to enable the power received by "Desktop Charger Connector" from the desktop charging device 162 to be transmitted through the "CHARGE" line, SW1, and SW2 to charge batteries 160. Ex.1003¶72.

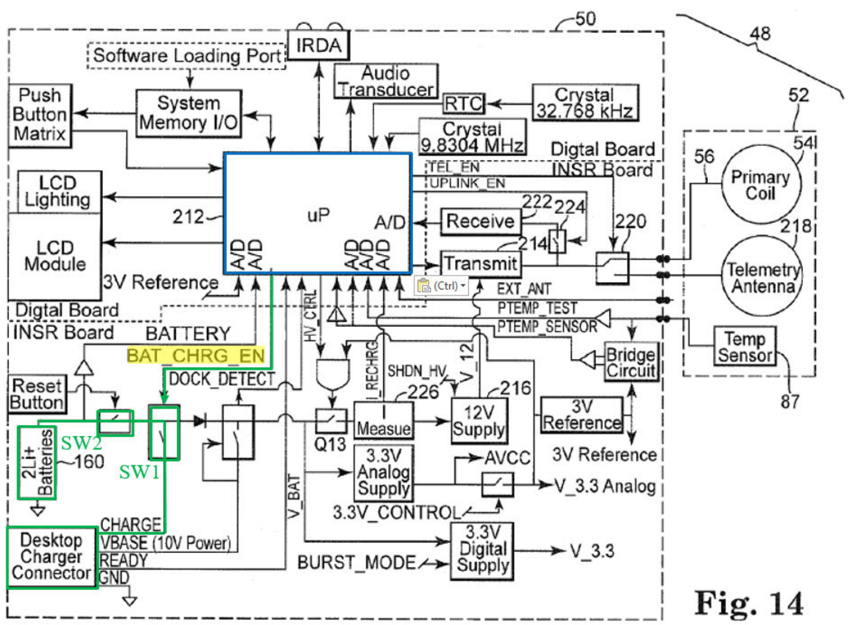

Fig. 14

To charge the implantable medical device's battery, microprocessor 212 enables transmit block 214 by implementing the algorithm or program associated with the "Recharge Device" action that, *e.g.*, drives the H-bridge circuit within the transmit block with an oscillating drive signal and closes switch Q13 to supply power to transmit block 214 via 12V Supply 216. Ex.1004, 14:29-30, 14:34-35, 14:39-42 ("Twelve volt power supply 216 is a switching regulator supplying power to transmit block 214 during power transfer and/or charging…."); Ex.1003¶73. Transmit block 214, in turn, drives primary coil 54 to charge the implanted battery. Ex.1004, 14:26-37.

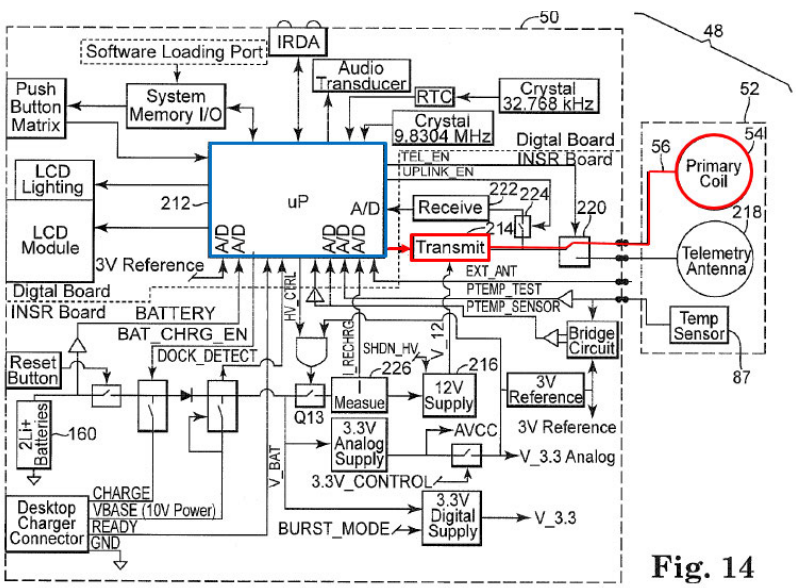

Fig. 14

Schommer also discloses that the external charger can charge the implant battery while the desktop charging device, in which the external charger's charging unit is cradled, is plugged into an AC power source. Ex.1004, 14:9-17 ("[C]harging unit 50 may be used with external antenna 52 to transfer power and/or charge implanted medical device 16 ***while*** desktop charging device 162 is coupled to a line voltage source of AC power."). It would have at a minimum been obvious to a POSA that the external batteries and implanted battery can be charged at the same time by, *e.g.*, additionally closing switch SW1. Ex.1003¶¶76-79. Therefore, based on the determination that the external batteries and implanted battery need to be recharged, Schommer's system can enable the external battery charging circuit (*e.g.*, by executing the algorithm or program that closes switch SW1) and transmit block 214 (*e.g.*, by executing the algorithm or program that, *e.g.*, drives transmit block 214 with an oscillating drive signal and closes switch Q13 to supply power to transmit block 214 through 12V Supply 216) to simultaneously charge the external and implanted batteries.[13] Ex.1003¶¶76-79.

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[13] This limitation requires "controllably enabl[ing]" both the battery charging circuit and the transmitter "in the event that the control circuitry determines that both" batteries require charging. One of the charging algorithms disclosed by the '933 patent in the event it is determined that both batteries require charging, charges the implant battery and the external battery simultaneously by enabling both the battery charging circuit and enabling the transmitter. Ex.1001, 9:65-10:6, Fig. 10 (step 175). As discussed herein, Schommer at a minimum renders obvious enabling both the battery charging circuit and the transmitter to charge the external

And because Schommer's external charger does not begin charging either battery until it has determined whether both of the external and implant batteries require charging and then charges them at the same time, Schommer's charging

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batteries and implant battery at the same time. Ex.1003¶¶75-79. The '933 further discloses that the capacities of the batteries and the temperature of the external charger are monitored while the batteries are being charged. Ex.1001, 10:7-21. Schommer discloses that "[i]f a charge event occurs, then the process checks to determine if charging is complete [block 140]." Ex.1004, 16:16-18; *see also id.*, 15:60-61 ("[E]xternal charging device 48 is able to monitor…charging status."). It would have been obvious to a POSA that one potential method for determining whether "charging is complete" is by measuring battery capacity. Ex.1003¶80. The '933's algorithm (*e.g.*, in Fig. 10) also monitors the temperature of the external charger and if the external charger's temperature exceeds "predetermined temperature, Tmax," the charging of the batteries may be modified by, for example, reducing the power used to charge the implanted battery. Ex.1001, 10:14-38. As explained with respect to Claim 4 (§V.A.3, below), Schommer expressly discloses monitoring the temperature at the external coil and limiting the amount of energy transferred to the implanted battery when the temperature reaches the preset temperature limit. Ex.1003¶80.

determinations are not "independent" of each other. Ex.1003¶74; *see* §IV.A.

Schommer further explains that its external charging device 48 is "***controlled by microprocessor 212***." Ex.1004, 14:25-28; *see also id*., 14:29-30 ("H-bridge ***control signals and timing are provided conventionally by microprocessor 212***."), 20:34-39 ("***[E]xternal charging device 48 incorporates*** . . . ***control circuitry*** in charging unit 50 which can ensure that external antenna 52 does not exceed acceptable temperatures . . . ."), 10:53-63 ("***Control circuitry*** . . . can then limit the energy transfer process . . . ."), 21:45-48. Thus, a POSA would have understood that the above-described charging process (or algorithm)—including determining whether the external batteries and/or implant battery require charging and, based on that determination, executing the program(s) for enabling the battery charging circuit and/or transmitter accordingly—would have been implemented by the external charger device's microprocessor 212, which "control[s]" the circuitry in the external charger device. Ex.1004, 14:22-26; Ex.1003¶74.

Thus, Schommer discloses and/or renders obvious "control circuitry" (*e.g.*, microprocessor 212) "for implementing an algorithm to controllably enable the battery charging circuit" (*e.g.*, execute the algorithm or program associated with the "Recharge Charger" action to close switch SW1 via "BAT_CHRG_EN" line, so that power can flow from "Desktop Charger Connector" through "CHARGE" line, SW1, and SW2 to batteries 160) and "the transmitter" (*e.g.*, execute the algorithm or program associated with the "Recharge Device" action to, *e.g.*, drive transmit block 214 with an oscillating drive signal and close switch Q13 to supply power to transmit block 214 through 12V Power Supply 216) "in the event that the control circuitry determines that both the external battery and the implant battery require charging" (*e.g.*, when the microprocessor 212 determines that the "External Charger Battery Depleted" and "Implantable Medical Device Will Not Provide Therapeutic Result Until Recharged" conditions have occurred). Ex.1003¶¶61-80.

3. Claim 4

Claim 4 depends on claim 1 and further recites "wherein the algorithm enables both the battery charging circuit and the transmitter simultaneously, but reduces an amount of power to either or both of the battery charging circuit and the transmitter."

Schommer discloses that the desktop charging device 162, which is used to charge the external batteries, can be plugged into AC power ***while*** the implanted battery is being charged:

> Since charging unit 50 is not, in a preferred embodiment, coupled directly to the line voltage source of AC power, ***charging unit 50 may be used with external antenna 52 to transfer power and/or charge implanted medical device 16 while desktop charging device 162 is coupled to a line voltage source of AC power***.

Ex.1004, 14:9-14. Thus, as discussed (§V.A.2.d), it would have been at a minimum obvious to a POSA that the external batteries and the implanted batteries can be charged at the same time by, for example, also closing switch SW1. Ex.1003¶82.

Schommer further discloses that its external charger monitors the temperature at the external coil and if the temperature "approaches or reaches preset limits," which are programmed in software (Ex.1004, 16:41-44), its "control circuitry" controls the temperature by, *e.g.*, limiting the amount of energy to the primary coil:

> Control circuitry using the output from temperature sensor 87 can then ***limit the energy transfer process in order to limit the temperature which external antenna 52 imparts to patient 18***. As temperature sensor 87 approaches or reaches preset limits, ***control circuitry can take appropriate action such as limiting the amount of energy transferred, e.g., by limiting the current driving primary coil 54**, **or limiting the time during which energy is transferred, e.g., by curtailing energy transfer or by switching energy transfer on and off to provide an energy transfer duty cycle of less than one hundred percent***.

Ex.1004, 20:53-63; *see also id*., 16:25-44.

Schommer discloses that microprocessor 212, which controls external charging device 48, "drive[s]" H-bridge circuit in transmit block 214 at 9 kilohertz during power transfer to and/or charging of the implanted device. Ex.1004, 14:25-36. And, in turn, transmit block 214 drives the primary coil 54. *Id*. Thus, one way to reduce the amount of power to transmit block 214 is for microprocessor 212 to drive transmit block 214 with oscillating control signal at a reduced duty cycle, as expressly disclosed by Schommer. Ex.1004, 20:53-63; Ex.1003¶83.

Therefore, Schommer discloses "wherein the algorithm enables both the battery charging circuit and the transmitter simultaneously" (*e.g.*, charging the external batteries and implanted battery simultaneously), "but reduces an amount of power to either or both of the battery charging circuit and the transmitter" (*e.g.*, reducing duty cycle to transmit block 214 and thereby limiting the current driving primary coil 54). Ex.1003¶¶82-83.

4. Claim 34

a) [34.preamble]: "An external charger for interfacing with an implantable medical device"

To the extent it is limiting, Schommer discloses the preamble for the same reasons discussed for element [1.preamble]. *See* §V.A.2.a); Ex.1003¶84.

b) [34.a]: "an external battery in the external charger for producing a battery voltage"

Schommer discloses that its external charger contains a battery for producing a battery voltage to charge the battery in the implantable medical device. For example, Schommer discloses that "[a]s shown in FIG. 13, ***external charging device 48 can be powered…directly from internal (to charging unit 50) batteries***

160" and that "***[b]atteries 160…allow charging unit 50 and, hence, external charging device 48, to be used in transferring power and/or charging of implanted medical device 16***…." Ex.1004, 13:61-63, 14:17-22, Fig. 13; *see also, e.g.*, *id*., 14:7-9 ("Once charged and/or recharged, batteries 160 can provide the power through internal circuitry 166 and cable 56 to external antenna 52."), 14:39-44 (explaining external batteries provide voltage to 12 volt power supply 216, which supplies power to transmit block 214 during charging), Fig. 14; Ex.1003¶¶85-87.

c) [34.b]: "a battery charging circuit for controlling the charging of the external battery"

Schommer discloses and/or renders obvious this limitation for the same reasons as claim [1.a]. *See* §V.A.2.b); Ex.1003¶88.

d) [34.c]: "a circuit node configured to receive a DC voltage, wherein the DC voltage is provided to the battery charging circuit to allow the external battery to be charged"

Schommer discloses that desktop charging device 162, which connects to an AC power source, can be configured as a cradle that receives charging unit 50. Ex.1004, 13:64-67. Desktop charging device 162 can recharge batteries 160 in charging unit 50 by inductive coupling between coil 167 in the desktop charging device 162 and coil 168 in charging unit 50. Ex.1004, 14:3-7.

As discussed above (§V.A.2.b), based on Schommer's disclosures, a POSA would have understood that the "Desktop Charger Connector" in Figure 14 receives power from the desktop charging device 162 and transfers that power via the "CHARGE" line to batteries 160 when switch SW1 is closed via the "BAT_CHRG_EN" line:

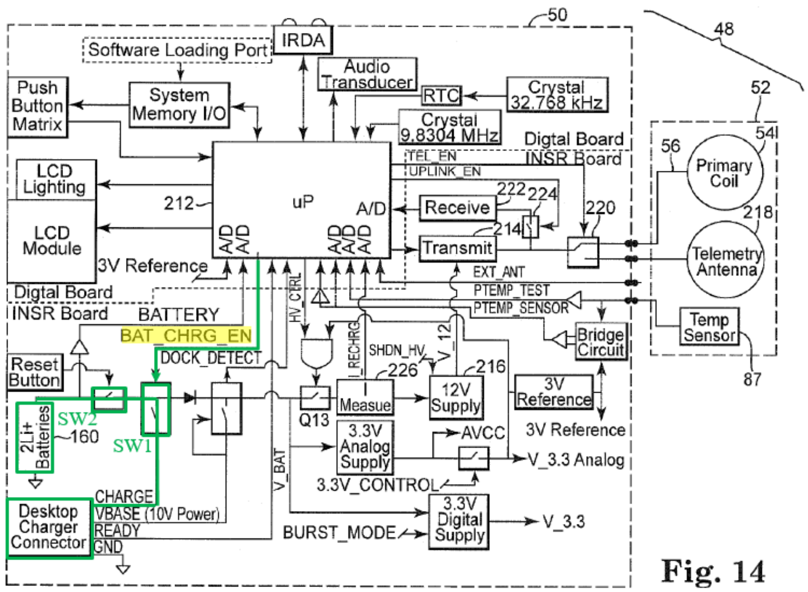

Fig. 14

Ex.1003¶¶89-90.

Because batteries are direct current ("DC") sources, the power the desktop charging device 162 receives from the AC power source (*e.g.*, wall outlet) and transmits inductively to charger unit 50 must be converted to DC power before it can be applied to external charger device's 48 batteries 160. Ex.1004, 13:61-14:7; Ex.1003¶91. It was well-known at the time that inductive coils, like coil 167 in the desktop charging device 162 and coil 168 in charger unit 50, transfer alternating current. Ex.1009, 41:65-42:3 ("Such circuitry 275 essentially comprises DC-to-

AC conversion circuitry that converts dc power from the battery 277 to an ***ac signal that may be inductively coupled through a coil 279 located in the external charging head 272 . . . with another coil 680 included within the IPG 100*, *as is known in the art*.”). Ex.1003¶92.

The circuitry depicted in Figure 14 does not expressly show circuitry that can perform the necessary conversion from AC power to DC power. A POSA, however, would have understood or, at a minimum, found it obvious that such conversion would occur in the “Desktop Charger Connector.” Ex.1003¶93. Circuitry within the “Desktop Charger Connector” that could perform the necessary conversion includes a rectifier, which was a well-known electrical device that converts (or rectifies) AC into DC. Ex.1009, 42:4-7 (“Upon receipt of such ac signal . . . , it is rectified by rectifier circuitry 682 and converted back to a dc signal . . . .”); Ex.1010, 7:25-27 (“The rectifier 12 converts the sinusoidal voltage received by the secondary coil 10 to a DC voltage for charging the battery 13.”); Ex.1003¶93. Thus, the power received on the “CHARGE” line (and subsequently by SW1, SW2, and batteries 160) from the “Desktop Charger Connector” is DC voltage. Ex.1003¶94.

Therefore, Schommer discloses “a circuit node configured to receive a DC voltage” (*e.g.*, the point of connection between the “Desktop Charger Connector” and “CHARGE” line, which receives DC voltage that was converted from AC in the "Desktop Charger Connector") "wherein the DC voltage is provided to the battery charging circuit" (*e.g.*, the DC voltage is provided to the "CHARGE" line, SW1, and SW2 portions of the battery charging circuit) "to allow the external battery to be charged" (*e.g.*, to charge batteries 160). Ex.1003¶¶89-94.

e) [34.d]: "a coil to provide power wirelessly to charge an implant battery in an implantable medical device"

As discussed in §V.A.2.c), Schommer discloses that—as was well-known in the art—the external charger's coil 54 is driven with an oscillating current to charge the implantable medical device's battery when the device is implanted:

> ***Rechargeable power source 24 can be charged while implantable medical device 16 is in place in a patient through the use of external charging device 48***. In a preferred embodiment, external charging device 48 consists of charging unit 50 and external antenna 52. Charging unit 50 contains the electronics necessary to ***drive primary coil 54 with an oscillating current in order to induce current in secondary coil 34*** when primary coil 54 is placed in the proximity of secondary coil 34.

Ex.1004, 10:10-18; *see also id*., 1:48-60, 4:44-56 ("Transcutaneous energy transfer through the use of inductive coupling involves the placement of two coils positioned in close proximity to each other on opposite sides of the cutaneous boundary. … The primary coil is driven with an alternating current. A current is induced in the secondary coil through inductive coupling. This current can then be used to …charge, or recharge, an internal power source…."), 6:47-54 ("[T]he present invention provides a system for transcutaneous energy transfer.”), 9:29-31, 9:42-45, 14:9-22 (“[C]harging unit 50 may be used with external antenna 52 to transfer power and/or charge implanted medical device . . . .”), 14:30-35 (“H-bridge circuit in transmit block 214 is used to drive both primary coil 54, used for power transfer and/or charging . . . .”), claim 1 (“A method of transcutaneous energy transfer to a medical device implanted in a patient having a secondary charging coil using an external power source having a primary coil ….”); Ex.1003 ¶¶95-96.

Thus, Schommer discloses “a coil” (*e.g.*, primary coil 54) “to provide power wirelessly to charge” (*e.g.*, to transfer power and/or charge through the patient’s skin) “an implant battery in an implantable medical device” (*e.g.*, rechargeable power source 24 in implantable medical device 16). Ex.1003¶¶95-96.

f) [34.e]: “a transmitter for driving the coil”

As discussed in §V.A.2.c), Schommer’s external charger includes a transmit block 214 that “drives primary coil 54.” Ex.1004, 14:26-35 (“Transmit block 214 drives primary coil 54 in external antenna 52. . . . H-bridge circuit in transmit block 214 is used to drive . . . primary coil 54, used for power transfer and/or charging . . . .”); *see also id*., 10:14-18.

Thus, Schommer discloses “a transmitter” (*e.g.*, transmit block 214) “for driving the coil” (*e.g.*, for driving primary coil 54). Ex.1003¶97.

g) [34.f]: "control circuitry programmed to control the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging"

As explained above (§IV.A), the proper construction of "programmed to control the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging" is "control per a program the battery charging circuit and the transmitter based on the simultaneous, dual determination (and not independent determinations) that both the external battery and the implant battery require charging." Although the language used in this limitation and that used in claim [1.c] differ slightly in that claim [1.c] recites "implementing an algorithm to controllably enable" and this limitation recites a "program[] to control" the battery charging circuit and transmitter, there is no meaningful difference between the two limitations for purposes of this petition.[14] Therefore, Schommer renders obvious this limitation for the same reasons as claim [1.c] under either a non-means-plus-function or means-plus-function reading of this limitation. *See* §V.A.2.d); Ex.1003¶98.

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[14] In parallel district court proceeding, PO proposes the same exact construction for both limitations. Ex.1007, 15-16.

5. Claim 35

Claim 35 depends on claim 34 and further recites "wherein the transmitter receives an oscillating drive signal."

Schommer discloses that its microprocessor 212 "drive[s]" the H-bridge circuit in transmit block 214 at 9 kilohertz during power transfer to and/or charging of the implanted device's battery. Ex.1004, 14:25-36, 14:34-35. The 9 kilohertz signal is an oscillating drive signal that alternates at a rate of 9,000 times per second. Ex.1003¶¶100-01. H-bridge circuit in transmit block 214, in turn, drives primary coil 54 with an oscillating current. Ex.1004, 14:28-33; *see also id*., 10:14-18 ("Charging unit 50 [in external charging device 48] contains the electronics necessary to ***drive primary coil 54 with an oscillating current*** in order to induce current in secondary coil 34 when primary coil 54 is placed in the proximity of secondary coil 34.").

Thus, Schommer discloses the "transmitter" (*e.g.*, transmit block 214, including H-bridge circuit) "receives an oscillating drive signal" (*e.g.*, receives from microprocessor 212 an oscillating drive signal at 9 kilohertz). Ex.1003¶¶100-01.

6. Claim 40

Claim 40 depends on claim 34 and further recites "wherein the control circuitry enables both the battery charging circuit and the transmitter simultaneously, but reduces an amount of power to either or both of the battery charging circuit and the transmitter in the event that the control circuitry determines that both the external battery and the implant battery requires charging."

As explained above (*see* §§ V.A.2.d), V.A.3), Schommer discloses or, at a minimum, renders obvious that the external charger checks the battery status of both the external charger and the implantable medical device and can recharge them simultaneously if it is determined that both require charging. And, as further explained in Section V.A.3, Schommer also discloses that its control circuitry controls the temperature at the external coil by, *e.g.*, limiting the current driving the transmit block 214 and, therefore, primary coil 54. *E.g.*, Ex.1004, 20:53-63. And Schommer monitors and controls the temperature at the external coil so long as the implant battery is being charged, including when the external batteries and implant battery are being charged simultaneously. Ex.1004, 16:19-22, 20:34-41; Ex.1003¶104. Therefore, Schommer discloses or, at a minimum, renders obvious claim 40. Ex.1003¶¶103-04.

B. Ground 2: Schommer in view of Veselic Renders Obvious Claim 48

1. Overview of Veselic (Ex.1005)

Veselic is a patent application that was published on August 26, 2004 and is prior art to the ’933 patent under §102(b)[15]. Ex.1003¶35. Veselic is directed to a battery charger—more particularly, a battery charging circuit comprising a battery charge controller—that can receive power from a variety of external sources, including USB ports. Ex.1005, ¶¶[0001], [0148]. Veselic explains that one of the disadvantages of conventional battery chargers, which typically at that time received power from an AC power source, is that there are no universal standards for AC power supplies. Ex.1005, ¶¶[0002], [0020]. Thus, “[a] traveller who forgets his AC power supply at home, may not be able to find a suitable replacement.” Ex.1005, ¶[0020]. In contrast, because the USB standard is widely accepted, a traveler whose device is equipped with a USB connector has a greater chance of finding a charging source, such as a personal computer or laptop. Ex.1005, ¶¶[0014], [0015], [0021], [0022]. Accordingly, Veselic proposes a battery charge controller that can receive power from, for example, standard USB ports. Ex.1005, ¶¶[0031], [0032]. *See also* Ex.1003¶106.

2. Claim 48

Claim 48 depends on claim 34 and further recites “wherein the external charger further comprises a housing and a DC-DC regulator, wherein the housing comprises a port for receiving another DC voltage, and wherein the DC voltage is

[15] Veselic later issued as U.S. Patent No. 7,791,319 (Ex.1012).

generated by the regulator."

Schommer in view of Veselic discloses these features. Schommer expressly discloses that its external charger's primary coil is contained within a housing. *See*, *e.g.*, Ex.1004, 7:18-21 ("[T]he external power source has a housing containing the primary coil . . . ."). Further, a POSA would have understood that the external charger's charging unit 50 also has its own housing because each of the figures that includes charging unit 50 depicts it as a single enclosed unit containing various circuitry, and it would have at a minimum been obvious to include a housing for charging unit 50 to protect its circuitry from external elements. *See* Ex.1004, Figs. 3, 13, 14; Ex.1003¶¶108-09.

Schommer does not expressly disclose that its external charger includes a DC-DC regulator that generates the DC voltage provided to the battery charging circuit or that its external charger's housing includes a port for receiving another DC voltage. Ex.1003¶110. It would have been obvious, however, to implement these features into Schommer's external charger in view of Veselic. Ex.1003¶110.

Veselic discloses a charging circuit, including a "battery charge controller," that can receive power to charge and/or operate a portable device. The "battery charge controller" can receive power from DC power supplies, including "computer data busses such as USB ports, external battery packs, . . . and DC outlets in automobiles and on aircraft." Ex.1005, ¶[0148]; *see also id.*, ¶[0015]

("USB ports supply a low DC voltage supply . . . ."); Ex.1003¶111. Veselic further discloses that the portable device includes a port (*e.g.*, USB connector) for connecting to the power-supplying USB port. *See, e.g.*, Ex.1005, ¶[0021] ("[T]he USB standard is widely accepted, so that a traveller whose mobile device is equipped with a ***USB connector*** will have a much greater chance of finding a charging source."), *see also id*., ¶¶[0014] ("As well, ***USB ports*** are operable to supply limited power to ***connected external devices***."), [0015] ("[T]he docking cradle 10 is connected to a USB port 12 of a personal computer (PC) 14, ***via a simple USB cable and connectors 16***."), [0019], [0086], [0113], [0114] ("V_{BUS}, the input voltage, is presented via Q904*a* to the ***USB input pin of the battery charge controller*** U909."), [0138]; Ex.1003¶111. Thus, Veselic discloses a portable device, including a battery charger, having a port for receiving a DC voltage (*e.g.*, USB port). Ex.1003¶111.

Veselic further discloses that its charging circuit can include a "voltage regulator" to regulate the voltage input from V_{BUS}—the power line of the USB interface—and provide a constant output voltage. Ex.1005, ¶¶[0078], [0113], [0114]. When the source of the input voltage (V_{BUS}) is a DC power source, the "voltage regulator" is a DC-DC regulator because the regulator converts a received DC voltage, which may vary in level, to a constant DC output voltage level, thereby simplifying the design of downstream circuitry. Ex.1003¶114; Ex.1005,

¶[0078] ("V_{REF} is used as an input . . . rather than V_{BUS} because ***the regulator will provide a constant output voltage, whereas V_{BUS} has a wide range making the design more difficult***."). Thus, Veselic discloses a DC-DC regulator that generates a DC voltage that is used to charge a battery. Ex.1003¶114.

A POSA would have been motivated and found it obvious to include features taught by Veselic in Schommer's charging system because Veselic is directed to advantageous ways of recharging batteries in portable devices and Schommer's external charger is one such portable device. Ex.1003¶116. While Veselic uses portable communications devices (*e.g.*, BlackBerry handheld devices) as examples of the portable devices that can take advantage of Veselic's disclosed charging circuit (*see, e.g.*, Ex.1005, ¶[0086]), Veselic expressly states that its disclosed charging circuit and process can "be used to charge ***any rechargeable battery in a portable or similar electronic device***." Ex.1005, ¶[0137]; *see also id*., ¶¶[0149], [0150] ("any manner of electrical appliance could be charged with such a circuit . . . any manner of rechargeable battery could be used including single or multiple lithium-ion . . . ."). Ex.1003¶116.

In particular, a POSA would have been motivated and found it obvious to include in Schommer's external charger the ability to receive power from a USB port, as taught by Veselic, because it would improve the portability of Schommer's charging system and because, by the time the '933 patent was filed, it was known that external chargers in implantable medical device systems could charge its batteries via a USB port. Ex.1011, 8:30-53 ("When a USB port 300 is used, the external controller 210 . . . can connect with other devices, such as a computer 312 . . . via a USB connector 315 and an AC-DC adapter 316. . . . [B]ecause USB protocols call for provision of DC power, either the computer 312 or the power source 317 may be used . . . to recharge its battery 126."), Fig. 5; Ex.1003¶¶112-13. As Veselic explains, one of the disadvantages of conventional AC power supplies at that time was that there were no universal standards for AC power supplies. Ex.1005, ¶[0020]. Thus, a device was typically tied to its particular AC power supply and a traveler who forgets his AC power supply at home may not be able to find a suitable charging source for that device. Ex.1005, ¶[0020]. The USB standard, on the other hand, was widely accepted making it a desirable choice as a power supply for portable devices. Ex.1005, ¶¶ [0021], [0022] ("Thus, it would clearly be desirable to use USB power to charge portable devices."), [0015] ("USB ports would seem to be a very logical choice as a power supply for portable devices for a number of reasons."). *See also* Ex.1003¶¶112-13.

Thus, a device that is equipped with a USB connector has many more options in charging sources, such as a personal computer or a laptop computer. Ex.1005, ¶¶[0014], [0021]. And a POSA implementing Schommer's charging system would have recognized that providing the patient with more options for power sources that can charge the external charger's batteries would have improved the portability of Schommer's system—a feature that Schommer recognizes as a benefit. Ex.1004, 14:17-24 (explaining external charger's batteries allows the patient to be "ambulatory" while charging the implantable medical device); Ex.1003¶113. For example, a patient who is traveling but forgets to bring his desktop charging device would have the additional option of charging or powering Schommer's external charger using, *e.g.*, a laptop computer's USB port, so that the patient can continue to charge and operate his implanted medical device. Ex.1003¶113.

A POSA would have further been motivated to include a DC-DC regulator, like that disclosed in Veselic, in Schommer's external charger to simplify the design of the charging circuitry, as expressly taught by Veselic. Ex.1005, ¶[0078] ("V_{REF} is used as an input . . . rather than V_{BUS} because ***the regulator will provide a constant output voltage, whereas V_{BUS} has a wide range making the design more difficult***."); Ex.1003¶115. Converting the voltage received from either a DC power source (*e.g.*, USB source) or an AC power source (*e.g.*, wall outlet) that is converted to DC voltage to a constant level would advantageously simplify the battery charging circuitry because otherwise, the circuitry would have to be designed to accommodate all potential voltage variations. Ex.1003¶115.

Because of the similarities between Schommer's and Veselic's battery charging systems and because USB communication standards were well-known by the ’933 patent’s May 2009 alleged priority date, a POSA would have known that the features from Veselic could be predictably combined with Schommer. Ex.1003¶116; *see also, e.g.*, Ex.1011, 9:12-14 (“As USB is dictated by its own communication protocol, it is a routine matter for designers to implement communications, and such details do not require repeating here.”).

VI. NO SECONDARY CONSIDERATIONS EXIST

As described above, the presented grounds of unpatentability render obvious each of the Claims. No secondary indicia of non-obviousness exist having a nexus to the ’933 patent’s putative invention contrary to that conclusion. Petitioner reserves its right to respond to any assertion of secondary indicia of non-obviousness advanced by PO. Ex.1003¶117.

VII. CONCLUSION

Petitioner respectfully submits the evidence presented in this Petition establishes a reasonable likelihood Petitioner will prevail in establishing the Challenged Claims are unpatentable, and requests Trial be instituted.

VIII. STANDING (§42.104(a))

Petitioner certifies the ’933 patent is available for IPR and Petitioner is not barred or estopped from requesting IPR of the ’933 patent claims. Neither Petitioner, nor any party in privity with Petitioner, has filed a civil action challenging the validity of any claim of the ’933 patent. The ’933 patent has not been the subject of a prior IPR by Petitioner or a privy of Petitioner.

Petitioner certifies this IPR petition is timely filed as it was filed less than one year after December 9, 2016, the date Petitioner was first served with a complaint alleging infringement of a ’933 patent claim. *See* §315(b).

The Director is authorized to charge the fee specified by §42.15(a) to Deposit Account No. 50-1597.

IX. PETITIONER’S MANDATORY NOTICES (§42.8(b))

A. Real Party in Interest (§42.8(b)(1))

The real party in interest of this petition is Petitioner Nevro Corp.

B. Other Proceedings (§42.8(b)(2))

1. Patents and Applications

According to PAIR, the ’933 patent is currently assigned to Boston Scientific Neuromodulation Corporation.

The ’933 patent is a division of the application that became U.S. Patent No. 8,214,042 (“’042 patent”).

While not directly related to the ’933 patent, PCT/US10/34666, which is pending, claims priority to the application that became the '042 patent.

2. Related Litigation

The '933 patent has been asserted against Petitioner in *Boston Scientific Corp. and Boston Scientific Neuromodulation Corp. v. Nevro Corp.*, Civil Action No. 16-1163-GMS in the District of Delaware.

3. Patent Office Proceedings

The '933 patent is not currently the subject of any other proceedings before the Patent Office.

Petitioner has filed several other IPR petitions on other patents involved in the above-identified litigation, including: IPR2017-01811 and IPR2017-01812 (both filed July 21, 2017) and IPR2017-01920 (filed August 11, 2017) challenging claims of U.S. Patent No. 6,895,280; IPR2017-01831 (filed July 21, 2017) challenging claims of U.S. Patent No. 7,437,193; IPR2017-01899 (filed July 31, 2017) challenging claims of U.S. Patent No. 7,587,241; IPR2018-00143 (filed November 2, 2017) challenging claims of U.S. Patent No. 7,891,085; and IPR2018-00147 (filed November 2, 2017) challenging claims of U.S. Patent No. 8,650,747.

C. Lead and Backup Counsel (§42.8(b)(3))

Lead Counsel is Ching-Lee Fukuda (Reg. No. 44,334, clfukuda@sidley.com, 212-839-7364) at the address: Sidley Austin LLP, 787 Seventh Avenue, New York, New York 10019. Backup Counsel are Thomas A.

Broughan, III (Reg. No. 66,001, tbroughan@sidley.com, 202-736-8314), Sharon Lee[16] (sharon.lee@sidley.com, 202-736-8510), both at the address: Sidley Austin LLP, 1501 K Street N.W., Washington, DC 20005. Additional back-up counsel includes Jon Wright (Reg. No. 50,720, jwright-PTAB@skgf.com), and Richard D. Coller III (Reg. No. 60,390, rcoller-PTAB@skgf.com), both at STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C., 1100 New York Avenue, N.W., Washington, D.C., 20005, phone number (202) 371-2600, and facsimile (202) 371-2540.

D. Service Information (§42.8(b)(4))

Petitioner consents to electronic service by email at: clfukuda@sidley.com, tbroughan@sidley.com, sharon.lee@sidley.com, jwright-PTAB@skgf.com, and rcoller-PTAB@skgf.com.

Dated: November 3, 2017

Respectfully Submitted,

/s/ Ching-Lee Fukuda
Ching-Lee Fukuda
Reg. No. 44,334
SIDLEY AUSTIN LLP
787 Seventh Avenue
New York, NY 10019
P: (212) 839-7364
F: (212) 839-5599

[16] Petitioner will file a motion for Sharon Lee to appear *pro hac vice* according to the Board's orders and rules.

CERTIFICATE OF COMPLIANCE

I hereby certify that this petition complies with the type-volume limitations of 37 C.F.R. § 42.24, because it contains 11,206 words (as determined by the Microsoft Word word-processing system used to prepare the petition), excluding the parts of the petition exempted by 37 C.F.R. § 42.24.

Dated: November 3, 2017

Respectfully Submitted,

/s/ Ching-Lee Fukuda

Ching-Lee Fukuda
Reg. No. 44,334
SIDLEY AUSTIN LLP
787 Seventh Avenue
New York, NY 10019
P: (212) 839-7364
F: (212) 839-5599

CERTIFICATE OF SERVICE

I hereby certify that on this 3rd day of November, 2017, a copy of this Petition, including all attachments, appendices and exhibits, has been served in its entirety by overnight mail on the following counsel of record for patent owner:

LEWIS, REESE & NESMITH, PLLC
11625 Spring Cypress Rd., Suite A
Tomball, Texas 77377
PAIR Correspondence Address for U.S.P.N. 8,644,933

YOUNG CONAWAY STARGATT & TAYLOR LLP
Karen L. Pascale
1000 North King Street
Wilmington, Delaware 19801
Other address known to the petitioner as likely to effect service

ARNOLD & PORTER KAYE SCHOLER LLP
Matthew M. Wolf
601 Massachusetts Avenue, N.W.
Washington, DC 20001-3743
Other address known to the petitioner as likely to effect service

Dated: November 3, 2017

Respectfully Submitted,

/s/ Ching-Lee Fukuda

Ching-Lee Fukuda
Reg. No. 44,334
SIDLEY AUSTIN LLP
787 Seventh Avenue
New York, NY 10019
P: (212) 839-7364
F: (212) 839-5599