IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Ex Parte* Reexamination of:	)	
U. S. Patent No. 11,316,371 B1	)	Control No.: *To be assigned*
Issue Date: April 26, 2022	)	Group Art Unit: *To be assigned*
Inventors: Afshin Partovi, *et al.*	)	Examiner: *To be assigned*
Appl. No. 17/507,323	)	Confirmation No.: *To be assigned*
Filing Date: October 21, 2021	)	
For: SYSTEM AND METHOD FOR INDUCTIVE CHARGING OF PORTABLE DEVICES	)	

Mail Stop *Ex Parte* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

<u>REQUEST FOR *EX PARTE* REEXAMINATION OF U.S. PATENT NO. 11,316,371</u>

Reexamination is requested under 35 U.S.C. § 302 and 37 C.F.R. § 1.510 for claims 1, 2, 28, and 30 of U.S. Patent No. 11,316,371 B1 (the '371 Patent), which issued on April 26, 2022 to assignee Mojo Mobility, Inc.

The *ex parte* reexamination fee of $12,600 is paid herewith by deposit account authorization. The Commissioner is hereby authorized to charge any additional fees which may be required regarding this request, or credit any overpayment, to Deposit Account No. 50-2613. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 50-2613.

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Ex. PAT-D	U.S. Patent No. 7,952,322 (“the ’322 patent”)
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Ex. PA-4	Watson, J., Mastering Electronics, Third Ed., McGraw-Hill, Inc. (1990) ("*Watson*")
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Ex. PA-17	Physics, Henry Semat et al., Rinehart & Co., Inc., 1958, Chapters 29-32 ("*Semat*")
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I. Introduction

An *ex parte* reexamination is requested on claims 1, 2, 28, and 30 of U.S. Patent No. 11,316,371, which issued on April 26, 2022 to Partovi ("the '371 Patent," Ex. PAT-A), for which the U.S. Patent and Trademark Office ("Office") files identify Mojo Mobility Inc. ("Mojo" or "Patent Owner") as the assignee. In accordance with 37 C.F.R. § 1.510(b)(6), Requester Samsung Electronics Co., Ltd. ("Requester") hereby certifies that the statutory estoppel provisions of 35 U.S.C. § 315(e)(1) and 35 U.S.C. § 325(e)(1) do not prohibit it from filing this *ex parte* reexamination request.

This request raises substantial new questions of patentability based on prior art that the Office did not have before it and/or did not fully consider during the prosecution of the '371 Patent, and which discloses or suggests the features recited in the challenged claims. Requester respectfully urges that this Request be granted and that reexamination be conducted with "special dispatch" pursuant to 35 U.S.C. § 305.

The substantial new question of patentability for claims 1, 2, and 30 of the '371 Patent involves a ground demonstrating that these claims are not entitled to the filing date of an earlier application (U.S. Patent Application No. 12/116,876 (filed on May 7, 2008, now Pat. No. 8,169,185) in the priority chain, and as a result a publication of the '876 application is prior art against the claims 1, 2, and 30 of the '371 patent. With respect to claim 28, the prior art renders the claim obvious even if claim 28 is entitled to the priority date alleged by Patent Owner.

In accordance with 37 C.F.R. § 1.20(c), the fee for *ex parte* reexamination (non-streamlined) is submitted herewith. If this fee is missing or defective, please charge the fee as well as any additional fees that may be required to Deposit Account No. 50-2613.

II. Related Proceedings

On October 7, 2022, Patent Owner filed suit against Requester asserting, *inter alia*, infringement of the '371 Patent in *Mojo Mobility Inc. v. Samsung Electronics Co., Ltd.*, No 2-22-CV-00292 (E.D. Tex.).

Requester filed *inter partes* review petitions against the '371 Patent on June 27, 2023. IPR2023-01094, Paper 1; IPR2023-01095, Paper 1; IPR2023-01096, Paper 1; IPR2023-01097, Paper 1. The Patent Trial and Appeal Board ("the PTAB") denied *inter partes* review.

This request, however, does not raise "the same or substantially the same prior art or arguments" previously presented, including in IPR2023-01094, IPR2023-01095, IPR2023-1096, and IPR2023-1097. 35 U.S.C. § 325(d). This request is based on prior art that the Office did not have before it or did not fully consider during the prosecution of the ’371 Patent, and that the PTAB did not have before it in IPR2023-01094, IPR2023-01095, IPR2023-1096, and IPR2023-1097, and which discloses or suggests the features recited in the challenged claims, especially under the broadest reasonable interpretation standard applicable to this request. And the references used in this request are substantially different than those used in the aforementioned *inter partes* reviews.

III. Identification of Claims and Citation of Prior Art Presented

Requester respectfully requests reexamination of claims 1, 2, 28, and 30 of the ’371 patent in view of the following prior art references, which are also listed on the attached PTO Form SB/08 (Ex. PA-SB08).

Ex. PA-1	U.S. Patent Application Publication No. 2009/0096413 to Partovi *et al.* (“*Partovi*”)
Ex. PA-2	U.S. Patent No. 5,713,939 to Nedungadi *et al*. (“*Nedungadi*”)
Ex. PA-3	U.S. Patent Application Publication No. 2005/0127868 to Calhoon *et al.* (“*Calhoon*”)
Ex. PA-31	U.S. Patent 8,004,235 to Baarman *et al*. (“*Baarman*”)
Ex. PA-32	U.S. Provisional Application No. 60/827,586 to Baarman *et al*. (“*Baarman* Provisional”)
Ex. PA-33	U.S. Patent Application Publication No. 2007/0029965 to Hui (“*Hui*”)
Ex. PA-34	U.S. Patent No. 5,808,587 (“*Shima*”)
Ex. PA-35	U.S. Patent No. 6,960,968 (“*Odendaal*”)

Ex. PA-36	U.S. Patent Application Publication No. 2003/0095027 ("*Hui-027*")

A copy of each of the above-listed references is attached to this request pursuant to 37 C.F.R. § 1.510(b)(3). A copy of the ’371 Patent is also attached to this request as Exhibit PAT-A pursuant to 37 C.F.R. § 1.510(b)(4).

IV. Overview of the ’371 Patent

A. Specification and Drawings of the ’371 Patent

The ’371 patent is titled "System and method for inductive charging of portable devices." The named inventors are Afshin Partovi and Michael Sears. (Ex. PAT-A, Cover.) It issued from United States Patent Application No. 17/507,323, which was filed on October 21, 2021. (*Id.*) The ’371 patent is a continuation of U.S. Patent Application No. 16/055,109, filed on Aug. 5, 2018, now U.S. Patent No. 11,201,500, which is a continuation of U.S. patent application No. 15/463,252, filed on March 20, 2017, now U.S. Patent No. 10,044,229, which is a continuation of U.S. patent application No. 15/056,689, filed on February 29, 2016, now U.S. Patent No. 9,601,943, which is a continuation of U.S. patent application No. 14/608,052, filed on January 28, 2015, now U.S. Patent No. 9,276,437, which is a continuation of U.S. patent application No. 13/708,548, filed on December 7, 2012, now U.S. Patent No. 8,947,047, which is a continuation of U.S. patent application No. 13/442,698, filed on April 9, 2012, now U.S. Patent No. 8,629,654, which is a continuation of U.S. patent application No. 12/116,876, filed on May 7, 2008, now U.S. Patent No. 8,169,185, which is a continuation-in-part of U.S. patent application No. 11/669,113, filed on January 30, 2007, now U.S. Patent No. 7,952,322. (*Id.*, *see also id.*, 1:6-40.) The ’371 patent claims priority to provisional application Nos. 60/763,816 ("’816 provisional"), filed on January 31, 2006, 60/810,262 ("’262 provisional"), filed on June 1, 2006, 60/810,298 ("’298 provisional"), filed on June 1, 2006, and 60/868,674 ("’674 provisional"), filed on December 5, 2006, 60/916,748 ("’748 provisional"), filed on May 8, 2007, 60/952,835 ("’835 provisional"), filed July 30, 2007, 61/012,922 ("’922 provisional"), filed on December 12, 2007, 61/012,924 ("’924 provisional"), filed on Dec. 12, 2007, 61/015,606 ("’606 provisional"), filed on December 20, 2007, and 61/043,027 ("’027 provisional"), filed on April 7, 2008. (*Id.*) Mojo asserts that claims 1 and 28 of the ’371 patent have a July 30, 2007 priority date and claims 2 and 30 of the ’371 patent have a priority date of December 12, 2007. (Ex. LIT-1, 7.)

The ’371 patent is directed to “[a] system for providing power inductively to a portable device.” (Ex. PAT-A, Abstract.) Figure 1 excerpted below shows a diagram of an embodiment of the alleged invention of the ’371 patent.

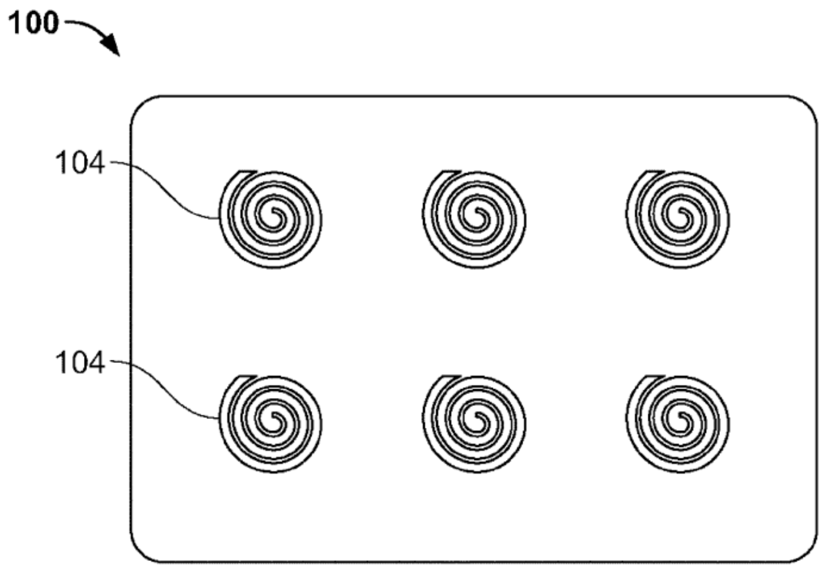

FIG. 1

(*Id.*, Figure 1.)

The ’371 patent explains that the pad of Figure 1:

> the mobile device or battery charger or power supply preferably has a substantially flat configuration, such as the configuration of a pad 100, and comprises multiple coils or sets of wires 104. These coils or wires can be the same size as or larger than the coils or wires in the mobile devices, or battery and can have similar or different shapes, including for example a spiral shape. For example, for a mobile device charger or power supply designed to charge or provide power to up to four mobile devices of similar power (up to 10 W each) such as mobile phones, MP3 players, batteries, etc., four or more of the coils or wires will ideally be present in the mobile device or battery charger.

(*Id.*, 10:36-47.)

Figure 10 of the ’371 patent, excerpted below, shows a more detailed view of the charger:

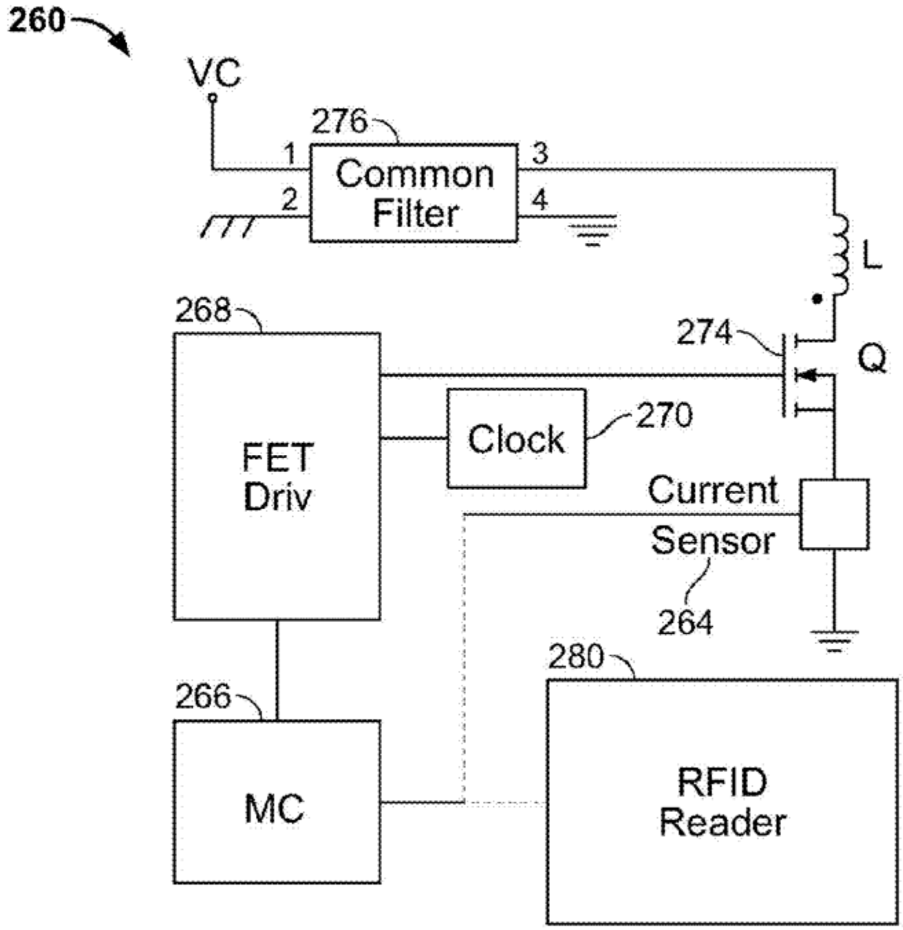

FIG. 10

(*Id.*, Figure 10.)

The ’371 patent describes Figure 10 as follows:

> As shown in FIG. 10, in accordance with one embodiment, the pad circuit 260 incorporates a micro control unit (MCU1) 266 that can enable or disable the FET driver 268. The MCU1 receives input from another sensor mechanism that will provide information that it can then use to decide whether a device is nearby, what voltage the device requires, and/or to authenticate the device to be charged or powered.

(*Id.*, 23:50-56.)

Figure 11 of the ’371 patent, excerpted below, shows a receiver capable of charging by the wireless charge:

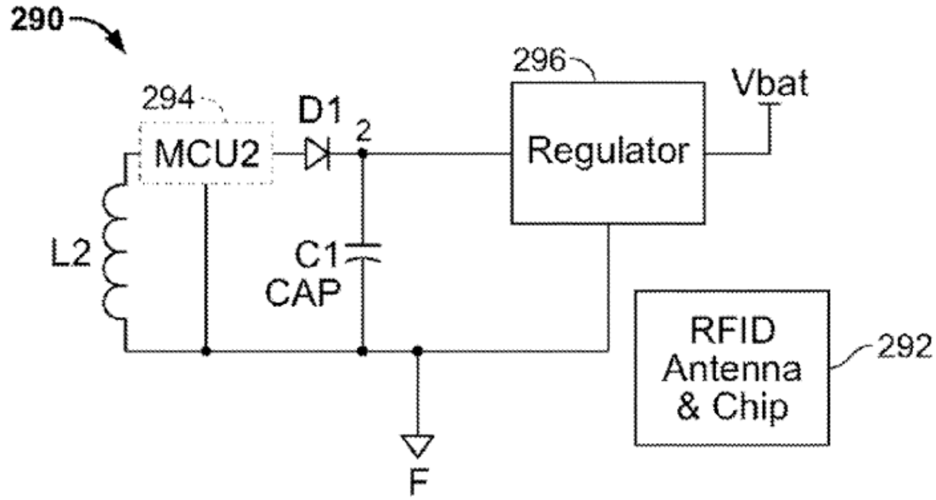

FIG. 11

(*Id.*, Figure 11.)

The ’371 patent describes Figure 11 as follows:

> FIG. 11 shows a figure of a circuit diagram 290 in accordance with an embodiment. In accordance with an embodiment, the MCU1 can periodically start the FET driver. If there is a receiver nearby, it can power the circuit. The regulator 296, or another memory chip in the circuit can be programmed so that on power-up, it draws current in a pre-programmed manner. An example is the integration of an RFID transponder chip in the path, such as ATMEL e5530 or another inexpensive microcontroller (shown here as MCU2 294), that upon power-up modulates the current in the receiver that can then be detected as current modulation in the primary. As with the previous example, other sensors, such as an RFID antenna 292 can also be used to provide positional and other information.

(*Id.*, 24:32-45.)

The inventors of the ’371 patent were involved with problems related to efficiency of a wireless charger capable of wirelessly charging many devices. (*Id.*, 3:23-38.) The ’371 patent and the provisionals that the application of the ’371 claims the benefit of admit that numerous claimed features of the alleged invention were known in the prior art prior to the alleged invention of the ’371 patent. For example, the ’262 provisional acknowledges that a person of ordinary skill in the art would recognize wireless charging from the principles of a transformer:

> Realizing that a power supply contains a transformer for voltage conversion, **one can envision breaking up the transformer into 2**

> **parts**. One part would contain the first winding and the electronics to drive this winding at the appropriate operating frequency. The other part consists of a winding where power is received and then rectified to obtain DC voltage. If the 2 parts are brought into physical proximity to each other, p**ower is transformed from one part to the other inductively** without any connection.

(Ex. PAT-G, at 2 (emphasis added).)

The '262 provisional further acknowledges that wireless charging and wireless power transfer were known prior to the priority date of the application of the '371 patent: "An early patent in '89 for use of an **inductive charger** for powering batteries in a watch is US patent 4,873,677 by K. Sakamoto et al." (*Id.*, 2.) "Patent 5,959,433 [] describes an **inductively rechargeable battery system**. Patent 6,208,115 [] describes a battery with a coil in the package for receiving power from a **primary charger**." (*Id.*, 3.) "[**I**]**nductive charging** would be particularly advantageous to [shavers and toothbrushes] []. B Choi. Et al. (Proc. IEEE ICCE '01 June 2001, PP. 58-59) have shown use of such **a charger for a mobile phone application**." (*Id.*) "Patents 5,600,225, 5,963,012, and 6,183,651 describe **charging systems** where ... **power transfer** ... **between the secondary and primary** is established." (*Id.*, 4.)

The '262 provisional further acknowledges that these prior wireless charging systems included a "charging pad":

> More recently, K. Hatanaka, et al., IEEE Trans. On Magnetics, 38, 3329 (2002) have investigated the possibility of developing **a surface with multiple coils** imbedded in it (a desk in this case) where **any device placed on the surface can be charged**. ... S. Hui et al., Transactions of 35th IEEE Power Electronics Specialists Conference, Aachen, Germany, pp. 638-644, 2004, describe a method for obtaining uniform power on the surface of **a charging pad**. By having **multiple coils** on 3 pcb layers and activating all the coils simultaneously, they have shown that they can obtain uniform magnetic fields on the surface.

(*Id.*, 3-4.)

The '262 provisional further acknowledges that wireless charging systems in the prior art wirelessly communicated, using the same set of coils, "information about the power requirements of the battery and its status during the charging":

> Patents 5,600,225, 5,963,012, and 6,183,651 describe charging systems where in addition to the power transfer, **a communication link between the secondary and primary** is established that

> transfers **information about the power requirements of the battery and its status** during the charging to the primary. This information is used to establish methods and **parameters for charging (voltage, current, duration, etc.)** and to identify **end of charge** point.

(*Id.*, 4.)

The '262 provisional further acknowledges a "typical" sequence for selectively activating primary coils for charger operation:

> A **<u>typical</u>** sequence for operation may be as follows: The mobile device charger may be in a low power status normally thus minimizing power usage. However, **periodically, each of the coils** (or a separate data coil in another PCB layer) **is powered up in rotation with a short signal such as a short RF signal that can activate a signal receiver in the secondary** such as an RF ID tag. The mobile device charger then tries to **identify a return signal from any mobile device** (or any secondary) that may be nearby. Once a mobile device (or a secondary) is detected **the mobile device charger and the mobile device proceed to exchange information**. This information can include **a unique ID code** that can verify the authenticity and manufacturer of the charger and mobile device, the **voltage requirements of the battery** or the mobile device, **and the capacity of the battery**.

(*Id.*, 7.)

The '262 provisional further acknowledges regulating the wireless power transfer by adjusting frequency: "Patent 6,301,128 [] includes a **variable frequency primary driver to optimize power transfer.**" (*Id.*, 3.)

The '674 provisional further acknowledges a "typical" wireless charging system that combines some of the well-known teachings described above:

> Figure 1 shows the main components of a **<u>typical</u> inductive power transfer system**. This system is **used to illustrate <u>the principle of inductive power transfer</u>** and is not meant to be limiting to the present invention.
>
> The system for transferring power inductively, thus comprises 2 parts: One is **a pad** that contains the primary which creates an alternating magnetic field by means of **applying an alternating current to** a winding**, a coil**, or any type of current carrying wire. In addition, the pad can contain various signaling, and switching or communication circuitry and means of **identifying the presence of devices to be charged**. The pad can also contain **multiple coils** or

> sections to charge various devices or to allow charging of devices placed anywhere on the pad. The second part is **a receiver** that comprises a means for receiving the energy from the alternating magnetic field from the pad such as **coils**, windings, or any wire **that can sense a charging magnetic field, rectifying it** to produce a dc voltage, and possibly electronic components to set the voltage and current to the appropriate levels required by the device. In addition, the receiver can also contain circuitry to sense and determine the status of the electronic device to be charged, the battery inside, or a variety of f other parameters and to **communicate this information to the pad**.

(Ex. PAT-I, 7.)

Figure 1 of the '674 provisional depicts the "typical" wireless charging system:

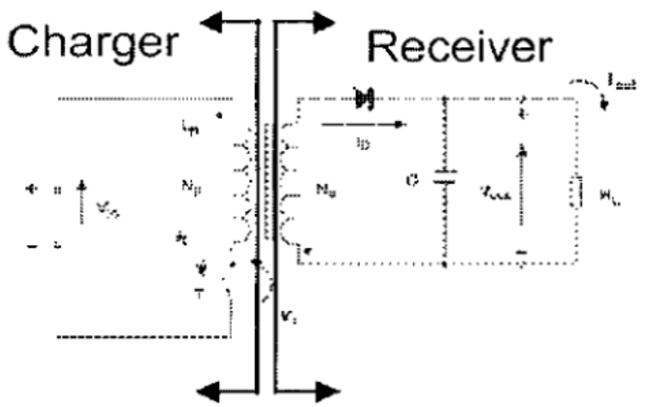

Figure 1 - Simplified picture of an inductive power transfer unit.

(*Id.*, Figure 1.)

The '674 provisional further acknowledges that the "typical" wireless charging system of Figure 1 was known in prior art publications:

> Hui et al. (Trans. On IEEE Transactions on Power Electronics, Vol. 14, P. 506, 1999) describes the performance of coreless PCBs used as transformers. In operation, the coil demonstrates a resonance at a frequency determined by the parameters of the design of the coil (number of windings, coil thickness, width, etc.). Previous work (Hui, et al., Circuits & Systems, Vol. 11, No. 3, P.2, 2000 & Hui et all, Electronics Letters, Vol. 34, p. 1052, 1998) demonstrate the frequency dependency of the coreless PCB coil. **However, the circuits in these articles are driven by square waves with a MOSFET <u>as shown in Figure 1</u>**.

(*Id.*, 9.)

The ’674 provisional further acknowledges that microcontrollers that modulate current were known in the art: “An example would be integration of an RFID transponder chip in the path such as ATMEL e5530 or another inexpensive microcontroller (shown as MCU2) that would upon power-up, modulate the current in the secondary that can be detected as current modulation in the primary (current sensor in Figure 3).” (Ex. PAT-I, 12-13.)

The ’371 patent further acknowledges that “ferrite material (such as those provided by Ferrishield Inc.)” was known in the art and was known to be “used between the receiver and the battery to shield the battery or device from the EM fields.” (Ex. PAT-A, 17:38-41.)

B. Prosecution History of the ’371 Patent

During prosecution of the ’371 patent, the applicant was rejected multiple times, and replaced the filed claims with completely new claims. (*See e.g.*, PAT-B, 387-407, 600-628, 631-636, 697-727.) Mojo wholesale rewrote the pending claims for the ’371 patent during prosecution. (*See id.*, 600-628.) As can be seen in the below example amendments to claim 1, Mojo replaced nearly every claim element, and added a significant number of new claim elements.

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) An apparatus comprising:

a system for providing ~~A charger or power supply~~ for providing ~~substantially continuous charging or for supplying wireless~~ power inductively to [[one,]] a portable device comprising a battery and an inductive receiver unit including a receiver coil and a receiver circuit, the system ~~plurality, or a combination of electrical, electronic or mobile devices and/or batteries, on a surface of the charger or power supply,~~ comprising:

a first primary coil ~~plurality of coils arrayed in one or multiple layers to provide~~ that is substantially planar and substantially parallel to a surface of the system for providing power inductively to the portable device; ~~continuous charging or to supply wireless power over an effective charging area of the surface of the charger or power supply, wherein the effective charging area is larger than a single coil surface area, and the coils are arrayed such that any location on the effective charging area is at a distance equal to or less than a radius or a side-to-center length of at least one coil; and~~

a first drive circuit, including a FET driver, a capacitor, and a FET switch, coupled to a DC voltage input and coupled to the first primary coil, wherein during operation the first drive circuit is configured to apply an alternating electrical current to the first primary coil at an operating frequency and duty cycle to generate an alternating magnetic field in a direction substantially perpendicular to the plane of the first primary coil and the surface of the system to provide power inductively to the portable device, wherein the operating frequency is within a range of frequencies (i) that are near a resonance frequency of a circuit comprising the first primary coil and the capacitor and (ii) such that increasing values of the operating frequency within the range of frequencies would correspond to a lower voltage or current induced in the output of the receiver circuit and (iii) that allow activation and powering of the receiver unit and charging the battery of the portable device.

a first sense circuit to monitor current flow through the first primary coil during operation of the first drive circuit, wherein the first sense circuit includes a low pass filter and an amplifier to assist in detecting and amplifying a signal corresponding to a current modulation in the first primary coil induced by modulation of current in the receiver coil; and

a communication and control circuit, including a microcontroller coupled to the first drive circuit and the first sense circuit, configured to:

detect, through the first sense circuit, a received communication of information in the current modulation in the first primary coil;

operate the first drive circuit to inductively transfer power from the first primary coil to the receiver coil to activate and power the receiver unit to enable the receiver circuit to communicate the information detected in the current modulation in the first primary coil, wherein the communication of information includes information to enable the communication and control circuit to configure the inductive transfer of power to the portable device, wherein the received communication of information includes:

information corresponding to a voltage or current induced by the first primary coil at an output of the receiver circuit;

a unique identification code;

a manufacturer code;

a charge algorithm profile; and

a power requirement;

operate the first drive circuit according to the power requirement and charge algorithm profile to provide the power from the first primary coil to the receiver coil to power the receiver unit and charge the battery of the portable device, wherein to charge the battery of the portable device the communication and control circuit is further configured to:

receive additional information in the current modulation in the first primary coil from the modulation of the current in the receiver coil corresponding to the voltage or current at the output of the receiver circuit while charging the battery of the portable device;

regulate in a closed loop feedback manner the voltage or current at the output of the receiver circuit in accordance with the received additional information corresponding to the voltage or current at the output of the receiver circuit by adjusting at least one of the operating frequency and the duty cycle of the first drive circuit while charging the battery of the portable device;

monitor for continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit; and

if the portable device is no longer present or charging is complete, stop operation of the first drive circuit for the provision of power inductively to the portable device.

~~ferromagnetic and/or electrically conductive layers or structures positioned within the charger or power supply to shield components within the charger or power supply or to shield nearby environment.~~

(Ex. PAT-B, 605-607.)

The examiner objected to these claim amendments as non-responsive to the prior Office Action, and refused to enter the amendment. (*Id.*, 634-635.) The examiner noted many new features:

> ***Election/Restrictions***
>
> The amendment filed on 02/10/2022 canceling all claims drawn to the elected invention and presenting only claims drawn to a non-elected invention is non-responsive (MPEP § 821.03) and has not been entered. The remaining claims are not readable on the elected invention because the claims now include, inter alia, the system includes a first drive circuit, including a FET driver, a capacitor, and a FET switch, coupled to a DC voltage input and coupled to the first primary coil, wherein during operation the first drive circuit is configured to apply an alternating electrical current to the first primary coil at an operating frequency and duty cycle to generate an alternating magnetic field in a direction substantially perpendicular to the plane of the first primary coil and the surface of the system to provide power inductively to the portable device; a communication and control circuit, including a microcontroller coupled to the first drive circuit and the first sense circuit, configured to: detect, through the first sense circuit, a received communication of information in the current modulation in the first primary coil; operate the first drive circuit to inductively transfer power from the first primary coil to the receiver coil to activate and power the receiver unit to enable the receiver circuit to communicate the information detected in the current modulation in the first primary coil. The aforementioned aspects cause the new claims to have a materially different design and mode of operation compared to the claims originally filed. For further clarification, see the claims originally filed on 10/21/2021.

(*Id.*)

In the Notice of Allowance, the examiner stated that the prior art failed to teach the combination of features that included "a communication and control circuit ... configured to: detect ... information in the current modulation," "operate the first drive circuit ... to activate and power the receiver unit," and "regulate in a closed feedback manner" the voltage at the rectifier output.

(*Id.*, 734-737.) However, the features identified by the examiner were well-known in the art at the time of the invention.

C. Level of Ordinary Skill

A person of ordinary skill in the art ("POSITA") around the time of the purported invention (whether in or around 2007 or in or around 2012) would have had at least a master's degree in electrical engineering, or a similar discipline, and at least two years of experience in the relevant field, e.g., wireless power transfer. More education can supplement practical experience and vice versa. (Ex. PA-DEC, ¶20-21.)

V. Claim Construction

During patent examination, the pending claims must be 'given their broadest reasonable interpretation consistent with the specification.'" MPEP § 2111; *see also* MPEP § 2258. Limitations in the specification are not read into the claims. MPEP § 2258. The standard of claim interpretation in reexamination is different than that used by the courts in patent litigation.[1] Therefore, any claim interpretations submitted or implied herein for the purpose of this reexamination do not necessarily correspond to the appropriate construction under the legal standards mandated in litigation. MPEP § 2686.04.11; *see also In re Zletz*, 893 F.2d 319, 322, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). For purposes of this request, Requester believes that no special constructions of the challenged claims, are needed over the asserted prior art. (Ex. PA-DEC, ¶¶86-87.)

VI. Statement of Substantial New Questions of Patentability

The following combinations of prior art disclose or suggest all of the features of claims 1, 2, 28, and 30 of the '371 Patent.

SNQ1: *Partovi* and *Calhoon* raise a substantial new question of patentability ("SNQ1") with respect to claims 1 and 2 of the '371 patent.

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1 Requester reserves all rights and defenses available including, without limitation, defenses as to invalidity, unenforceability, and non-infringement regarding the '371 patent. Further, because the claim interpretation standard used by courts in patent litigation is different from the appropriate standard for this reexamination, any claim constructions submitted or implied herein for the purpose of this reexamination are not binding upon Requester in any litigation related to the '371 patent. Specifically, any interpretation or construction of the claims presented herein or in Dr. Baker's declaration for reexamination, either implicitly or explicitly, should not be viewed as constituting, in whole or in part, the Requester's own interpretation or construction of such claims.

<u>SNQ2</u>: *Baarman* in view of *Hui*, *Odendaal*, *Shima*, and *Hui-027* raises a substantial new question of patentability with respect to claim 28 of the ’371 Patent.

<u>SNQ3</u>: *Partovi* and *Nedungadi* raise a substantial new question of patentability with respect to claim 30 of the ’371 Patent.

The above combinations were not applied in a rejection by the Patent Office during prosecution. Nor were they presented in IPR2023-01094, IPR2023-01095, IPR2023-01096, and IPR2023-01097, which involved different prior art. For example, neither *Partovi* nor *Baarman* were presented as a primary reference like in the instant request. Moreover, as explained in detail below, *Partovi* discloses the “planar coil” limitations that the Board found non-obvious in the prior combination set forth in IPR2023-01094. IPR2023-01094, Paper 11 at 26-29 (Feb. 9, 2024). Thus, “the request is not based on the same or substantially the same prior art or arguments presented in the prior petition.” Control No. 90/015,130, Order Granting Request for Ex Parte Reexamination (November 17, 2022) at 10-11.

For the reasons discussed below and in the accompanying declaration of Dr. Baker (Ex. PA-DEC), *Partovi*, *Baarman*, *Hui*, *Odendaal*, *Shima*, *Hui-027*, *Nedungadi*, and *Calhoon* raise a substantial new question of patentability with respect to claims 1, 2, 28, and 30 of the ’371 Patent.

A. SNQ1: *Partovi* in View of *Calhoon* Discloses or Suggests Claims 1 and 2

1. Effective Filing Date of Claims 1, 2, and 30 of the ’371 Patent

Mojo asserts that claims 1 and 28 of the ’371 patent are entitled to at least an effective filing date of July 30, 2007 and claims 2 and 30 are entitled to at least an effective filing date of December 12, 2007. (Ex. LIT-1, 7.) Mojo’s assertions are incorrect. As explained below, the ’371 patent claims are not even entitled to the May 7, 2008 filing date of U.S. Patent Application No. 12/116,876 (filed on May 7, 2008, now Pat. No. 8,169,185) (the “’876 Application”), which is an application in the priority chain of the ’371 patent. This is relevant because the failure to claim priority back to the ’876 application results in the publication of the ’876 application becoming prior art to the ’371 patent claims. (*See infra* Section VI.A.1.a.1-3.)

The ’371 patent is a continuation of U.S. patent application No. 16/055,109 (filed on Aug. 5 , 2018, now U.S. Patent No. 11,201,500) (the “’109 Application”), which is a continuation of U.S. patent application No. 15/463,252 (filed on March 20, 2017, now U.S. Patent No. 10,044,229) (the “’252 Application”), which is a continuation of U.S. patent application No. 15/056,689 (filed on February 29, 2016, now U.S. Patent No. 9,601,943) (the “’689 Application”), which is a continuation of U.S. patent application No. 14/608,052 (filed on January 28, 2015, now U.S. Patent No. 9,276,437) (the "'052 Application"), which is a continuation of U.S. patent application No. 13/708,548 (filed on December 7, 2012, now U.S. Patent No. 8,947,047) (the "'548 Application"), which is a continuation of U.S. patent application No. 13/442,698 (filed on April 9, 2012, now U.S. Patent No. 8,629,654) (the "'698 Application"), which is a continuation of U.S. patent application No. 12/116,876 (filed on May 7, 2008, now U.S. Patent No. 8,169,185) (the "'876 Application"), U.S. Patent Application No. 11/669,113 (filed on Jan. 30, 2007, now Pat. No. 7,952,322) (the "'113 Application"), Provisional Application No. 60/763,816 (filed on Jan. 31, 2006) (the "'816 Application"), Provisional Application No. 60/810,262 (filed on Jun. 1, 2006) (the "'262 Application"), Provisional Application No. 60/810,298 (filed on Jun. 1, 2006) (the "'298 Application"), Provisional Application No. 60/916,748) filed on May 8, 2007) (the "'748 provisional"), Provisional Application No. 60/952,835 (filed on July 30, 2007) (the "'835 provisional"), Provisional Application No. 61/043,027 (filed on April 7, 2008) (the "'027 provisional"), Provisional Application No. 61/015,606 (filed on December 20, 2007) (the "'606 provisional"), Provisional Application No. 61/012,924 (filed on Dec. 12, 2007) (the "'924 provisional"), Provisional Application No. 61/012,922 (filed on December 12, 2007) (the "'922 provisional"), and Provisional Application No. 60/868,674 (filed on Dec. 5, 2006) (the "'674 Application"). (Ex. PAT-A, Cover.)

Claims 1, 2, 28, and 30 of the'371 Patent are, however, not entitled to the May 7, 2008 filing date of the '876 Application because the '876 Application (and the prior applications it incorporates by reference) does not provide written description support for each limitation in claims 1, 2, 28, and 30.

"It is elementary patent law that a patent application is entitled to the benefit of the filing date of an earlier filed application only if the disclosure of the earlier application provides support for the claims of the later application, as required by 35 U.S.C. § 112." *PowerOasis, Inc. v. T-Mobile USA, Inc*., 522 F.3d 1299, 1306 (Fed. Cir. 2008) (citations omitted*); see also Research Corps. Techs. v. Microsoft Corp*., 627 F.3d 859, 871-72 (Fed. Cir. 2010) (holding that a later-filed application, with claims that were not limited to a "blue noise mask," was not entitled to the priority filing date of the parent application, which was "limited to a blue noise mask"). This requirement prevents an inventor from "overreaching" in a later-filed application as to the scope of what was invented at the time of the earlier-filed application by requiring that the invention be described in "such detail that . . . future claims can be determined to be encompassed within the . . . original creation." *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1561 (Fed. Cir. 1991). To satisfy the written description requirement, the disclosure of the earlier-filed application must "reasonably convey[]" to one of ordinary skill in the art that, as of the filing date sought, "the inventor had possession" of the subject matter now claimed. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351–52 (Fed. Cir. 2010); *Vas-Cath*, 935 F.2d at 1563-64. The test for written description, therefore, requires "an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art" to determine whether the specification "show[s] that the inventor [had] actually invented," or possessed, each feature now included as a claim limitation. *Ariad Pharm.*, 598 F.3d at 1351; *see also New Railhead Mfg.*, 298 F.3d at 1295. While "the disclosure as originally filed does not have to provide in *haec verba* support for the claimed subject matter at issue…one skilled in the art, reading the original disclosure***, must immediately discern the limitation at issue in the claims***." *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000) (emphasis added).

Here, none of the aforementioned applications disclose limitation [1.l] which requires the "**communication and control circuit**" to "**monitor for continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit and if the portable device is no longer present or charging is complete, stop operation of the first drive circuit for the provision of power inductively to the portable device**." (Ex. PAT-A, 72:49-54[2] (emphasis added); Ex. PA-DEC, ¶¶119-150.)

Furthermore, none of the aforementioned applications disclose limitation [30.l] which requires the "**receiver circuit**" to "**periodically communicate to the base unit information corresponding to a presently induced output voltage or current of the receiver rectifier circuit to enable the base unit to regulate in a closed loop manner the output voltage or current of the receiver rectifier circuit during the charging of the battery of the portable device**." (Ex. PAT-A., 80:47-54 (emphasis added); Ex. PA-DEC, ¶¶151-167.)

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[2] [1.l] refers to Requester's numbering of the claim limitations.

a. Claims 1 and 2 of the '371 Patent Require the Communication and Control Circuit to Monitor for the Continued Presence of the Portable Device, And If the Portable device Is No Longer Present . . . Stop Operation of the First Drive Circuit

Claim 1 of the '371 Patent requires the communication and control circuit to "**detect, through the first sense circuit, a received communication of information in the current modulation in the first primary coil**." (Ex. PAT-A, 72:6-8.) Claim 1 further requires the communication and control circuit to "**monitor for continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit**." (*Id.*, 72:49-54.) "[**M**]**onitor for** **<u>continued presence</u>** of the portable device," however, is different from detecting the presence of the portable device <u>initially</u>. This is evident from the claim itself because the claim initially recites that the communication and control circuit "detect [] a received communication of information in the current modulation in the first primary coil" and then later recites monitoring for a "**continued**" presence of the portable device "**based on the communication from the receiver circuit**." (*Compare id.*, 72:6-8, *with*, 72:49-54.)

In other words, "**monitor for <u>continued</u> presence**" requires **<u>the communication and control circuit</u>** to check for the presence of the portable device <u>after</u> the initial detection of the receiver to unit, and further requires this monitoring to be "**based on the communication from the receiver circuit**." It is not sufficient for the communication and control circuit to detect the **initial** presence of the portable device or detect a continued presence unilaterally. (Ex. PA-DEC, ¶122.)

Claim 1 <u>additionally</u> requires that "**if the portable device is no longer present . . . stop operation of the first drive circuit for the provision of power inductively to the portable device**." (*Id.*, 72:55-58.) That is, claim 1 further requires stopping operation of the first drive circuit upon detecting that the portable device is no longer present.

As claim 2 depends from claim 1, it also require these limitations.

(1) The ’876 Application Does Not Disclose the “Communication and Control Circuit” “Monitor[ing] for [the] Continued Presence of the Portable Device” And “If the Portable device Is No Longer Present . . . Stop Operation of the First Drive Circuit”

The ’876 Application does not disclose the communication and control circuit “**monitor[ing] for [the] continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit**.” (Ex. PAT-A, 72:49-54.) Therefore, the ’371 Patent cannot claim the benefit of the ’876 Application as there is no written description support in the ’876 Application for claim limitation [1.l] of the ’371 Patent.

For example, the ’876 Application’s disclosures related to the presence of the portable device concern either the base unit unilaterally detecting the presence of the portable device or the portable device communicating with the base unit to indicate its <u>initial</u> (as opposed to “continued”) presence near the base unit.

Ex. PAT-J, ¶[0090], (“In some embodiments the pad can also contain various signaling, and switching or communication circuitry, or means of identifying the presence of devices or batteries to be charged or powered.”);

Ex. PAT-J, ¶[0100], (“In one embodiment a chip connected to an antenna (for example, the receiver coil or separate data antenna) or another means of transfer of information can be used to provide information about, for example, the presence of the mobile device or battery, its authenticity (for example its manufacturer code) and the devices' charging/power requirements (such as its required voltage, battery capacity, and charge algorithm profile).”);

Ex. PAT-J, ¶[0103], (“In other embodiments the mobile device or battery can be sensed by means of a number of proximity sensors such as capacitance, weight, magnetic, optical, or other sensors that determine the presence of a mobile device or battery near a coil in the mobile device or battery charger or power supply.”);

Ex. PAT-J, ¶[0153], (“A Hall sensor or a Reed switch can sense a magnetic field. If a small magnet is placed inside the receiver unit of the system, a Hall sensor or Reed switch can be used to sense presence of the magnet and can be used as a signal to start the FET.”);

Ex. PAT-J, ¶[0153], ("Other capacitance, optical, magnetic, or weight, etc. sensors can be incorporated to sense the presence of a secondary or receiver and to begin the energy transfer process.");

Ex. PAT-J, ¶[0164], ("In another embodiment, the pad will include a method for detecting the presence of the mobile device, battery/receiver and taking appropriate action to turn on the coil and/or to drive the coil with the appropriate pattern to generate the required voltage in the receiver. This can be achieved through incorporation of RFID, proximity sensor, current sensor, etc.");

Ex. PAT-J, ¶[0229], ("The current through the FET is monitored through a current sensing method. The inductance of L1 is highly dependent on the presence of objects nearby that affect its magnetic field. These objects include metallic objects or another nearby coil such as L2. Switching L1 at high frequency (100 kHz to several MHz) through a Field Effect Transistor (FET) such as Q1, the value of current being drawn is highly dependent on the L1 Value. This property can be used to sense the presence of nearby devices or batteries capable of drawing power and also to enable bi-directional communication if desired.");

Ex. PAT-J, ¶[0240], ("Figure 36 shows an embodiment in which a coil mosaic is used to cover the surface area of the pad. The circuitry can include means of sensing the presence of a receiver coil to start the appropriate driver to provide power.");

Ex. PAT-J, ¶[0241], ("A sensing mechanism senses the presence of a receiver coil on top or close to a charger or power supply coil and starts the drive circuit to power the appropriate coil. The sensing mechanism can be a current sense mechanism.");

Ex. PAT-J, ¶[0365], ("Alternatively, the case and/or coils can turn on when a device is placed in it by sensing the presence of a device through a magnetic, mechanical, or other form of switch.")

The aforementioned disclosures cannot provide written description support for limitation [1.l] of the '371 Patent because they concern <u>initial</u> detection (as opposed to "continued" presence) of the receiver or portable device.

The '876 Application also discloses "[t]he pad also uses monitoring to find out when and if the first mobile device is removed from the pad, or when the end of charge is reached." (Ex. PAT-J, ¶[0164].) But even this statement does not support claim [1.l]. (Ex. PA-Dec, ¶138.) The statement does not explain ***how*** the pad performs monitoring or ***what happens if the pad finds outs that the mobile device has been removed***. For example, the sentence does not disclose that the communication and control circuit in the charger monitors the continued presence of the portable device as required by the claim ***based on communication from receiver circuit*** – "**monitor[ing] for [the] continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit**." (Ex. PAT-A, 72:49-54 (emphasis added).) Nor is there any disclosure of the communication and control circuit stopping "operation of the first drive circuit for the provision of power inductively to the portable device" if the mobile device is no longer present. The single disclosure of the base unit using monitoring to find out when and if the first mobile device is removed from the pad (Ex. PAT-J, ¶[0164]) cannot provide written description support for limitation [1.l] because it fails to disclose the specifics of the claim, (e.g., **stopping of operation of the drive circuit if the mobile device is found to be absent**).

As discussed below, neither the '113 Application or the Provisional Applications, which are incorporated by reference in the '876 Application, remedy this deficiency in the '876 Application.

(2) The '113 Application Also Does Not Disclose the "Communication and Control Circuit" "Monitor[ing] for [the] Continued Presence of the Portable Device" And "If the Portable device Is No Longer Present . . . Stop Operation of the First Drive Circuit"

The '113 Application also does not disclose the communication and control circuit "**monitor[ing] for [the] continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit**." (Ex. PAT-A, 72:49-54.) Therefore, the '371 Patent cannot claim the benefit of the '113 Application as there is no written description support in the '113 Application for claim limitation [1.l] of the '371 Patent.

For example, the '113 Application's disclosures related to the presence of the portable device concern either the base unit unilaterally detecting the presence of the portable device or the portable device communicating with the base unit to indicate its initial (as opposed to "continued") presence near the base unit.

Ex. PAT-E, ¶[0036] ("In some embodiments the pad can also contain various signaling, and switching or communication circuitry, or means of identifying the presence of devices to be charged.");

Ex. PAT-E, ¶[0046] ("In one embodiment a chip connected to an antenna (for example, the secondary coil or separate data antenna) or another means of transfer of information can be used to provide information about, for example, the presence of the mobile device, its authenticity (for example its manufacturer code) and the devices [] charging requirements (such as its required voltage, battery capacity, and charge algorithm profile).");

Ex. PAT-E, ¶[0049] ("In other embodiments the mobile device can be sensed by means of a number of proximity sensors such as capacitance, weight, magnetic, optical, or other sensors that determine the presence of a mobile device near a coil in the mobile device charger. Once a mobile device is sensed near a primary coil or section of the mobile device charger, the mobile device charger can then activate that primary coil or section to provide power to the secondary coil in the mobile device's battery, shell, receiver module, or the device itself.");

Ex. PAT-E, ¶¶[0098]-[0101] ("In addition to high efficiency, one method that is required for minimizing EMI and maintaining high overall efficiency is the ability to recognize the presence of a secondary nearby, and then turning on the pad only when appropriate. Two methods for this are shown in Figures 10 and 11 . . . The MCU1 receives input from another sensor mechanism that will provide information that it can then use to decide whether a device is nearby, what voltage the device requires, and/ or to authenticate the device to be charged . . . One of the sensor mechanisms for this information are through the use of an RFID reader 280 that can detect an RFID tag of circuit and antenna in the secondary (i.e. device to be charged) . . . Once a device containing the tag is nearby the pad, the RFID reader can be activated, read the information on the tag memory and compare with a table to determine authenticity / voltage required or other info . . . Other capacitance, optical, magnetic, or weight, etc. sensors can be incorporated to sense the presence of a secondary or receiver and to begin the energy transfer process.");

Ex. PAT-E, ¶[0110] ("In another embodiment, the pad will include a method for detecting the presence of the mobile device/ receiver and taking appropriate action to turn on the coil and/ or to drive the coil with the appropriate pattern to generate the required voltage in the receiver. This can be achieved through incorporation of RFID, proximity sensor, current sensor, etc. . . . The coils in the pad are normally off and periodically powered up sequentially to sense whether the secondary is nearby by measuring the current through the primary coil. Alternatively, proximity sensors under each section can sense the presence of a magnet or change in capacitance or other parameter to know where a device is placed. RFID techniques with localized antennas under each section or such can also be used.")

Ex. PAT-E, ¶[0110], ("The pad [may] also use the monitoring to find out when and if the first mobile device is removed from the pad or end of charge is reached.")

For the reasons articulated in Section VI.A.1.a.1, the aforementioned disclosures cannot provide written description support for limitation [1.l] of the '371 Patent because, while they generally concern identifying the presence of the receiver or portable device, limitation [1.l] requires the communication and control circuit in the charger to monitor **the continued presence of the portable device and that too "based on the communication from the receiver circuit**." Therefore, the '113 Application's disclosures related to the presence of the receiver are unrelated to the receiver communicating to the first sense circuit of its continued presence near the base unit. Furthermore, there is no disclosure of **stopping of operation of the drive circuit if the mobile device is found to be absent**. For example, the '113 Application's disclosure that "[t]he pad [may] also use the monitoring to find out when and if the first mobile device is removed from the pad or end of charge is reached," does not disclose **stopping of operation of the drive circuit if the mobile device is found to be absent.** As discussed below, the Provisional Applications, which are incorporated by reference in the '113 Application, cannot remedy this deficiency in the '113 Application.

(3) The Provisional Applications Also Do Not Disclose the "Communication and Control Circuit" "Monitor[ing] for [the] Continued Presence of the Portable Device" And "If the Portable device Is No Longer Present . . . Stop Operation of the First Drive Circuit"

The '262, '298, '922, '924, '606, '748, '835, and '674 Provisional Application's disclosures related to the presence of the portable device concern either the base unit unilaterally detecting the presence of the portable device or the receiver communicating to the base unit to indicate its **initial** presence near the base unit. *See e.g.*, (Ex. PAT-G, 6-7 ("[t]echniques employed in RF ID whereby a small chip connected to an antenna (secondary coil or separate data antenna) or other means of transfer of information can be used to provide information about, for example, the presence of the mobile device, its authenticity (manufacturer code) and the charging requirements (required voltage, battery capacity, charge algorithm profile, etc.”); (Ex. PAT-G, 8, (“The mobile device charger can sense the mobile device by means of change in the conditions of a resonant circuit in the mobile device charger when the mobile device is brought nearby. In another geometry the mobile device can be sensed by means of a number of proximity sensors such as capacitance, weight, magnetic, optical, or other sensors that determine the presence of a mobile device near a coil in the mobile device charger.”)); (Ex. PAT-H, 5, (“In addition, the pad could contain various signaling, and switching or communication circuitry and means of identifying the presence of devices to be charged.”)); (Ex. PAT-H, 5, (“The receiver may contain circuitry to identify its presence and characteristics to the pad.”)); (Ex. PAT-I, 5, (“the pad can contain various signaling, and switching or communication circuitry and means of identifying the presence of devices to be charged.”)); (Ex. PAT-I, 11-13, (“In addition to high efficiency, one method that is required for minimizing EMI and maintaining high overall efficiency is implementation of a method to recognize the presence of a secondary nearby and turning on the pad only when appropriate. Two methods for this are shown in Figure 3 . . . The MCU1 receives input from another sensor mechanism that will provide information that it can use to decide whether a device is nearby, what voltage the device requires, and / or to authenticate the device to be charged . . An RFID reader that would detect an RFID tag of circuit and antenna in the secondary (i.e. device to be charged). The information on the tag can be detected to identify the voltage in the secondary required and to authenticate the circuit to be genuine or under license . . . Once a device containing the tag is nearby the pad, the RFID reader would be activated, read the information on the tag memory and compare with a table to determine authenticity/ voltage required or other info . . . In another method, the MCU1 periodically starts the FET driver. The current through the FET driver is monitored through a current sensing method . . . Other capacitance, optical, magnetic, or weight, etc. sensors can be incorporated to sense the presence of a secondary or receiver and to begin the energy transfer process . . . The MCU1 can periodically start the FET driver. If there is a receiver nearby, it would power the circuit in Figure 4 . . . An example would be integration of an RFID transponder chip in the path such as ATMEL e5530 or another inexpensive microcontroller (shown as MCU2) that would upon power-up, modulate the current in the secondary that can be detected as current modulation in the primary (current sensor in Figure 3).”)); (Ex. PAT-I, 35-36, (“In another embodiment, the pad will include a method for detecting the presence of the mobile device / receiver and taking appropriate action to turn on the coil and / or to drive the coil with the appropriate pattern to generate the required voltage in the receiver. This can be achieved through incorporation of RFID, proximity sensor, current sensor, etc. . . . The coils in the pad are normally off and periodically powered up sequentially to sense whether the secondary is nearby by measuring the current through the primary coil as shown in Figure 3. Alternatively, proximity sensors under each section can sense the presence of a magnet or change in capacitance or other parameter to know where a device is placed. RFID techniques with localized antennas under each section or such can also be used . . . The board will also use the monitoring to find out when and if the first mobile device is removed from the pad or end of charge is reached.")); (Ex. PAT-M, 22 ("The charging continues in open or closed loop depending on the system architecture until end of charge is achieved. This is either indicated to the charger by the MCU2 or sensed in the charger sense circuit by a change in the amount of current being drawn.")); (Ex. PAT-L, 14 ("An MCU in the charger, MCUI also monitors the process and can switch on an optional lower voltage input to the primary coil (through Q2 and Voltage Regulator) if necessary. It can also sense the end of charge or perform verification or other tasks.")); (Ex. PAT-L, 11 ("At the end of the charge cycle, the Charge Management IC can signal end of charge cycle to MCU2 which sends a pre-determined code to MCU1 to shut down the charger, move to hibernation mode or take some other pre-determined step.")); (Ex. PAT-K, 22 ("The charging continues in open or closed loop depending on the system architecture until end of charge is achieved. This is either indicated to the charger by the MCU2 or sensed in the charger sense circuit by a change in the amount of current being drawn.")); (Ex. PAT-K, 10("By monitoring the current and comparing it to a baseline measurement taken at power up, and periodically with no devices nearby, MCU1 can determine whether a device is near the coil and drawing power.")); (Ex. PAT-P, 6 ("In accordance with some embodiments, the case can also include means of recognition of the device automatically by, for example, RFID, Felica, detection of coil from change in the case's coil's induction, or by verification using proprietary techniques, etc.")); (Ex. PAT-O, 38 ("The pad also use the monitoring to find out when and if the first mobile device is removed from the pad or end of charge is reached.")); (Ex. PAT-O, 39 ("In an alternate geometry, the total system current or individual coil current is monitored, and, if a sudden unexpected drawn current is noticed, measures to investigate further or to shut down the appropriate coil indefinitely or for a period of time or to indicate an alarm would be taken.")) The '816 and '027 Provisional Application do not disclose detecting the presence of a portable device.

For the reasons articulated in Section VI.A.1.a.1, the aforementioned disclosures cannot provide written description support for limitation [1.l] of the ’371 Patent because, while they generally concern identifying the presence of the receiver or portable device, or that charging has ended, limitation [1.l] requires **<u>monitoring for the continued presence of the portable device</u>** near the base unit by the communication and control circuit, which is not disclosed. Moreover, nothing in the above-identified provisionals discloses **stopping of operation of the drive circuit if the mobile device is found to be absent**, as claimed.

b. Claim 30 of the ’371 Patent Requires the Receiver Circuit to “Periodically” Communicate Induced Output Voltage or Current of the Receiver Rectifier Circuit to the Base Unit

Claim 30 requires a “receiver circuit” in the portable device. (Ex. PAT-A, 80:21-24.) Claim 30 recites that the receiver circuit “**<u>periodically</u> communicate to the base unit information corresponding to a presently induced output voltage or current of the receiver rectifier circuit to enable the base unit to regulate in a closed loop manner the output voltage or current of the receiver rectifier circuit during the charging of the battery of the portable device**.” (*Id.*, 80:47-54 (emphasis added).) This limitation thus requires the receiver communication and control circuit to “**<u>periodically</u>**” communicate, via modulating the receiver coil, specific information, where the specific information is “**a presently induced output voltage or current of the receiver rectifier circuit.**” (*Id.*)

Periodically carries a particular meaning to a person of ordinary skill in the art, which is that something occurs at <u>regular intervals</u>. (Ex. PA-DEC, ¶152.) This meaning is confirmed by the specification of the ’371 Patent. (*See e.g.*, *id*, 24:5-6 (“In another embodiment the MCU1 relies on a <u>clock 270</u> to periodically start the FET driver.”) (emphasis added), 26:14-17, (“The coils in the pad are normally off and periodically powered up sequentially to sense whether the receiver is nearby by measuring the current through the primary coil.”).)

(1) The ’876 Application Does Not Disclose the Charger “Periodically” Receiving the Claimed Information from the Receiver

The ’876 application does not disclose a receiver circuit “**<u>periodically</u> communicat[ing] to the base unit <u>information corresponding to a presently induced output voltage or current of the receiver rectifier circuit</u> to enable the base unit to regulate in a closed loop manner the output voltage or current of the receiver rectifier circuit during the charging of the battery**

of the portable device." (Ex. PAT-A, 80:47-54 (emphasis added).) Therefore, the '371 Patent cannot claim priority to the '876 Application as there is no written description support in the '876 Application for claim limitation [30.l] of the '371 Patent.

For example, the '876 Application's disclosures related to **periodic** activity concern detecting whether a portable device is nearby the charging pad. (Ex. PAT-J, ¶[00154], ("In accordance with an embodiment, the MCU1 can periodically start the FET driver. If there is a receiver nearby, it can power the circuit.")); *id.*, [00164] ("The coils in the pad are normally off and periodically powered up sequentially to sense whether the receiver is nearby by measuring the current through the primary coil."; *id.*, ¶[00229] ("By monitoring the current and comparing it to a baseline measurement taken at power up, and periodically with no devices nearby, MCU1 can determine whether a device or battery is near the coil and drawing power."); *id.*, ¶[00241] ("Each coil drive can periodically start driving the coil at an appropriate frequency and a current sense circuit can monitor the drawn current to sense when a receiver is nearby thereby affecting the inductance of the charger or power supply coil."); *id.*, ¶[00248] ("The switch periodically switches each of the coils in rotation to the coil drive and sense circuitry. Once an appropriate receiver coil in the vicinity of a charger or power supply coil is detected, that coil may be interrogated further to verify a chargeable device is nearby and then charging or powering of the device begins."; *id.*, ¶[00279] ("MCU1 gives a command to the FET driver periodically to begin switching the coil. The duty cycle may be set very low to generate a low voltage in any potential nearby receiver coil."); *id.*, at 105, claim 7 ("The system of claim 1, wherein one or more coils includes a switch component, and wherein the microcontroller unit periodically starts the switch components, monitors the current therein, and uses the current to sense the proximity of a receiver and device or battery to that coil, and activate charging in that coil, or a selection of coils in that region.").

The aforementioned disclosures cannot provide written description support for limitation [30.l] of the '371 Patent because, while they concern periodic activity, they relate to initial detection of a receiver or portable device. Claim limitation [30.l] requires "receiver circuit" to "***periodically*** communicate to the base unit information corresponding to a presently induced output voltage or current of the receiver rectifier circuit" which occurs "during the charging of the battery" which necessarily occurs ***after a receiver is initially detected***. Therefore, the '876 Application's disclosures related to "**periodically**" are unrelated to periodically communicating the **voltage or current information of the rectifier** via a primary coil.

The ’876 Application’s disclosures relating to the receiver conveying information about the current and voltage to the charger similarly fail to disclose claim [21.l] at least because the information transfer is **not periodic**. *See e.g.*, (Ex. PAT-J, ¶[00118], (“Furthermore, the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device.”)); *id.*, ¶[00180] (“The communicated feedback from the receiver to primary can be used by the primary to, for example, adjust the frequency, or to otherwise alter the output voltage to that receiver, using the frequency/output characteristics described above.”); *id.*, ¶[00181] (“In a closed loop design, such as in a switching mode power supply, the device/receiver communicates information back to the primary, and then the primary determines how much power should be sent to the receiver.”); *id.*, ¶[00204] (“In one implementation, the receiver sends a digital code corresponding to the output voltage and MCU1 compares this to the earlier output voltage value and makes a determination about which direction and by how many steps to move the frequency. The frequency is then changed accordingly. In another implementation, MCU2 sends one of 2 values corresponding to a voltage high or low condition. If the voltage is within range, MCU2 does not communicate with the primary. When a voltage high signal is received, MCU1, takes a predetermined step towards higher frequency to lower the output power and the process is repeated until output voltage is within required range.”); *id.*, ¶[00279] (“The charging continues in open or closed loop depending on the system architecture until end of charge is achieved. This is either indicated to the charger or power supply by the MCU2 or sensed in the charger or power supply sense circuit by a change in the amount of current being drawn.”); *id.*, ¶[00204] (“In one implementation, the receiver sends a digital code corresponding to the output voltage and MCU1 compares this to the earlier output voltage value and makes a determination about which direction and by how many steps to move the frequency. The frequency is then changed accordingly. In another implementation, MCU2 sends one of 2 values corresponding to a voltage high or low condition. If the voltage is within range, MCU2 does not communicate with the primary.”); *id.*, claim 11 (“wherein the charger or the power supply, and the mobile device, communicate with each other to transfer data”).

The aforementioned disclosures cannot provide written description support for limitation [30.l] of the ’371 Patent because, while they may disclose a charger receiving information corresponding to the induced voltage or current of the receiver of the portable device, there is no disclosure of the receiver circuit communicating the voltage or current information of the rectifier ***periodically*** (e.g., at a predetermined or regular interval). Furthermore, Applicant's use of the term "periodically" in other portions of the '876 Application confirms that Applicant's non-use of the term when describing communication between the receiver and the charger was deliberate. (*See e.g.*, Ex. PAT-J, ¶[00164], ("The coils in the pad are normally off and periodically powered up sequentially to sense whether the receiver is nearby by measuring the current through the primary coil.").) Moreover, there is no disclosure of communicating voltage or current information, at a regular interval, via a primary coil.

The '876 Application's disclosures concerning communicating via a primary coil similarly fail to disclose periodically communicating information corresponding to the output voltage or circuit of the receiver rectifier. (*See e.g.*, Ex. PAT-J, ¶¶[00130], ("In accordance with another embodiment, the receiver in the battery or mobile device also includes a means for providing information regarding battery manufacturer, required voltage, capacity; current, charge status, serial number, temperature, etc. to the charger. In a simplified embodiment, only the manufacturer, required voltage, and/or serial number is transmitted . . . The communication link can also use the same coil or wires as antenna for data transfer or use a separate antenna."), [00200] ("The communication between the charger and the receiver 630 is achieved through the same coil as the power transfer.").) These disclosures solely relate to conveying information via a primary coil and fail to disclose conveying such information ***periodically***.

For the forgoing reasons the '371 Patent cannot claim the benefit of the '876 Application as there is no written description support in the '876 Application for claim limitation [30.l] of the '371 Patent. As discussed below, neither the '113 Application nor the Provisional Applications, which are incorporated by reference in the '876 Application, remedy this deficiency in the '876 Application.

(2) The '113 Application Also Does Not Disclose the Charger "Periodically" Receiving the Claimed Information from the Receiver

There is no disclosure of "one or more communication and control circuits" that "**periodically** receive information corresponding to one or more output voltages or currents of the one or more receiver rectifier circuits via the one or more primary coils and the one or more sense circuits" (Ex. PAT-A, 80:47-54) in the '113 Application.

For example, the ’113 Application’s disclosures related to “periodically” concern powering the primary coil to initially detect whether a portable device is nearby. (*See e.g.*, Ex. PAT-E, ¶[00102], (“In accordance with an embodiment, the MCU1 can periodically start the FET driver. If there is a receiver nearby, it can power the circuit.”)); (Ex. PAT-E, ¶[00110], (“The coils in the pad are normally off and periodically powered up sequentially to sense whether the secondary is nearby by measuring the current through the primary coil.”)); (Ex. PAT-E, claim 15, (“The system of claim 14 wherein the alternating switching is periodically started and stopped to automatically detect a presence of a mobile device placed close to or aligned with the primary coil of the base unit.”).) For the reasons articulated in Section VI.A.1.b.1, the aforementioned disclosures cannot provide written description support for limitation [30.l] of the ’371 Patent because, while they concern periodic activity, they relate to initial detection of a receiver or portable device.

The ’113 Application’s disclosures relating to conveying information about the current and voltage of the receiver similarly fail to disclose periodically communicating information corresponding to the output voltage or current of the receiver rectifier. (*See e.g.*, Ex. PAT-E, ¶[0037], (“In some embodiments, the receiver can also contain circuitry to sense and determine the status of the electronic device to be charged, the battery inside, or a variety of other parameters and to communicate this information to the pad.”); Ex. PAT-E, ¶[0046], (“In accordance with an embodiment, the mobile device charger or pad, and the various mobile devices, can communicate with each other to transfer data. In one embodiment, the coils in the mobile device charger that are used for powering the mobile device, or another set of coils in the same PCB layer or in a separate layer, can be used for data transfer between the mobile device charger and the mobile device to be charged or the battery directly.”); Ex. PAT-E, ¶[0063], (“Furthermore, the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device.”).) For the reasons articulated in Section VI.A.1.b.1 above, the aforementioned disclosures cannot provide written description support for limitation [30.l] of the ’371 Patent because, while there is disclosure of the charger receiving information corresponding to the induced voltage or current of the portable device, there is no disclosure of the receiver communicating the voltage or current information of the rectifier periodically, or <u>at a regular interval</u>.

(3) The Provisional Applications Also Do Not Disclose the Charger "Periodically" Receiving the Claimed Information from the Receiver

There is no disclosure of "one or more communication and control circuits" to "periodically receive information corresponding to one or more output voltages or currents of the one or more receiver rectifier circuits via the one or more primary coils and the one or more sense circuits" in the '262, '298, '922, '606, '027, '748, '835, and '674 Provisional Applications.

For example, the disclosures in the '262, '298, '922, '606, '027, '748, '835, and '674 Applications, related to "periodically," concern powering on the primary coil to initially detect whether a portable device is nearby. (*See e.g.*, Ex. PAT-G, 7 ("However, periodically, each of the coils (or a separate data coil in another PCB layer) is powered up in rotation with a short signal such as a short RF signal that can activate a signal receiver in the secondary such as an RF ID tag."); Ex. PAT-I, 15 ("The coils in the pad are normally off and periodically powered up sequentially to sense whether the secondary is nearby by measuring the current through the primary coil as shown in Figure 3."); Ex. PAT-H, 18 ("Since batteries in these devices such as pace makers, cochlear implants, or other monitoring devices may need periodic charging, inductive power transfer can provide an ideal non-contact method for charging and testing the performance of the devices (i.e. check up) or downloading data that the devices have logged."); Ex. PAT-K, 10 ("By monitoring the current and comparing it to a baseline measurement taken at power up, and periodically with no devices nearby, MCUI can determine whether a device is near the coil and drawing power."); Ex. PAT-M, 10 ("By monitoring the current and comparing it to a baseline measurement taken at power up, and periodically with no devices nearby, MCUI can determine whether a device is near the coil and drawing power."); Ex. PAT-N, 14 ("As an example, a circular path around the main charger/ power supply PCB coil can be powered by a DC current periodically or when a user desires to charge or power a mobile device."); Ex. PAT-P, 9 ("In accordance with an embodiment, this part can be a stand-alone charger or desktop charger that comprises a Field Effect Transistor (FET) that periodically turns the current through a coil on and off."); Ex. PAT-O, 14 ("The mobile device charger can be in a low power status normally, thus minimizing power usage. However, periodically, each of the coils (or a separate data coil in another PCB layer) is powered up in rotation with a short signal such as a short radiofrequency (RF) signal that can activate a signal receiver in the secondary such as an RF ID tag.").)

The ’816 and ’924 Applications do not disclose periodic activity. For the reasons articulated in Section VI.A.1.b.1, the aforementioned disclosures cannot provide written description support for limitation [30.l] of the ’371 Patent because, while they may concern periodic activity, at most they relate to initial detection of a receiver or portable device.

The disclosures in the ’262, ’298, ’922, ’924, ’606, ’027, ’748, ’835, and ’674 Applications relating to conveying information about the current and voltage of the receiver similarly fails to disclose ***periodically*** receiving information ***corresponding to the output voltage or circuit of the receiver rectifier***. (Ex. PAT-G, 6-7 (“Preferably, the mobile device charger and the mobile devices can communicate with each other to transfer data. In a preferred embodiment, the coils in the mobile device charger used for powering the mobile device or another set of coils in the same PCB layer or in a separate layer can be used for data transfer between the mobile device charger and the mobile device to .be charged or the battery directly . . . other means of transfer of information can be used to provide information about, for example, the presence of the mobile device, its authenticity (manufacturer code) and the charging requirements (required voltage, battery capacity, charge algorithm profile, etc..”); Ex. PAT-K, 9 (“The MCUI and current sense chips in the charger and MCU2 can provide bi-directional communication between the charger and the receiver for optimum charging.”); Ex. PAT-L, 7 (“As shown in Figure 4, the output voltage to the load is monitored and with changes in the load condition, a chip or a Micro Controller Unit (MCU) varies the frequency or the duty cycle of the FET driver to achieve optimum operation and controlled output voltage with a changing load.”); Ex. PAT-M, 11 (“After the initial handshake and verification, the MCUI and current sense chips in the charger and MCU2 can provide bi-directional communication between the charger and the receiver for optimum charging during the charge cycle. The system can also regulate the power and voltage received at the Charge Control Circuit to insure overvoltage conditions do not occur.”); Ex. PAT-O, 55 (“In a closed loop design, such as in a switching mode power supply, the device/secondary communicates information back to the primary, and then the primary determines how much power should be sent to the secondary.”); Ex. PAT-G, 9 (“Alternatively, the duty cycle of the charger switching circuit or its frequency can be changed to modify the voltage in the mobile device. -- Alternatively, a combination of the above two approaches where regulation is partially provided by the charger and partially by the circuitry in the secondary can be used.”); Ex. PAT-H, 7 (“In one embodiment, the receiver or the mobile device may, through an electrical (such as RF), mechanical, or optical method, inform the charger about the voltage/ current characteristics of the device. The primary of the charger in the circuit diagram above then can be driven to create the appropriate voltage/ current in the receiver. For example, the duty cycle of the switch in that circuit can be programmed with a microprocessor to be changed to provide the appropriate levels in the receiver."); Ex. PAT-H, 8, ("Furthermore, the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device."); Ex. PAT-H, 11-12 ("The information exchange between the charger and the receiver may be through an RF link or an optical transmitter/ detector or some combination. RF ID techniques, Near-Field Communication (NFC), bluetooth or some method for information transfer can be used. Similarly, the receiver could send signals that can be used by the charger to determine the location of the receiver to determine which coil or section of the charger to activate. The communication link can also use the same coil or wires as antenna for data transfer or use a separate antenna or use the capabilities of the mobile device (i.e. built in blue tooth or NFC)."); Ex. PAT-G, 6 ("Preferably, the mobile device charger and the mobile devices can communicate with each other to transfer data. In a preferred embodiment, the coils in the mobile device charger used for powering the mobile device or another set of coils in the same PCB layer or in a separate layer can be used for data transfer between the mobile device charger and the mobile device to .be charged or the battery directly."); Ex. PAT-G, 9 ("For example, to set the mobile device voltage to the right value required, the value of the voltage to the mobile device charger can be set. Alternatively, the duty cycle of the charger switching circuit or its frequency can be changed to modify the voltage in the mobile device."); Ex. PAT-I, 5 ("In addition, the receiver can also contain circuitry to sense and determine the status of the electronic device to be charged, the battery inside, or a variety of other parameters and to communicate this information to the pad."); Ex. PAT-I, 12-13 ("An example would be integration of an RFID transponder chip in the path such as ATMEL e5530 or another inexpensive microcontroller (shown as MCU2) that would upon power-up, modulate the current in the secondary that can be detected as current modulation in the primary (current sensor in Figure 3).").) The '027 and '748 Provisional Applications do not disclose conveying information about the current and voltage of the receiver to the charger.

For the reasons articulated in Section VI.A.1.b.1, the aforementioned disclosures cannot provide written description support for limitation [30.1] of the '371 Patent because, while there is disclosure of the charger receiving information corresponding to the induced voltage or current of the portable device, there is no disclosure of the receiver communicating the voltage or current information of the rectifier ***periodically***.

2. Overview of *Partovi*

Partovi was filed on January 30, 2007 and published on August 9, 2007 (Ex. PA-1, cover), and qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(b) for claims 1, 2, and 30 because those claims are not entitled to the May 7, 2008 filing date of the ’876 Application, as discussed above. Because those claims are not entitled to the filing date of the ’876 application, they cannot have a filing date earlier than April 9, 2012, which is the filing date of U.S. Application No. 13/442,698—the next application in the priority chain of the ’371 patent. As such, *Partovi* is prior art at least under pre-AIA 35 U.S.C. § 102(b) because its publication date is more than one year before April 9, 2012.[3]

Partovi discloses a pad 100 that inductively transfers power to a mobile device. (Ex. PA-1, ¶¶[0104]-[0118], [0128], FIGS, 1, 2.)

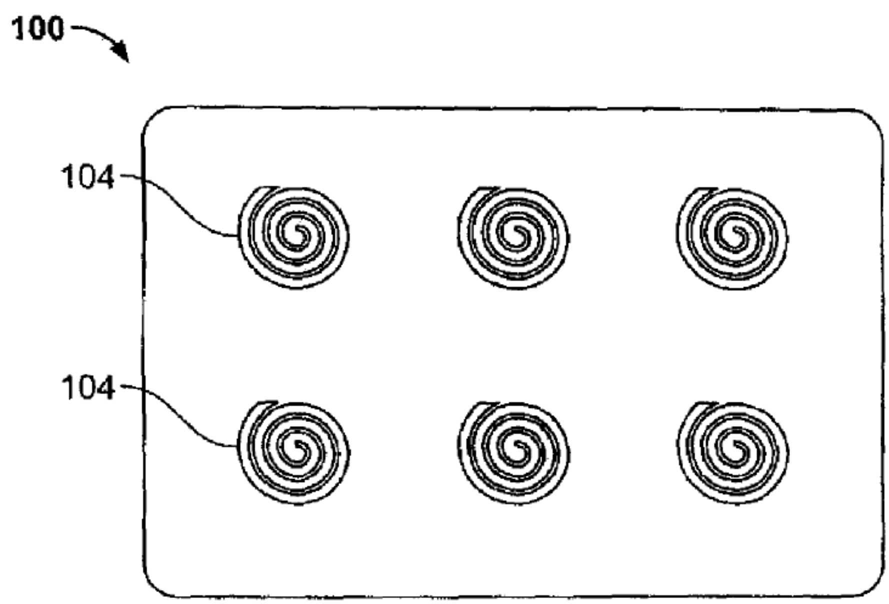
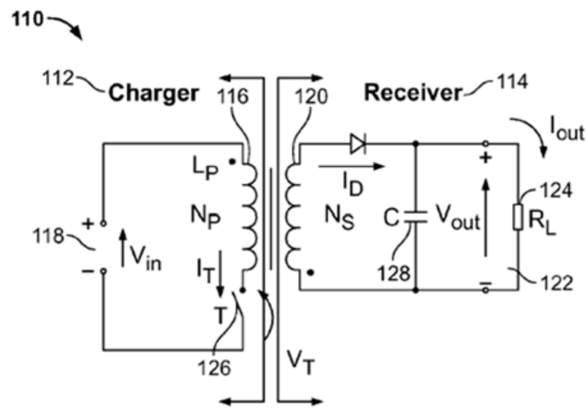


FIG. 1

[3] To be sure, the claims are not even entitled to the April 9, 2012 filing date of U.S. Application No. 13/442,698 because even the ’698 application lacks written description support for these claims. But that does not matter for this request. Even assuming *arguendo* that the claims could get the April 9, 2012 filing date, *Partovi* would still be prior art.

(*Id.*, FIG. 1.)



(*Id.*, FIG. 2.)

3. Overview of *Calhoon*

Calhoon was filed on December 12, 2003 and published on June 16, 2005, and thus qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(e). *Calhoon* is titled "Inductive Battery Charger." (Ex. PA-3, Cover.) *Calhoon* discloses "[a]n inductive charging system [that] transfers energy by inductively coupling a source coil on a power source to a receiver coil for a battery charger." (*Id.*, Abstract.) *Calhoon* discloses "a charging system 300" that includes "an inductive charging source 302 that wirelessly provides electrical power and/or data communications to an inductive battery charger assembly 304." (*Id.*, ¶[0029].) "The battery charger assembly 304 may be configured to receive electrical energy from inductive power source 302" through "a power pickup coil 324 that is operatively connected to a power supply 320." (*Id.*, ¶[0031].) "In one operation, the power supply 320 of battery charger assembly 304 provides electrical energy to a battery charger 322 that supplies energy to legacy battery pack 350." (*Id.*)

Figure 3, which illustrates the components of the inductive charger system, is reproduced below:

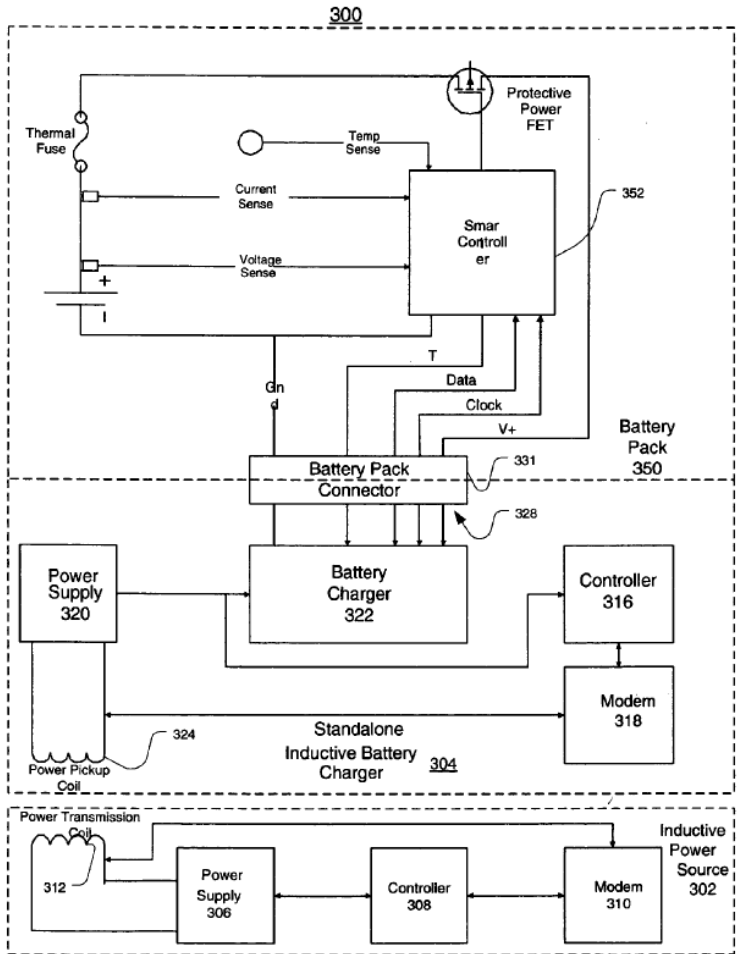


FIGURE 3

(*Id.*, Figure 3.)

Calhoon's charging system can avoid overcharging.

> After the negotiation process, in process block 514, when the battery charger assembly 304 begins to receive its requested voltage and power, the controller 316 may turn on the battery charger 322 in order to charge the battery pack 350. In process block 520, <u>if the battery is charged to the desired level, the battery charger 322 can be switched off-line</u>**.** When power from the source is lost, the battery pack returns to its listening mode. In process block 522, if the battery 314 is not at the desired level of charge, then the charging process is continued.

(*Id.*, ¶[0048].)

Furthermore, charger assembly 304 can transmit information to the inductive power source 302, including "<u>charging parameters</u> ... such as the required charging voltage and maximum power requirement. [and] . . . other information relevant to the battery charger assembly 304, such as a battery charger identification (ID) number, battery type chemistry of the battery pack, or serial number of the battery charger or the serial number of the battery pack [which] can be used for security, data integrity, or other purposes." (*Id.* ¶[0047] (emphasis added).)

Calhoon explains that the inductive power source 302 can authenticate the battery charger assembly 304.

> In process block 606, upon receiving the battery pack's request for power, the inductive charging source 302 may request for a security certificate or digital signature from the battery charger assembly 304 to authenticate it. The security certification or digital signature may be stored in the computer readable storage of the controller 308. In process block 608, if battery charger assembly 304 has a digital certificate or digital signature stored, the battery charger assembly 304 transmits it to the source 302. In process block 610, if the battery charger assembly 304 is authenticated in view of the certification or signature, the source 302 supplies the requested voltage and power the battery charger as shown in process block 612.

(*Id.*, ¶[0052] (emphasis added).)

Calhoon is also in the same field as the '371 patent because *Calhoon* relates to an inductive charging system. (*See, e.g.*, *id.*, ¶[0022].) *Calhoon* is also pertinent to the same types of problems the inventor was trying to solve. For example, *Calhoon* relates to a universal charger that allows "device independence" (*id.*, ¶¶[0006]-[0008]) and can handle "multiple battery packs [with] different power requirements." (*Id.*, ¶¶[0045], [0033] ("This feature provides a more flexible and adaptable solution for persons or organizations with different electronic devices.").) These are problems with which the inventor was concerned. (*See, e.g.*, Ex. PAT-A, at 1:51-3:41.)

4. Claim 1

a. An apparatus comprising: a system for providing power inductively to a portable device comprising a battery and an inductive receiver unit including a receiver coil and a receiver circuit, the system comprising:

To the extent the preamble is limiting, *Partovi* discloses this limitation. (Ex. PA-DEC, ¶¶168-172.) *Partovi* discloses a system for "powering or charging electrical, electronic, battery-operated, mobile, rechargeable batteries." (Ex. PA-1, ¶[0091].) The system includes "two parts." (*Id.*) "The first part is a pad or similar base unit that contains a primary, which creates an alternating magnetic field by means of applying an alternating current to a winding, coil, or any type of current carrying wire." (*Id.*) "[T]he pad can also contain multiple coils or sections to charge or power various devices or to allow charging or powering of devices or batteries placed anywhere on the pad." (*Id.*) *Partovi* discloses many examples of such a charging pad. For example, "FIG. 3 shows a charging pad using multiple coils" whereas "FIG. 4 shows a charging pad using multiple overlapping coil layers." (*Id.*, ¶¶[0121]-[0122].) Further examples of the coil arrangement in the charging pad are set forth with reference to Figures 36-38. (*Id.*, ¶¶[0051]-[0053].)

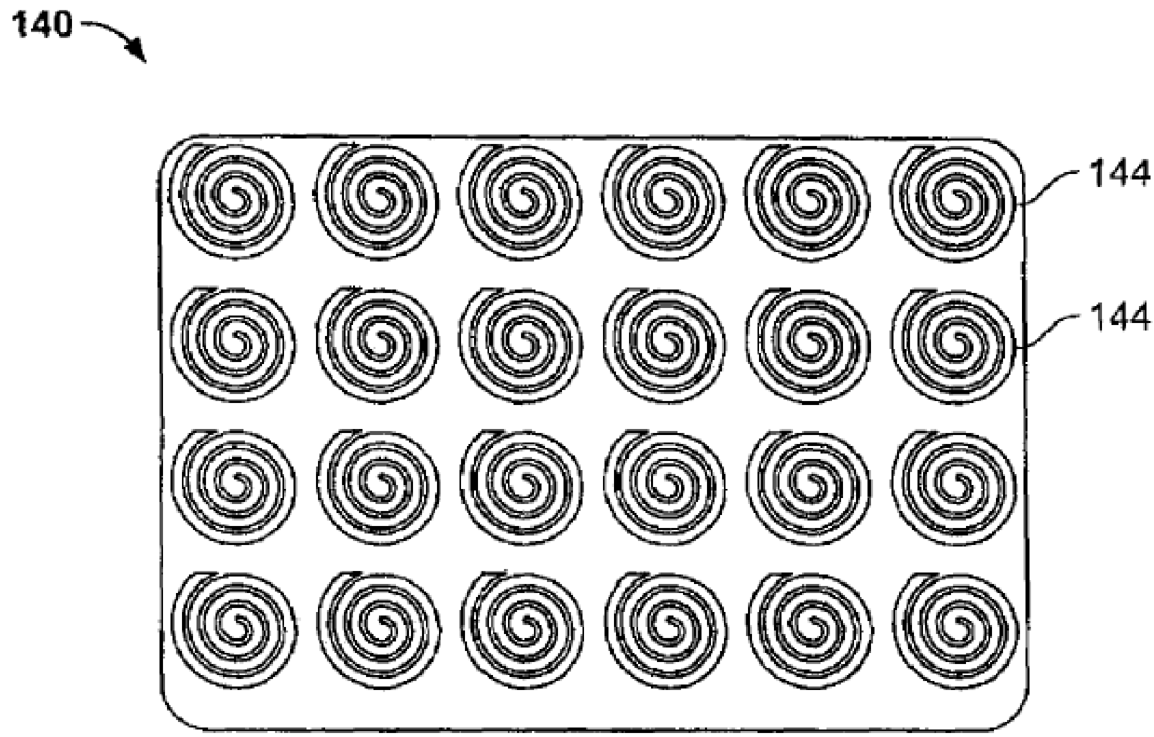


FIG. 3

(*Id.*, FIG. 3.)

"The second part of the system is a receiver that comprises a means for receiving the energy from the alternating magnetic field from the pad and transferring it to a mobile battery, or other device. The receiver can comprise coils, windings, or any wire that can sense a changing magnetic field, and rectify it to produce a direct current (DC) voltage, which is then used to charge or power the device or battery." (*Id.*, ¶[0091].) The "receiver can also contain circuitry to sense and determine the status of the electronic device or battery to be charged, the battery inside a device, or a variety of other parameters and to communicate this information to the pad." (*Id.*, ¶[0092].)

Partovi thus discloses "[**a**]**n apparatus comprising: a system for providing power inductively to a portable device comprising a battery and an inductive receiver unit including a receiver coil and a receiver circuit, the system comprising**."

A specific example of the circuitry associated with the charging pad and the receiver is set forth with reference to "FIG. 34," which "shows the main components of a more advanced wireless power/charging system." (*Id*., ¶[0285].) As shown in Figure 34, the charger provides power to a receiver, which is integrated into a mobile device or electronic device battery. (*Id*., ¶[0285].) The receiver shown in Figure 34 is a "**receiver unit**" that includes a "receiver circuit," which has a receiver coil L2, a battery, and a circuit that includes, *inter alia*, microcontroller MCU2 ("**a battery and an inductive receiver unit including a receiver coil and a receiver circuit**.") For example, the receiver circuit could be a combination the circuit components in the receiver unit of Figure 34 excluding the battery, MCU2, Q2, and the receiver coil. Moreover, the primary coil L1 (*see* Figure 34) can be one or more coils of the charging pad. (*Id*., ¶¶[0287] ("[a]t the beginning of charging (when a device is placed on a pad first) . . ."), [0323]-[0339], [0364] ("If a receiver coil is placed on the pad, it will cause the appropriate charger or power supply coil center port to contact the pad on the flexible film and therefore the appropriate coil is contacted to points A and C in FIG. 34.").) *Partovi* thus discloses a system, comprising a charger and receiver for charging portable devices.

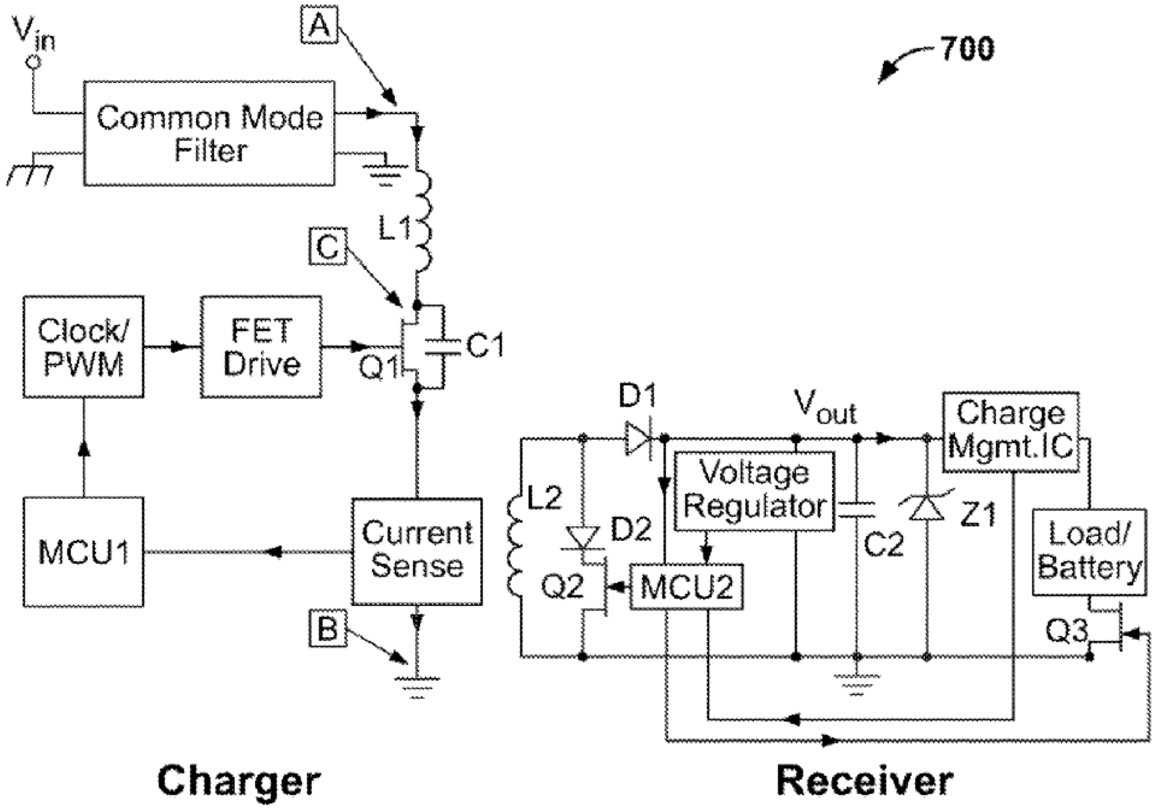


FIG. 34

(*Id.*, FIG. 34.)

The above-described mobile device and charger are a "**system for providing power inductively to a portable device comprising, the system comprising**" wherein the portable device comprises "**a battery and an inductive receiver unit including a receiver coil and a receiver circuit**."

b. a first primary coil that is substantially planar and substantially parallel to a surface of the system for providing power inductively to the portable device;

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶173-176.) *Partovi* discloses that the charging pad "contains a primary, which creates an alternating magnetic field by means of applying an alternating current to a winding, coil, or any type of current carrying wire." (Ex. PA-1, ¶[0091].) "[T]he pad can also contain multiple coils or sections to charge or power various devices or to allow charging or powering of devices or batteries placed anywhere on the pad." (*Id.*)

In the Figure 34 implementation, there is a primary coil L1 ("**a first primary coil**") that is used to send power to the receiver, which is incorporated into a mobile device having a battery ("**for providing power inductively to the portable device**"). (*Id.*, ¶¶[0285]-[0286], FIG. 34.)

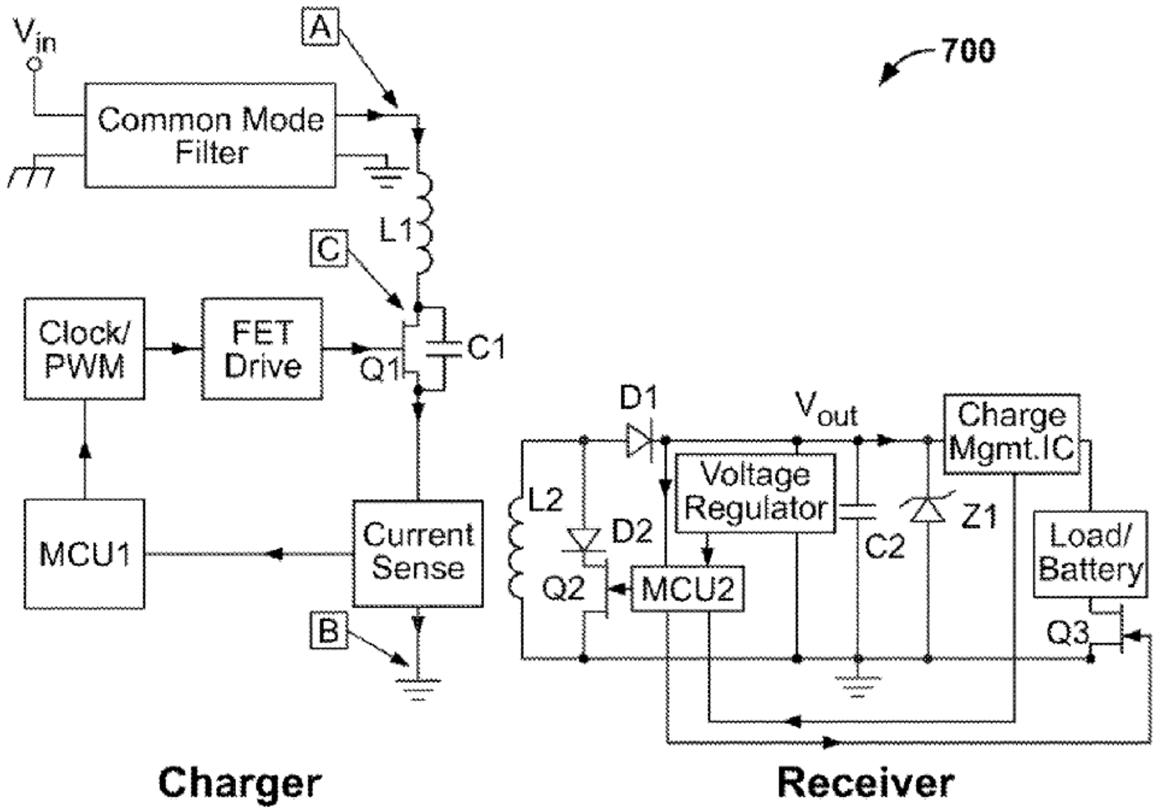


FIG. 34

Partovi further discloses that the primary coils in the charging pad are "**substantially planar and substantially parallel to a surface of the system**," as claimed. For example, "the mobile device or battery charger or power supply preferably has a substantially flat configuration, such as the configuration of a pad 100, and comprises multiple coils or sets of wires 104." (Ex. PA-1, ¶[0104] (emphasis added).) Furthermore, "the coils can be formed in any number of different shapes, including, for example, flat or planar hexagonal shapes, or spirals." (*Id.*, ¶[0225]; *see also id.*, claim 13 ("the primary coil having a generally planar shape").) And the coils are depicted as being parallel to the surface of the pad. (*Id.*, FIGS. 1, 3, 4.)

In particular, Figure 16 of *Partovi* shows cell phones 340 ("**portable devices**") placed on a surface of the charging pad 330 and receiving power. (*Id.*, ¶¶[0031], [0200]) As shown below in Figure 16 of *Partovi*, the primary coils 342 are parallel to the surface of the charging pad upon which the cellphones sit ("**substantially parallel to a surface of the system**"**)**. (*Id.*)

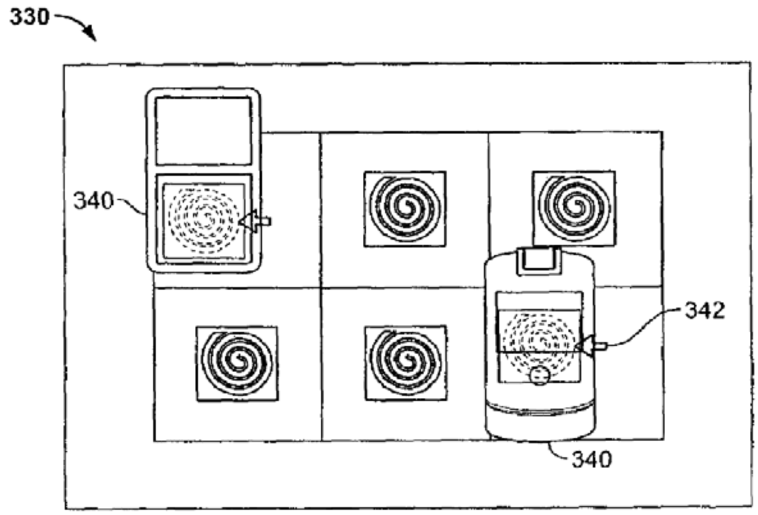


FIG. 16

(*Id.*, Figure 16.)

c. Limitation 1(d)

(1) **1(d)(1) a first drive circuit, including a FET driver, a capacitor, and a FET switch, coupled to a DC voltage input and coupled to the first primary coil**,

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶177-179.) Figure 34 of *Partovi* discloses a charger having a drive circuit ("**a first drive circuit**") comprising, *inter alia*, FET drive ("**FET driver**"), capacitor C1 ("**capacitor**"), and Q1 ("**FET switch**,"). (Ex. PA-1, ¶[0290], (stating Q1 is a field effect transistor that may switch primary coil L1).); *see also id.*, ¶[0284] ("the coil inductor in the charger pad is switched by Switch T which is typically a FET transistor. A capacitor in parallel with the FET may be used to improve performance.").)

Partovi discloses the FET driver, FET switch (Q1), and capacitor (C1) are coupled to the primary coil L1 and DC voltage input V_{in} ("**coupled to a DC voltage input and coupled to the first primary coil**"), as shown below in Figure 34. (Ex. PA-1, Figure 34.); *see also e.g.*, (Ex. PA-1, [0259], "In the implementation shown, the primary (Control Circuit, Clock, FET Driver, FET, primary coil, etc.) and the receiver (secondary coil, rectifier, capacitor, other circuitry, etc.) are able to communicate . . .").);

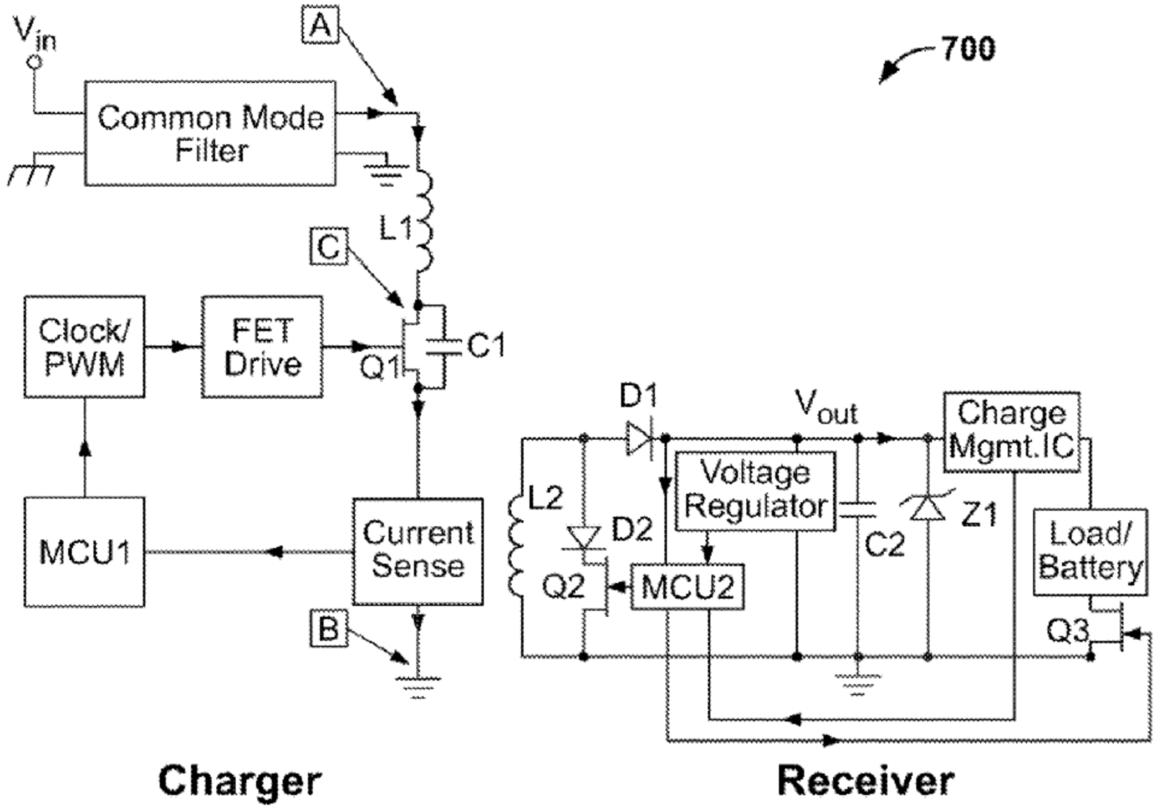


FIG. 34

(Ex. PA-1, Figure 34.)

The combination of the Clock, FET drive, FET switch Q1, and capacitor C1 constitutes a "**drive circuit**."

(2) 1(d)(2) wherein during operation the first drive circuit is configured to apply an alternating electrical current to the first primary coil at an operating frequency and duty cycle to generate an alternating magnetic field in a direction substantially perpendicular to the plane of the first primary coil and the surface of the system to provide power inductively to the portable device,

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶180-182.) For example, the microcontroller MCU1 enables the FET driver to drive the primary coil on the pad "to energize the receiver." (Ex. PA-1, ¶[0298].) The FET driver drives the coil by switching the primary coil through the FET Q1. (*Id.*, ¶[0290].) When the coil is switched, an AC voltage is generated across the primary coil, which results in an AC magnetic field. (*Id.*, ¶[0117].[4]) In other words, the drive circuit is configured to apply an AC electrical current to the primary coil at an operating frequency to generate a magnetic field, as claimed. (*See id.*, ¶[0091] ("a pad or similar base unit that contains a primary, which creates an alternating magnetic field by means of applying an alternating current to a winding, coil, or any type of current carrying wire"), claim 13 ("when a current is passed through the primary coil a magnetic field is generated in a direction substantially perpendicular to the plane of the primary coil").) *Partovi* thus discloses that "**during operation the first drive circuit is configured to apply an alternating electrical current to the first primary coil . . . to generate an alternating magnetic field**."

The FET driver switches the primary coil at "**an operating frequency and duty cycle**." In one implementation, the operating frequency of the FET drive is "1-2 MHz." (*Id.*, ¶¶[0259], [0263]-[0265].[5]) The "duty cycle" is set very low at least initially. (Id., ¶[0327].) Indeed, *Partovi* discloses that "a chip or a Micro Controller Unit (MCU) varies the frequency or the duty cycle of the FET driver to achieve optimum operation and controlled output voltage with a changing load." (*See id.*, ¶[259].) This disclosure is applicable to the implementation shown in Figure 34 because, for example, it uses a microcontroller MCU1 to achieve "optimum charging or supply of power" to the receiver. (*See id.*, ¶[285].)

The magnetic field is generated in "**a direction substantially perpendicular to the plane of the first primary coil and the surface of the system to provide power inductively to the portable device**." *Partovi* discloses that the, "the coils can be formed in any number of different shapes, including, for example, flat or planar hexagonal shapes, or spirals." (*Id.*, ¶[0225].) For example, a POSITA would have understood that when an AC current is passed through a spiral coil (such as the one in *Partovi*), a magnetic field will be generated that is perpendicular to the surface of the coil. (Ex. PA-DEC, ¶182.) Indeed, claim 13 of *Partovi* confirms this when it states that "when a current is passed through the primary coil a magnetic field is generated in a direction

[4] Paragraph 117 merely describes the basic principles of inductive charging applicable to the various inductive charging systems disclosed in *Partovi*.

[5] Figures 34 and 28 of *Partovi* have identical components. Therefore, the implementation described in Figure 28 is applicable to Figure 34 as the structures shown in the figures are identical. Indeed, Figure 34 builds upon the description of Figure 28 and the earlier implementations given that Figure 34 is "a more **advanced** wireless power/charging system." (Ex. PA-1, ¶[0285] (emphasis added).)

substantially perpendicular to the plane of the primary coil."[6] As discussed above in Section VI.A.4.b, and as shown in Figure 16, *Partovi* discloses the surface of the charger system and the primary coils may be substantially parallel to one another, therefore, if the magnetic field is substantially perpendicular to the plane of the primary coil, as disclosed by claim 13, then *Partovi* inherently discloses the magnetic field being substantially perpendicular to the plane of the surface of the system. (Ex. PA-DEC, ¶182.)

(3) 1(d)(3) wherein the operating frequency is within a range of frequencies (i) that are near a resonance frequency of a circuit comprising the first primary coil and the capacitor, (ii) such that increasing values of the operating frequency within the range of frequencies would correspond to a lower voltage or current induced in an output of the receiver circuit and (iii) that allow activation and powering of the receiver unit and charging the battery of the portable device;

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶183-187.) As discussed above, the FET driver switches the primary coil at "**an operating frequency and duty cycle**." In one implementation, the operating frequency of the FET drive is "1-2 MHz." (*Id*., ¶¶[0259], [0263]-[0265].) Based on Patent Owner's representations in litigation, *Partovi* discloses "**wherein the operating frequency is within a range of frequencies (i) that are near a resonance frequency of a circuit comprising the first primary coil and the capacitor**. [7]"

Partovi discloses to save energy it is desirable to regulate the power that is emitted by the charger. (Ex. PA-1, [0129].) To regulate the power emitted by the charger, *Partovi* discloses the receiver may inform the charger about the voltage/current characteristics of the mobile device or battery and then a microprocessor, in the charger, may control the duty cycle of the charger switching circuit to provide the correct power levels to the receiver. (*Id.*) *Partovi* further discloses that the microprocessor could be programmed to change the frequency of the charger switching

[6] Patent Owner cannot dispute that *Partovi* discloses this limitation because Patent Owner claims that the '876 Application (i.e., *Partovi*) provides support for the claims of the '500 Patent.

[7] Mojo has argued that paragraph [0131] of the '109 Application provides written description support for this limitation. (Ex. LIT-2, Ricketts Appendix G at 3-5). Paragraph [0131] in the '109 Application is identical to paragraph [130] of *Partovi*, therefore, if there is written description support, which Samsung takes no position on here, then *Partovi* must disclose this limitation.

circuit to move the circuit into, and out of, resonance to create the appropriate voltage in the receiver ("**wherein the operating frequency is within a range of frequencies (i) that are near a resonance frequency of a circuit comprising the first primary coil and the capacitor**."). (*Id*., ¶[0130].) *Partovi* also discloses that "[t]he coil in the wireless charger system is driven by switching the FET at the resonance frequency of the circuit when the receiver is present." (*Id*., ¶[0173].) Patent Owner has again taken the position that this disclosure in *Partovi* supports the claim limitation. (Ex. LIT-2, Ricketts Appendix G at 8.)[8]

The embodiment described in paragraphs [0129]-[0130] and [0173] may be applied to the implementation shown in Figure 34 because Figure 34 expressly contemplates the receiver providing voltage and current information to the charger's microcontroller MCU1, wherein microcontroller MCU1 regulates the power output of the charger to ensure overvoltage conditions do not occur. (Ex. PA-1, ¶¶[0296]-[0298].)

Partovi further discloses "**that increasing values of the operating frequency within the range of frequencies would correspond to a lower voltage or current induced in an output of the receiver circuit**," as claimed. *Partovi* discloses a "<u>[h]igher drive frequency corresponds to lower output power</u> by shortening the time for integration of power in the resonant ZVS cycle and lower frequency corresponds to higher output power." (*Id.*, ¶[0263] (emphasis added).) A POSITA would have understood that a lower output power corresponds to a lower voltage or current induced in the receiver circuit. (Ex. PA-DEC, ¶186.)

Partovi discloses the operating frequency is within a range of frequencies "**that allow activation and powering of the receiver unit and charging the battery of the portable device**." For example, *Partovi* discloses that "MCU1 can periodically start the FET driver" and if a receiver is nearby "the emitted power from L1 will power the receiver circuit" which then "draws current in a pre-programmed manner" that can be detected "as current modulation in current through L1 by the charger" which allows for bidirectional communication between the charger and power supply "for optimum charging" of the battery of the portable device. (*Id.*, ¶¶[0295], [0296].)

[8] Mojo withdrew its confidentiality designation for this exhibit (Ex. LIT-2) prior to filing.

d. a first sense circuit to monitor current flow through the first primary coil during operation of the first drive circuit, wherein the first sense circuit includes a low pass filter and an amplifier to assist in detecting and amplifying a signal corresponding to a current modulation in the first primary coil induced by modulation of current in the receiver coil; and

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶188-190.) *Partovi* discloses that MCU1 periodically starts the FET driver to drive primary coil L1 to determine if a receiver is nearby. (Ex. PA-1, ¶[0295].) If a receiver is nearby, the microcontroller MCU2 in the receiver is powered up by the emitted power from the primary coil L1. (*Id.*, ¶[0295].) MCU2 then executes a predetermined program that modulates "the current being drawn in the receiver in a predetermined code" such that "the receiver modulation can be detected as a current modulation in the current through the L1 by the charger or power supply current sensor in FIG. 34." (*Id.*, ¶[0295] (emphasis added); *see also id.*, ¶[0262] ("The Charge Management IC is in communication with the MCU2 which also monitors the output voltage (Vout) and tries to maintain this Vout within a pre-programmed range. This is achieved by MCU2 sending a digital signal to Q2 to modulate the switch. This modulation is prior to the rectifier stage and is at high frequency so the rectified and smoothed Vout is not affected. However, this modulation of the impedance of the secondary stage affects the current through the primary coil stage and can be easily detected by the Current Sense circuit in the primary.") (emphasis added); *id.*, ¶[0261] ("the primary (charger or power supply) 620 is controlled by a Micro Control Unit (MCU1) that receives signals from a Current Sensor in series with the coil.").) *Partovi*'s "Current Sense" is "**a first sense circuit**" and it is coupled to the primary coil and monitors the current through L1 to detect communications from the receiver ("**monitor current flow through the first primary coil during operation of the first drive circuit** . . . **[for] a signal corresponding to a current modulation in the first primary coil induced by modulation of current in the receiver coil**.").

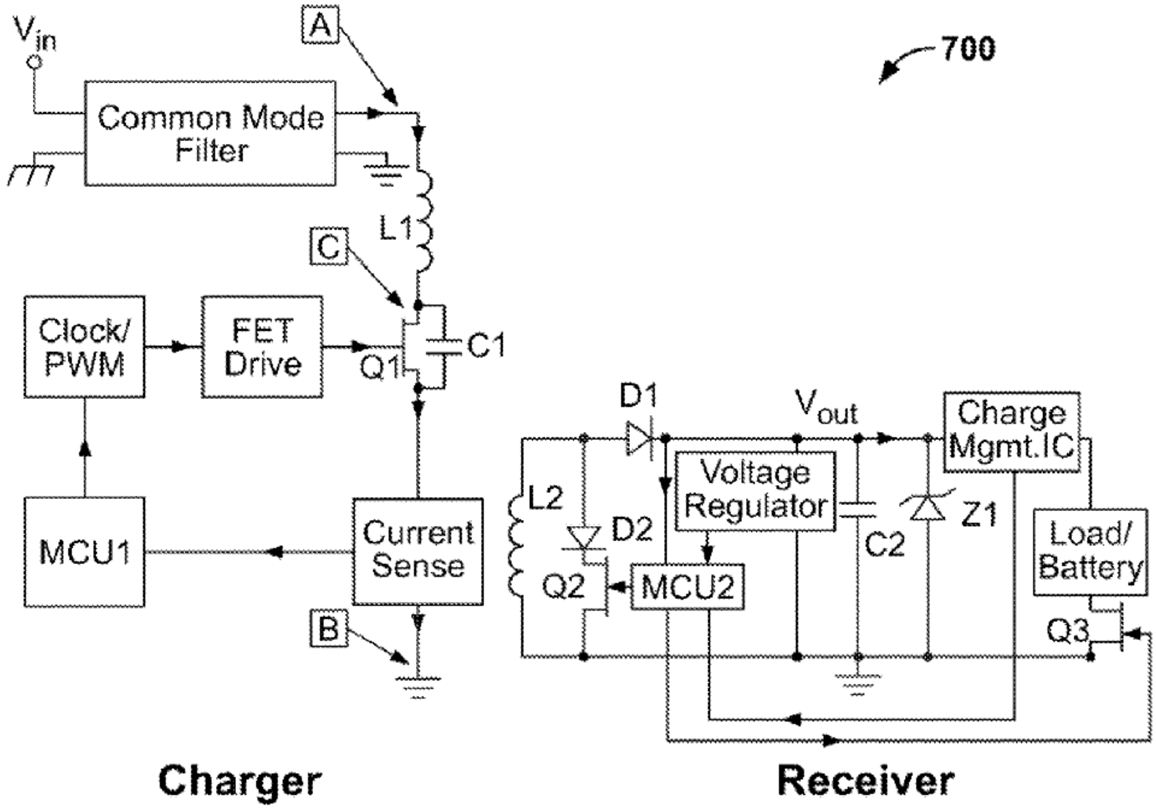


FIG. 34

(Ex. PA-1, Figure 34.)

Furthermore, the receiver modulation discussed above is "**a signal corresponding to a current modulation in the first primary coil induced by modulation of current in the receiver coil**." This is because the current through the receiver coil is being modulated by turning on/off transistor Q2 in order to transmit the communication to the primary coil in the charger from the receiver. (*Id.*, ¶[0262] ("The Charge Management IC is in communication with the MCU2 which also monitors the output voltage (Vout) and tries to maintain this Vout within a pre-programmed range. This is achieved by MCU2 sending a digital signal to Q2 to modulate the switch. This modulation is prior to the rectifier stage and is at high frequency so the rectified and smoothed Vout is not affected. However, this modulation of the impedance of the secondary stage affects the current through the primary coil stage and can be easily detected by the Current Sense circuit in the primary.").)

Partovi discloses the Current Sense circuit includes "**a low pass filter and an amplifier to assist in detecting and amplifying a signal**." For example, *Partovi* discloses with reference to Figure 19 (reproduced below) an amplifier (circuit element denoted by a triangle) and a low pass filter in series. The low pass filter and amplifier functions as a sense circuit to sense the information transmitted by the receiver, as shown in Figure 19.[9] A person of skill in the art would have understood a low pass filter and amplifier assist in detecting and amplifying a signal. (Ex. PA-DEC, ¶190.)

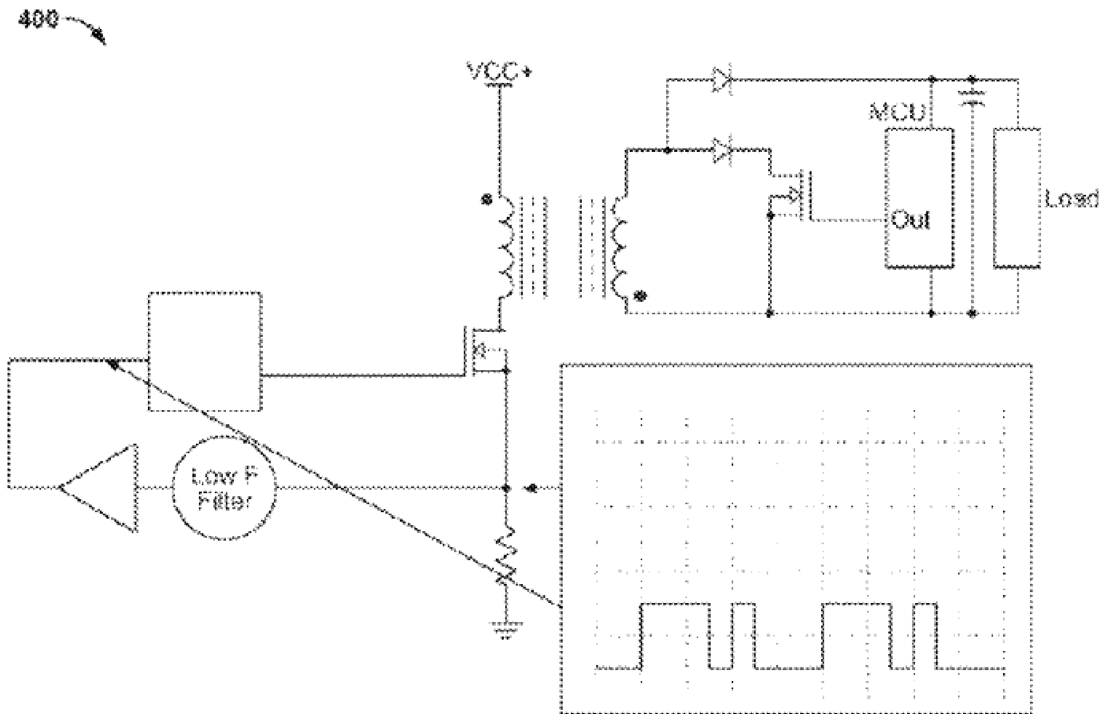


Fig. 19

(Ex. PA-1, Figure 34.)

e. a communication and control circuit, including a microcontroller coupled to the first drive circuit and the first sense circuit, configured to:

Partovi discloses this limitation. (Ex. PA-DEC, ¶191.) As shown in Figure 34 of *Partovi*, reproduced below, the charger includes a Micro Control Unit (MCU1) ("**a communication and control circuit, including a microcontroller**") coupled to the drive circuit (clock, FET Drive,

[9] If Patent Owner disagrees, then there is no support for this limitation in the '371 patent or any of its parent applications, including *Partovi*.

Q1, and C1) ("**coupled to the first drive circuit**") and the Current Sense circuit ("**coupled to the . . . first sense circuit**"). (Ex. PA-1, Figure 34, [0286]).

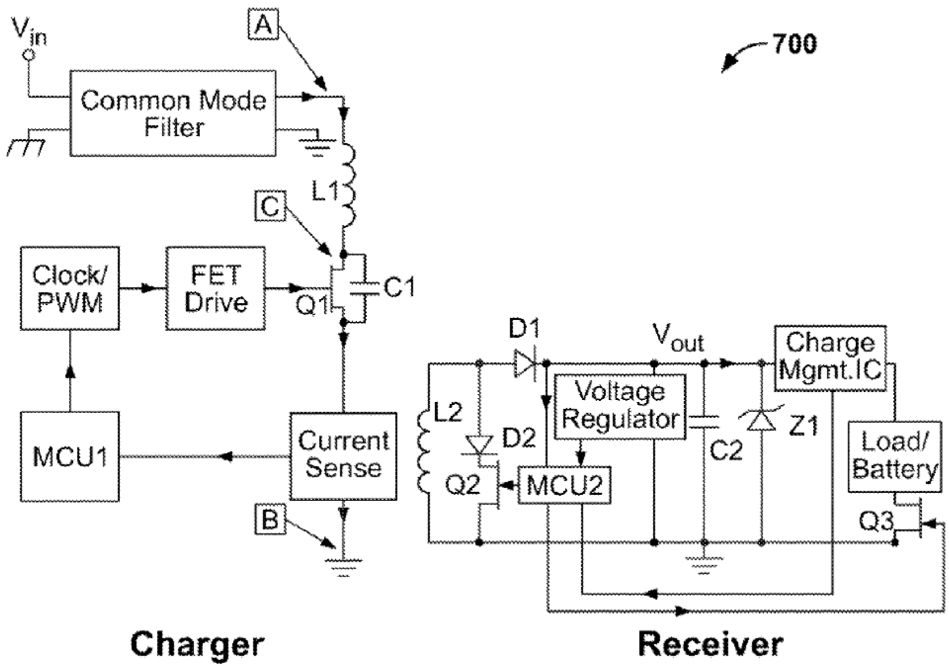


FIG. 34

(*Id.*, Figure 34.)

f. detect, through the first sense circuit, a received communication of information in the current modulation in the first primary coil;

Partovi discloses this limitation. (Ex. PA-DEC, ¶192.) For example, the MCU1, Current Sense circuit, and MCU2 can provide bi-directional communication between the charger and the receiver for optimum charging and to regulate the power and voltage received at the receiver charge control circuit. (*Id.*, ¶[0262], "After the initial handshake and verification, the MCU1 and current sense chips in the charger or power supply and MCU2 can provide bi-directional communication between the charger or power supply and the receiver for optimum charging or supply of power. The system can also regulate the power and Voltage received at the Charge Control Circuit to insure overvoltage conditions do not occur.") (emphasis added).) In particular, MCU2 modulates the current in the receiver to communicate the voltage generated in the receiver to the charger, where the communicated voltage is sensed by the Current Sense circuit through the primary coil and a corresponding signal provided to MCU1. (*Id.*, ¶¶[0262]-[0263].) MCU2 also executes a predetermined program that modulates "the current being drawn in the receiver in a predetermined code" such that "the receiver modulation can be detected as a current modulation in the current through the L1 by the charger or power supply current sensor in FIG. 34." (*Id.*, ¶[0295] (emphasis added).

g. operate the first drive circuit to inductively transfer power from the first primary coil to the receiver coil to activate and power the receiver unit to enable the receiver circuit to communicate the information detected in the current modulation in the first primary coil, wherein the communication of information includes information to enable the communication and control circuit to configure the inductive transfer of power to the portable device,

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶193-194.) For example, *Partovi* discloses an initial handshake and verification process in which "[t]he MCU1 receives input from another sensor mechanism that provides information that it can use to decide whether a device or battery is nearby, what voltage the device or battery requires, and/or to authenticate the device or battery to be charged or powered." (Ex. PA-1, ¶[0289].) As part of this process, microcontroller MCU1 ("**the communication and control circuit**") periodically starts the FET driver and the primary coil L1 ("**operate the first drive circuit**") to begin emitting power. (*Id.*, ¶¶[0294], [0295].) If a receiver is nearby, the power emitted from primary coil L1 will power the receiver circuit ("**activate and power the receiver unit**"). (*Id.*) Once the receiver circuit receives power, microcontroller MCU2 modulates the current being drawn in the receiver in a predetermined manner which "can be detected as current modulation in the current through the L1 by the charger or power supply sense . . ." ("**enable the receiver circuit to communicate the information detected in the current modulation in the first primary coil**"). (*Id.*) MCU2 also modulates the current in the receiver to communicate the voltage generated in the receiver to the charger, where the communicated voltage is sensed by the Current Sense circuit through the primary coil and a corresponding signal provided to MCU1. (*Id.*, ¶[0262]-[0263].) *Partovi* thus discloses "**operat[ing] the first drive circuit to inductively transfer power from the first primary coil to the receiver coil to activate and power the receiver unit to enable the receiver circuit to communicate the information detected in the current modulation in the first primary coil**," as claimed.

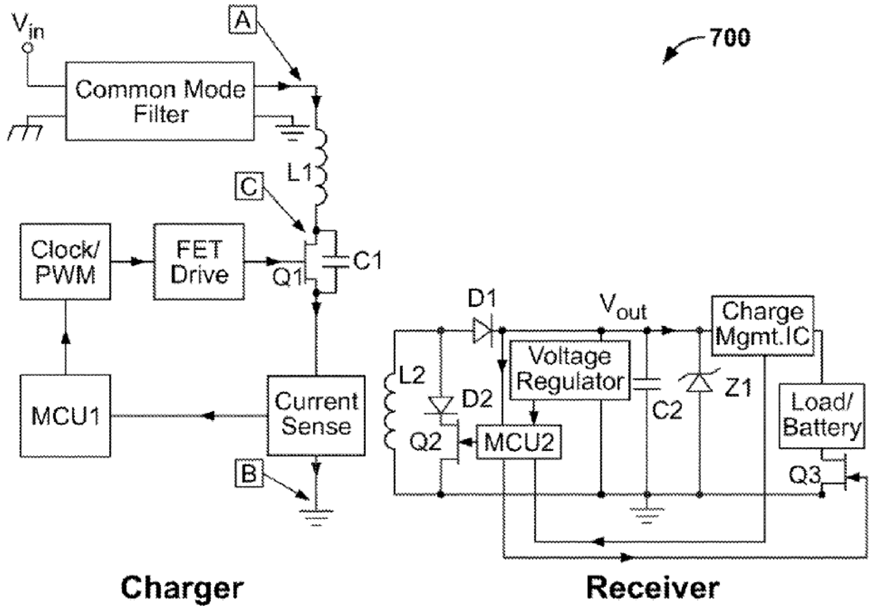


FIG. 34

(*Id.* Figure 34.)

Partovi discloses "**the communication of information includes information to enable the communication and control circuit to configure the inductive transfer of power to the portable device**," as claimed. For example, "[t]he MCU1 receives input from another sensor mechanism that provides information that it can use to decide whether a device or battery is nearby, what voltage the device or battery requires, and/or to authenticate the device or battery to be charged or powered." (Ex. PA-1, ¶[0289].) Indeed, "the mobile device or battery, during its hand shake and verification process can indicate its power/voltage requirements to the mobile device or battery charger or power supply." (Ex. PA-1, ¶[0124]; *see also id.*, ¶¶[0107], [0112]-[0114], ¶[0142] ("the receiver in the battery or mobile device also includes a means for providing information regarding battery manufacturer, required voltage, capacity; current, charge status, serial number, temperature, etc. to the charger").) This information is received for example, through the primary coil. (*Id.*, ¶[0107] ("the coils in the mobile device charger/power supply that are used for powering or charging the mobile device, or another set of coils in the same PCB layer or in a separate layer, can be used for data transfer between the mobile device charger/power supply and the mobile device to be charged or powered or the battery directly.").) And *Partovi* discloses that the handshake and verification process involves the receiver (in the mobile device or battery) communicating information to MCU1 in the charger via the primary coil. (*Id.*,

¶¶[0295]-[0296].) The power/voltage requirements enable the charger to "**configure the inductive transfer of power to the portable device**." (*Id*., ¶[0142] ("This information is used by the charger or power supply to adjust the primary to provide the correct charge or power conditions.").)

h. wherein the received communication of information includes: information corresponding to a voltage or current induced by the first primary coil at the output of the receiver circuit; a unique identification code; a manufacturer code; a charge algorithm profile; and a power requirement; and

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶195-198.) *Partovi* discloses the microcontroller MCU2 monitors the output voltage V_{out} of the rectifier D1 ("**a voltage or current induced by the first primary coil at the output of the receiver circuit**") and tries to maintain the output voltage within a pre-programmed range. (Ex. PA-1, ¶¶[0262], [0265], FIG. 34.) For example, "the receiver sends a digital code corresponding to the output voltage and MCU**1** compares this to the earlier output voltage value and makes a determination about which direction and by how many steps to move the frequency." (*Id*., ¶[0265].) Furthermore, "the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device." (*Id*., ¶[0130].) To do this, MCU2 modulates the switch Q2 to change the impedance of the receiver circuit which affects the current through the primary coil, which is detected by the current sense circuit ("**the received communication of information includes: information corresponding to a voltage or current induced by the first primary coil at the output of the receiver circuit**.") (*Id.*, ¶[0262]) The voltage Vout is "**induced by the first primary coil at the output of the receiver circuit**." (*Id*., ¶[0013], [0091], [0118], [0119], [0262] ("As the primary charger or power supply sends power to the secondary receiver, the circuit in the receiver turns on. The power received is rectified and filtered by rectifier D**1** and Capacitor C**2** respectively").)

Partovi further discloses similar features with respect to Figure 38.[10] Concerning Figure 38, *Partovi* discloses "the receiver circuit can note the amount of voltage or power being received

[10] The implantation of Figure 38 incorporates the switching and sense circuity of Figure 34. (Ex. PA-1, ¶[0326].) Therefore, the implementation described in Figure 38 is also applicable to Figure 34.

and report back to the charger or power supply. This information can be encoded by modulating the input impedance of the receiver circuit by MCU2. This information is then sensed by the charger or power supply sense circuitry, digitized by MCU1 and saved." (Ex. PA-1, ¶[0327].) A POSITA would understand that modulating the input impedance of the receiver circuit discloses communications from the receiver unit to the charger through the receiver's coil.

Partovi further discloses "**wherein the received communication of information includes . . . a unique identification code; a manufacturer code; a charge algorithm profile; and a power requirement**." For example, "[t]he MCU1 receives input from another sensor mechanism that provides information that it can use to decide whether a device or battery is nearby, what voltage the device or battery requires, and/or to authenticate the device or battery to be charged or powered." (Ex. PA-1, ¶[0289] (emphasis added).) What voltage the device or battery requires is a "**power requirement**." And a unique ID code is used to "**authenticate**." *Partovi* discloses once a receiver is detected nearby the charger, the charger and the receiver begin to exchange information, via current modulation, including a "unique ID code," a "manufacturer code," a "charge algorithm profile," and "voltage requirements of the battery" ("**a unique identification code; a manufacturer code; a charge algorithm profile; and a power requirement**"). (Ex. PA-1, ¶¶[107] ("In accordance with an embodiment, the mobile device charger/power supply or pad, and the various mobile devices or batteries, can communicate with each other to transfer data. In one embodiment, the coils in the mobile device charger/power supply that are used for powering or charging the mobile device, or another set of coils in the same PCB layer or in a separate layer, can be used for data transfer between the mobile device charger/power supply and the mobile device to be charged or powered or the battery directly . . . In one embodiment a chip connected to an antenna (for example, the receiver coil or separate data antenna) or another means of transfer of information can be used to provide information about, for example, the presence of the mobile device or battery, its authenticity (for example its manufacturer code) and the devices charging/power requirements (such as its required Voltage, battery capacity, and charge algorithm pro file)."), [0112]-[0113], ("This information can include a unique ID code that can verify the authenticity and manufacturer of the charger or power supply and mobile device or battery, the voltage requirements of the battery or the mobile device, and the capacity of the battery."), [0307].) The implementation described in paragraphs [0107], [0112]-[0113], and [0307] may be applied to the implementation shown in Figure 34 because Figure 34 of *Partovi* expressly contemplates the portable device and the charger exchanging information to authenticate the portable device (Ex. PA-1, ¶[0297].)

i. operate the first drive circuit according to the power requirement and charge algorithm profile to provide the power from the first primary coil to the receiver coil to power the receiver unit and charge the battery of the portable device,

Partovi discloses this limitation. (Ex. PA-DEC, ¶199.) *Partovi* discloses that "[t]he MCU1 receives input from another sensor mechanism that provides information that it can use to decide whether a device or battery is nearby, what voltage the device or battery requires, and/or to authenticate the device or battery to be charged or powered." (Ex. PA-1, ¶[0289] (emphasis added).) *Partovi* discloses that "[t]his information is used by the charger or power supply to adjust the primary to provide the correct charge or power conditions." (Ex. PA-1, ¶[0142]; *see also id*, ¶[0119], ("The mobile device or battery charger or power supply, after exchanging information with the mobile device or battery, determines the appropriate charging/powering conditions to the mobile device. It then proceeds to power the mobile device with the appropriate parameters required.").) The implementation described in paragraphs [0119] and [0142] may be applied to the implementation shown in Figure 34 because Figure 34 of *Partovi* expressly contemplates the receiver communicating information to the charger to enable the optimum charging or supply of power to the battery. (*Id.*, ¶[0285], ("The MCU1 and current sense chips in the charger and MCU2 can provide bidirectional communication between the charger or power supply and the receiver for optimum charging or supply of power."), ¶¶[0262]-[0266].)

j. wherein to charge the battery of the portable device the communication and control circuit is further configured to: receive additional information in the current modulation in the first primary coil from the modulation of the current in the receiver coil corresponding to the voltage or current at the output of the receiver circuit while charging the battery of the portable device;

Partovi discloses this limitation for reasons discussed in Section VI.A.4.h, and as further discussed below. (Ex. PA-Dec, ¶200.) For example, *Partovi* discloses that in order to perform optimum charging of the battery, MCU2 in the receiver communicates with MCU1 ("communication and control circuit"). (Ex. PA-1, ¶[0285], ("The MCU1 and current sense chips in the charger and MCU2 can provide bidirectional communication between the charger or power supply and the receiver for optimum charging or supply of power.").) In particular, microcontroller MCU2 monitors the output voltage V_{out} of the rectifier D1 ("**voltage or current induced by the first primary coil at the output of the receiver circuit while charging the battery of the portable device**") and tries to maintain the output voltage within a pre-programmed range. (Ex. PA-1, ¶¶[0262], [0265], FIG. 34.) For example, "the receiver sends a digital code corresponding to the output voltage and MCU**1** compares this to the earlier output voltage value and makes a determination about which direction and by how many steps to move the frequency." (*Id*., ¶[0265].) Furthermore, "the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device." (*Id*., ¶[0130].) To do this, MCU2 modulates the switch Q2 to change the impedance of the receiver circuit which affects the current through the primary coil, which is detected by the current sense circuit ("**receive additional information in the current modulation in the first primary coil from the modulation of the current in the receiver coil**.") (*Id.*, ¶[0262])

k. regulate in a closed loop feedback manner the voltage or current at the output of the receiver circuit in accordance with the received additional information corresponding to the voltage or current at the output of the receiver circuit by adjusting at least one of the operating frequency and the duty cycle of the first drive circuit while charging the battery of the portable device;

Partovi discloses this limitation. (Ex. PA-DEC, ¶201.) *Partovi* discloses that "the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device." (Ex. PA-1, [0130].) In the Figure 28 implementation, during the charging process, the receiver MCU2 communicates an output voltage (Vout) of the rectifier to the charger MCU 1, which then adjusts the frequency at which FET 1 is driven. (*Id*., ¶¶[0262]-[0265].) Therefore, the MCU 1 performs closed loop regulation as claimed. The implementation shown in Figure 28 may be applied to the implementation shown in Figure 34 because Figures 34 and 28 have identical components.

l. monitor for continued presence of the portable device and completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit; and if the portable device is no longer present or charging is complete, stop operation of the first drive circuit for the provision of power inductively to the portable device.

Partovi in view of *Calhoon* discloses or suggests this limitation. (Ex. PA-DEC, ¶¶202-207.) *Partovi* discloses that "[a]t the end of the charge cycle, the Charge Management IC can signal end of charge cycle to MCU**2** which sends a pre-determined code to MCU**1** to shut down the charger, move to hibernation mode or take some other pre-determined step." (Ex. PA-1, ¶[0266].) MCU2 sends the signal by affecting the current in the primary coil that is detected by the Current Sense Circuit. (*Id*., ¶[0262] ("The Charge Management IC is in communication with the MCU**2** which also monitors the output voltage (Vout) and tries to maintain this Vout within a pre-programmed range. This is achieved by MCU**2** sending a digital signal to Q**2** to modulate the switch. This modulation is prior to the rectifier stage and is at high frequency so the rectified and smoothed Vout is not affected. However, this modulation of the impedance of the secondary stage affects the current through the primary coil stage and can be easily detected by the Current Sense circuit in the primary.").) Thus, *Partovi* discloses the MCU 1 is configured to "**monitor for . . . completion of the charging of the battery of the portable device based on the communication from the receiver circuit and detected by the communication and control circuit through the first sense circuit**." Moreover, because MCU1 shuts down the charger if the end of charge cycle is reached (*id*., ¶[0266]), *Partovi* also discloses "**if . . . charging is complete, stop operation of the first drive circuit for the provision of power inductively to the portable device**."

Partovi, however, does not disclose that the MCU1 is configured to "**monitor for continued presence of the portable device**." *Calhoon*, however, discloses such a feature.

Like *Partovi*, *Calhoon* discloses "[a]n inductive charging system [that] transfers energy by inductively coupling a source coil on a power source to a receiver coil for a battery charger." (Ex. PA-3, at Abstract.) In particular, an inductive charging source 302 inductively transfers power to a battery charger assembly 304. (*Id*., ¶[0031], FIG. 3.) "The battery charger assembly 304 may be configured to receive electrical energy from inductive power source 302" through "a power pickup coil 324 that is operatively connected to a power supply 320." (*Id*.) "In one operation, the power supply 320 of battery charger assembly 304 provides electrical energy to a battery charger 322 that supplies energy to legacy battery pack 350 . . . ." (*Id.*) Figure 3, which illustrates the components of the inductive charger system, is excerpted below:

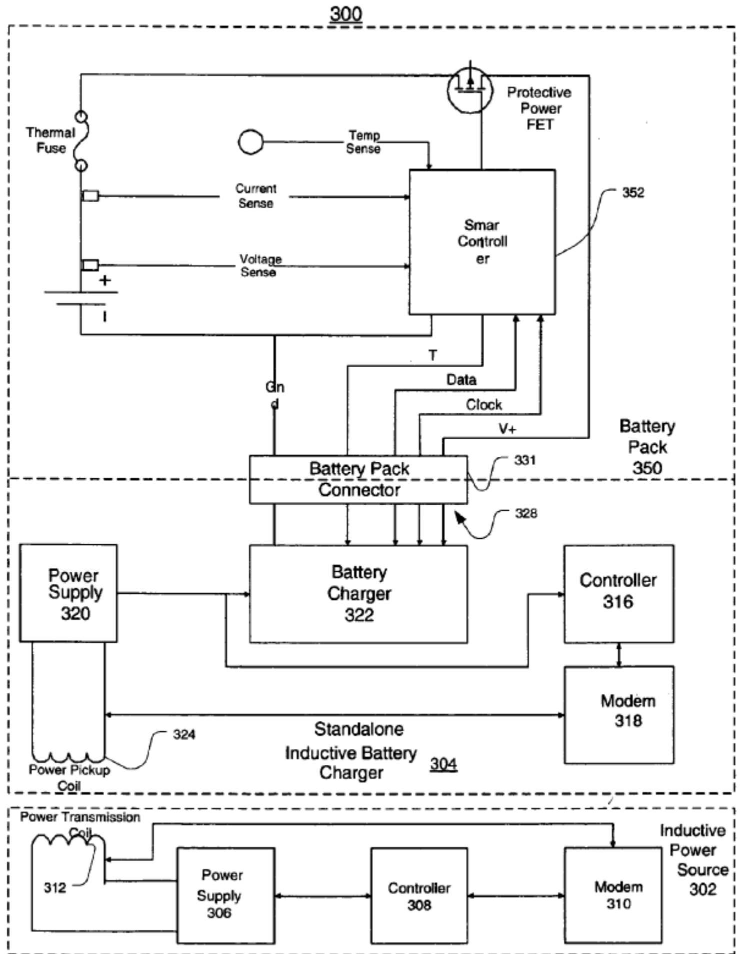


FIGURE 3

(*Id.*, FIG. 6.)

Calhoon teaches a method of polling performed by the source 302 to determine if the battery charger assembly 304 is present. (Ex. PA-3, ¶[0052].) During the powering process, the source 302 periodically polls the battery charger assembly 304 and if no response is received ("**monitor for continued presence of the portable device**") or inductive coupling is removed, the source 302 changes state from charging mode to return to polling mode. (*Id.*)

A POSITA would have been motivated to adopt *Calhoon*'s method of polling during charging to verify the continued presence of the receiver portable device in *Partovi* for efficiency purposes. (Ex. PA-DEC, ¶206.) For example, including such a functionality would allow the charger to shut off or stop powering certain coils if the portable device is removed therefrom or if charging is complete, thereby resulting in power savings. (*Id.*) A POSITA would have had a reasonable expectation of success in making such a modification given the above teachings of *Partovi* and *Calhoon*, and the modification would have been a straightforward combination of well-known technologies using known methods and techniques familiar to such a skilled person. (Ex. PA-DEC, ¶206.) For example, a POSITA would have known that incorporating such a functionality in *Partovi* would have simply required configuring the MCU1 to monitor signals from the portable device and stop power transmission if the requisite signals are not received. (*Id.*) *Partovi* already discloses polling capabilities to sense the presence of a portable device thereby confirming that a POSITA would have been able to modify *Partovi* as necessary based on *Calhoon*. (Ex. PA-1, ¶[0290].)

Partovi discloses that MCU1 shuts down the charger if the end of charge cycle is reached. (Ex. PA-1, ¶[0266]). This means that the FET driver stops energizing the primary coil. (Ex. PA-Dec, ¶207; Ex. PA-1, ¶[0295] (FET driver drives the primary coil to transmit power to the portable device).) *Partovi* thus discloses "**if the portable device is no longer present or charging is complete, stop operation of the first drive circuit for the provision of power inductively to the portable device**." Requester notes that there is an "or" in the above limitation and therefore, the prior art only needs to disclose stopping operation of the first drive in response to one of the two conditions (portable device is no longer present <u>or</u> charging is complete).

5. Claim 2

a. The apparatus of claim 1, wherein the closed loop feedback manner comprises a Proportional-Integral-Derivative (PID) control technique for regulating the voltage or current at the output of the receiver circuit.

Partovi discloses this limitation. (Ex. PA-DEC, ¶208.) *Partovi* discloses proportional-integral-derivative techniques may be used to regulate the voltage at the receiver. (Ex. PA-1, [0265], "Many variations of these basic methods are possible to allow rapid, efficient locking of the output voltage. Proportional-Integral-Derivative (PID) techniques, etc. can also be used.")

B. SNQ2: *Baarman* in view of *Hui*, *Odendaal, Shima,* and *Hui-027* Discloses or Suggests Claim 28

Mojo asserts that claim 28 of the '371 patent is entitled to at least an effective filing date of July 30, 2007. (Ex. LIT-1, 7.) Based on Mojo's representations, *Baarman*, *Hui*, *Odendaal*, *Shima*, and *Hui-027* are prior art.

For example, *Baarman*'s provisional application filing date is September 29, 2006. Below, it is demonstrated that (1) at least one claim of *Baarman* is supported by the *Baarman* Provisional Application, and (2) the subject matter relied upon in *Baarman* is also described by the *Baarman* Provisional Application. Thus, *Baarman* is prior art.

Hui was filed on September 23, 2005 and published on February 8, 2007, and thus qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(e). *Hui-027* was filed October 28, 2002 and issued May 22, 2003 and thus qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(e). *Shima* was filed on March 21, 1997 and issued on September 15, 1998, and thus qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(e). *Odendaal* was filed on June 26, 2002 and issued on November 1, 2005 and thus qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(e).

1. Overview of *Baarman*

Baarman discloses an "inductive charging system" that has two parts. (Ex. PA-31, 4:52-5:4.) The first part is the charger circuit 6 and the second part is the secondary circuit 8. (*Id.*) The charger circuit includes a primary coil 15 that provides power to the secondary circuit 8, which can be integrated into a mobile device to charge its battery ("**portable device**"). (*Id.*, 4:52-5:4, 4:17-25.) The secondary circuit includes a secondary coil 30 for receiving power from the charger circuit to charge a battery 34. (*Id.*, 5:34-38.) The circuitry associated with the charger circuit and the receiver circuit is set forth with reference to "FIG. 2."

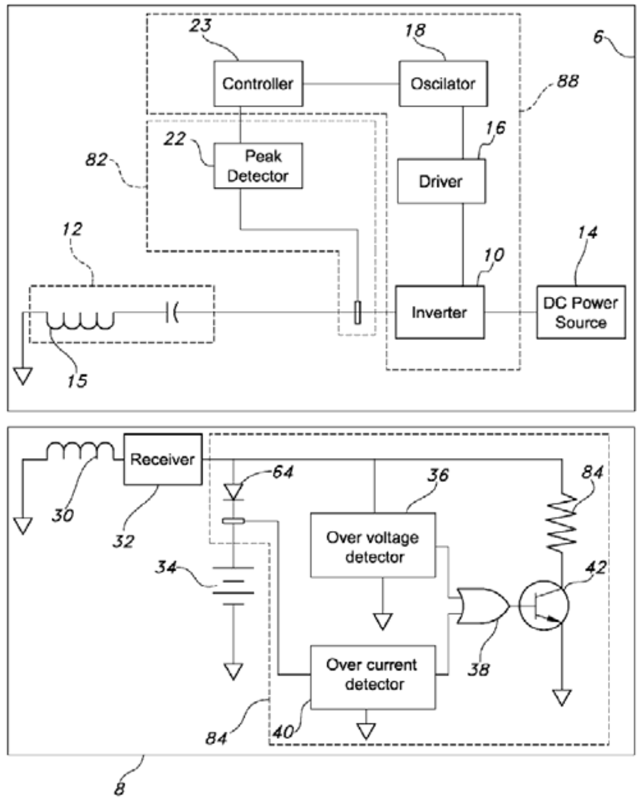


FIG. 2

(*Id.*, Figure 2.[11])

Baarman discloses the secondary circuit includes a feedback mechanism for providing feedback to the charger circuit "through the inductive coupling of the primary coil and the second coil." (*Id.*, 2:22-25.) The feedback mechanism includes an over-voltage detector and an over-current detector. (*Id.*, 2:38-39.) If either an over voltage or an over current condition is detected in the secondary circuit, the detectors can activate a switch to shunt power from the battery through a resistor to protect the battery from overvoltage or overcurrent conditions. (*Id.*, 2:38-48.) The feedback mechanism also includes a current sensor coupled to the primary tank circuit. (*Id.*, 2:49-50.) When the current is shunted through the resistor in the secondary, as a result of an overvoltage or overcurrent condition, the current in through the secondary coil increases which varies the

[11] Figure 2 of *Baarman* includes a few typographical errors. For example, element 88 should be element 80 to conform with frequency controller 80 as described in the *Baarman* specification. (Ex. PA-31, 5:7-8.) Similarly, element 23 should be element 20 to conform with controller 20 as described in the *Baarman* specification. (*Id.*, 5:27.)

reflected impedance of the secondary circuit resulting in increased current through the primary coil. (*Id.*, 2:49-50.)

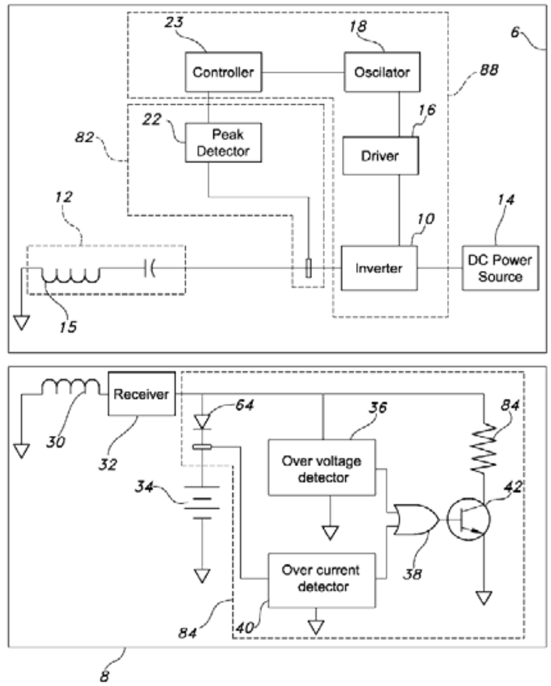
In *Dynamic Drinkware*, the Federal Circuit stated that "[a] reference patent is only entitled to claim the benefit of the filing date of its provisional application if the disclosure of the provisional application provides support for the claims in the reference patent in compliance with § 112." *Dynamic Drinkware, LLC*, 800 F.3d at 1382; *see also Ex parte Mann*, 2016 WL 7487271, at *6 (P.T.A.B. Dec. 21, 2016) ("We hold that under *Dynamic Drinkware*, a non-provisional child can be entitled to the benefit of a provisional application's filing date if the provisional application provides sufficient support for at least one claim in the child.").

The following chart demonstrates the enabling support found in the *Baarman* Provisional Application for *Baarman*. Furthermore, as shown in the table below, the subject matter of *Baarman* relied upon in Section VI.B.6 is also described by the *Baarman* Provisional Application.

Claim Language of *Baarman*	**Exemplary Disclosures of the *Baarman* Provisional Application**
[22.pre] A portable electronic device with a secondary circuit having a reflected impedance for receiving power from an inductive charger having a primary coil, said portable electronic device comprising:	The *Baarman* Provisional Application discloses this limitation. The *Baarman* Provisional Application discloses a portable electronic device with a secondary circuit. (*See e.*g., Ex. PA-32, 7:18-8:2, ("The present invention is well-suited for use in charging portable electronic devices, such as cell phones, personal digital assistants, handheld gaming devices, personal media players and other similar devices. In this context, the secondary circuit may be incorporated into the portable electronic device so that the device can be placed in close proximity to the charger circuit for charging, thereby eliminating the need to plug the device into a charger.").) The *Baarman* Provisional Application discloses the secondary circuit has "a reflected impedance for receiving power from an inductive charger having a primary coil, said portable electronic device," as claimed. (*Id.*, 4:16-5:2, ("In one embodiment, the feedback detector is a current sensor coupled to the primary tank circuit. In this embodiment, when the current is shunted through the feedback signaling resistor in the secondary, the current through the secondary coil increases, which varies the reflected impedance of the secondary circuit resulting in increased current through the primary coil. The increase in current through the primary coil is detected by the current sensor in the primary circuit, which could include a peak detector, thereby providing to the controller a feedback signal for detecting whether the battery is in an over-voltage or over-current state. In one embodiment, the frequency control mechanism makes appropriate adjustments to the frequency to correct the overvoltage or over-current state by reducing the power supplied to the secondary coil."), *see also id.* 7:9:12, ("In one embodiment, the detecting step further includes the steps of: applying a pulse of power to the primary coil at a predetermined probe frequency, sensing the reflected impedance, and determining whether a battery is present as a function of the sensed reflected impedance.").)
[22.a] a secondary coil;	The *Baarman* Provisional Application discloses this limitation. (*See e.*g., Ex. PA-32, 9:2-5 ("The secondary circuit 8 generally includes a secondary coil 30 for receiving inductive power from the charger circuit 6 and a feedback mechanism 84 for providing feedback to the charger circuit 6 indicative of the voltage or current in the secondary circuit 8.").)

[22.b] a battery electrically coupled to and chargeable by power from said secondary coil; and	The *Baarman* Provisional Application discloses this limitation. (*See e.*g., Ex. PA-32, 10:7-9, ("The secondary circuit 8 generally includes a secondary coil 30, a rectifier 32, and a feedback mechanism 84. The secondary coil 30 inductively receives power from the primary coil 15. The rectifier 32 provides DC power to charge the battery 34.").)

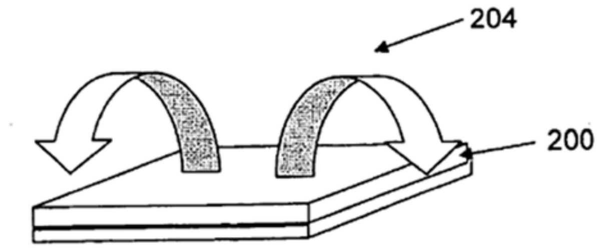
[22.c] a feedback circuit electrically coupled to said secondary coil wherein said feedback circuit varies the reflected impedance of said secondary circuit to generate a feedback signal in said secondary coil to said primary coil in response to an over-voltage or over-current condition by actuating a switch to direct current from said secondary coil through an impedance element, wherein said feedback signal causes a characteristic of power applied to said primary coil to vary to correct said over-voltage condition or said over-current condition.	The *Baarman* Provisional Application discloses this limitation. (*See e.g.*, *id.*, 3:18-23, ("The secondary circuit includes a feedback mechanism to provide feedback to the charger circuit through the inductive coupling of the primary coil and the secondary coil. The charger circuit includes a frequency control mechanism for controlling the frequency of the power applied to the primary coil at least partly in response to the feedback from the feedback mechanism."), 4:16-5:2, ("In one embodiment, the feedback detector is a current sensor coupled to the primary tank circuit. In this embodiment, when the current is shunted through the feedback signaling resistor [the claimed impedance element] in the secondary, the current through the secondary coil increases, which varies the reflected impedance of the secondary circuit resulting in increased current through the primary coil. The increase in current through the primary coil is detected by the current sensor in the primary circuit, which could include a peak detector, thereby providing to the controller a feedback signal for detecting whether the battery is in an over-voltage or over-current state. In one embodiment, the frequency control mechanism makes appropriate adjustments to the frequency to correct the overvoltage or over-current state by reducing the power supplied to the secondary coil.").) As shown in Figure 2 of *Baarman*, the feedback mechanism includes an over-voltage detector 36 and an over-current detector 40. (Ex. PA-32, 10:8-11:13.) The overvoltage and overcurrent detectors indicate whether the current or voltage of the battery is above a predetermined amount. (*Id.*) The overvoltage and overcurrent detectors are connected to an OR gate 38 which is connected to rectifier and switch 42. (*Id.*) The switch 42 is controlled by the OR gate and is connected in series between the rectifier and the resistor, which is connected to ground. (*Id.*)

	 FIG. 2 (*Id.*, Figure 2.) If either an over voltage or an over current condition is detected in the secondary circuit by the overvoltage or overcurrent detectors, then the OR gate activates switch 42 to shunt power from the rectifier to the resistor 44 to ground, to protect the battery from overvoltage or overcurrent conditions. (*Id.*, 10:8-11:13.) When the current is shunted through the resistor in the secondary, as a result of an overvoltage or overcurrent condition, the current through the secondary coil increases which varies the reflected impedance of the secondary circuit resulting in increased current through the primary coil. (*Id.*)

2. Overview of *Hui*

Hui is titled "Rechargeable battery circuit and structure for compatibility with a planar inductive charging platform." *Hui* discloses "a battery pack for an electronic device" that includes "a battery charging circuit, and an energy receiving element adapted to receive power from a planar inductive charging system." (*See, e.g.*, Ex. PA-33, Abstract; Ex. PA-Dec, ¶106.)

Hui discloses an "inductive battery charging platform" in Figure 2, where the "lines of flux of this charging platform flow 'perpendicularly' in and out of the charging surfaces." (Ex. PA-33, ¶[0005].) "This perpendicular flow of flux is <u>very beneficial</u> because it allows the energy transfer over the surface on which the electronic equipment (to be charged) is placed." (*Id*. (emphasis added).)



(*Id.*, FIG. 2.)

In one embodiment, *Hui* discloses charging a battery pack in a mobile phone by placing the mobile phone over the "planar charging platform of FIG. 2 (which has the magnetic flux lines flowing into and out of the charging surface perpendicularly)." (*Id*., ¶[0050].) In particular, an "energy receiving element in the form of a simple planar device is introduced [into] this battery pack structure so that this battery pack can be charged inductively by the planar charging platform of FIG. 2." (*Id*.) The "energy receiving element" includes an "energy pick-up coil," which is "essentially a planar inductor." (*Id*., ¶[0051].)

> When sensing a high-frequency AC magnetic flux flowing perpendicularly (or vertically) from the surface of the planar inductive battery charging platform, the energy pick-up coil will develop an AC voltage by Faraday's law and picks up the energy transmitted from a planar charging platform. This coil enclosing the soft magnetic sheet (as a low-profile magnetic core) is essentially a planar inductor. This planar inductor and the series-connected AC capacitor 3 form a series resonant tank that can amplify the AC voltage for the diode rectifier 4. The diode rectifier 4 and the DC capacitor 5 rectify the AC voltage into a DC voltage that can be fed to a battery charging circuit. Preferably a voltage regulator can be used to provide a stable DC voltage from the output of the rectifier.

(*Id*.)

Hui is also in the same field as the '371 patent because it discloses a system for inductively charging a battery using a charging platform.

3. Overview of *Hui-027*

Hui-027 discloses an inductive power/signal transfer system using primary and secondary coils (Ex. PA-36, Abstract, ¶¶[0001]-[0004], [0030]-[0033], [0039-0042], [0065], [0067], Table I, FIGS. 1, 2, 3a, and 3b.) For example, *Hui-027* discloses:

> It has been shown that the use of coreless PCB transformer in signal and low-power applications does not cause a serious EMC problem. In power transfer applications however, the PCB transformers have to be shielded to comply with EMC regulations. Investigations of planar transformer shielded with ferrite sheets have been reported and the energy efficiency of a PCB transformer shielded with ferrite sheets can be higher than 90% in Megahertz operating frequency range. However, as will be discussed below, the present inventors have found that using only thin ferrite materials for EMI shielding is not effective and the EM fields can penetrate the thin ferrite sheets easily.

(Ex. PA-36, ¶[0003].)

Hui-027 discloses PCB coils made of copper of certain thickness. For example, Table I (below) shows that the PCB coils of FIGS. 3a and 3b (below) have a "Copper Track Thickness" of "70 μm (**2 Oz/ft^2**)" and FIG. 3b illustrates that the "Conductor **Thickness**" corresponds to that of the primary winding. (Ex. PA-36, ¶¶[0004], [0030], FIGS. 3a and 3b (below).)

TABLE I

Geometric Parameters of the PCB Transformer

Geometric Parameter	Dimension
Copper Track Width	0.25 mm
Copper Track Separation	1 mm
Copper Track Thickness	70 μm (2 Oz/ft^2)
Number of Primary Turns	10
Number of Secondary Turns	10
Dimensions of Ferrite Plates	25 mm × 25 mm × 0.4 mm
PCB Laminate Thickness	0.4 mm
Insulating Layer Thickness	0.228 mm
Transformer Radius	23.5 mm

(Ex. PA-36, Table I (annotated).)

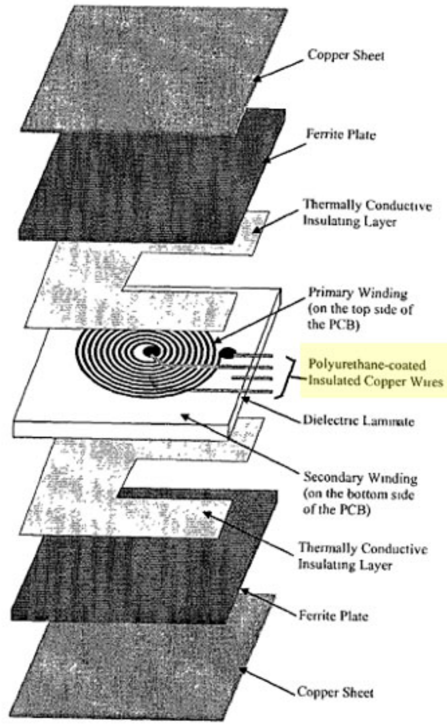


Fig. 3a.

(Ex. PA-36, FIG. 3a (annotated).)

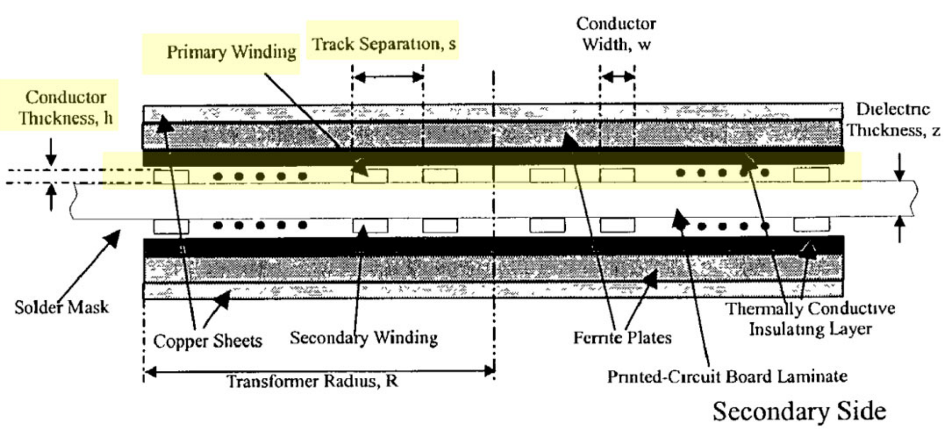


Fig. 3b.

(Ex. PA-36, FIG. 3b (annotated).)

4. Overview of *Odendaal*

Odendaal discloses a contactless inductive power/charging system (e.g., "contactless power transfer system[]") that uses inductive coupling (e.g., "coupling between battery charging circuit and the battery [that] may comprise capacitive coupling and/or **magnetic coupling, and wherein power is transferred by the coupling of** an electric field and/or **magnetic flux** across the IOET [interface-of-energy-transfer]") between primary and secondary coils (e.g., thin, planar-type coils) to provide power to a mobile device (e.g., cellphone, computer, etc.) through its secondary coil placed on or near primary coils in the surface of a powering device (e.g., charger for cellphones, powering pad, or charger embedded in a thin surface, including fabrics, etc.). (Ex. PA-35, 1:5-3:57; *see also id.*, Title, Abstract, FIGS. 1A-4, 11-12, 4:50-5:8, 5:24-28, 6:59-64.)

Odendaal discloses the known use of thin, planar-type inductor coils for use in a contactless power/data transfer system that transfers power/data via magnetic coupling for, e.g., charging a battery of a cellphone, computer, wearable items, etc. (*Id.*, FIGS. 1A-1B, 2A, 2C, 8E, 1:58-2:43.) For example, *Odendaal* explains:

> The spiral-shaped conductor may comprise pcb spiral-wound conductors. In addition, a battery charging circuit can be coupled to one of the first and second spiral-shaped conductors, and a load can be coupled to the other of the first and second spiral-shaped conductors. The coupling between battery charging circuit and the battery may comprise capacitive coupling and/or magnetic coupling, and wherein power is transferred by the coupling of an electric field and/or magnetic flux across the IOET [interface-of-energy-transfer].
>
> According to an aspect of the present invention, a signal applied to the first spiral-shaped conductor can be transferred to the second spiral-shaped conductor by coupling of magnetic flux of the first and second spiral-shaped conductors across the IOET.
>
> The first and second spiral-shaped conductors and the IOET are preferably integrated into a planar (flat/thin) structure.

(*Id.*, 2:55-3:5.) *Odendaal* also explains:

> According to another aspect of the invention, an isolating coupling interface and a resonant tank are functionally integrated into a planar configuration for transferring power with isolation properties. **The device may comprise two separable structures on either side of the IOET, such as, for example, a cellphone and its charger**. . . .
>
> An advantage of the present invention is that it facilitates the use of **wearable electronics**. For example, **flex circuits may be used so as to cause the surface of the coils to be flexible.** In addition to the flexibility, the coils may be formed in any arbitrary shape to facilitate woven wire arranged in **a fabric, or pads with embedded conductors that can be attached to clothes**. In this way, for example, **one could charge a radio, cellphone, and/or computer (just to name a few of the many wearable items) by bringing the**

> **device in close proximity to the fabric.** Thus, implementation of the invention with wearable electronics could provide an **interface between the wearable device(s) and external power sources. Digital or analog signals may also be transmitted across such interfaces to, for instance, up- or download digital information.**

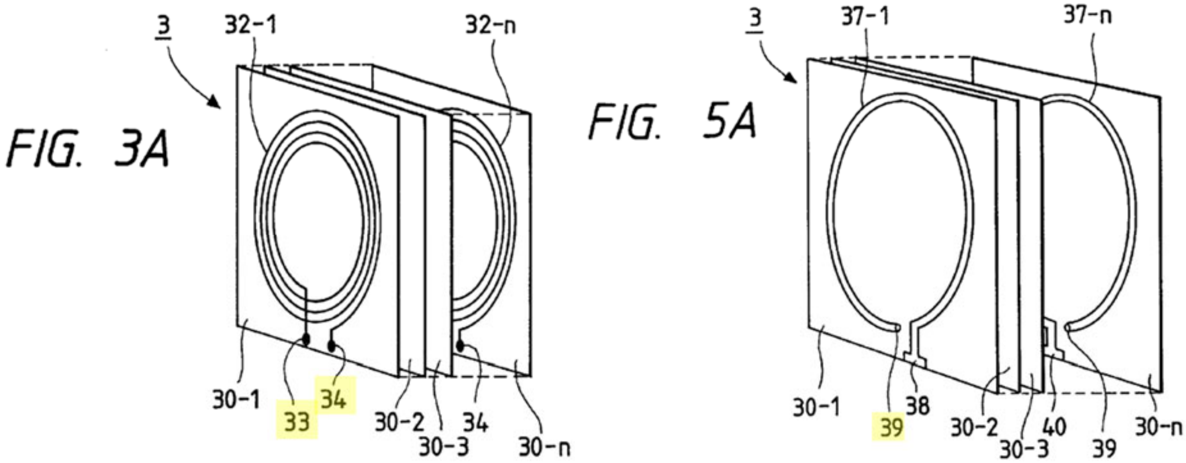
(*Id.*, 2:16-43; *see also id.*, 2:44-54 (explaining that the "interface-of-energy-transfer" (IOET) of the planar power resonator "may have a **thin and/or relatively flat top coil surface**" and may have coils arranged in upper and lower configurations "with an air gap"); *see also id.*, 2:1-15 (transferring power across IOET "in **either** an electric **or magnetic form**, or both" and "**transformer action** with or **without** capacitive energy transfer"), 4:44-5:8, 6:1-18 (air coil transformer).)

As noted in the quote above, *Odendaal* explains that in addition to charging "a radio, cellphone, and/or computer," etc. (Ex. PA-35, 2:30-41), its system can also transmit "**digital**" signals through the IOET (e.g., between the primary side and the secondary side) for uploading/downloading "**digital information**" (*id.*, 2:41-44). (Ex. PA-35, 2:30-44; *see also id.*, 2:65-3:2 ("According to an aspect of the present invention, a signal applied to the first spiral-shaped conductor can be transferred to the second spiral-shaped conductor by coupling of magnetic flux of the first and second spiral-shaped conductors across the IOET.").)

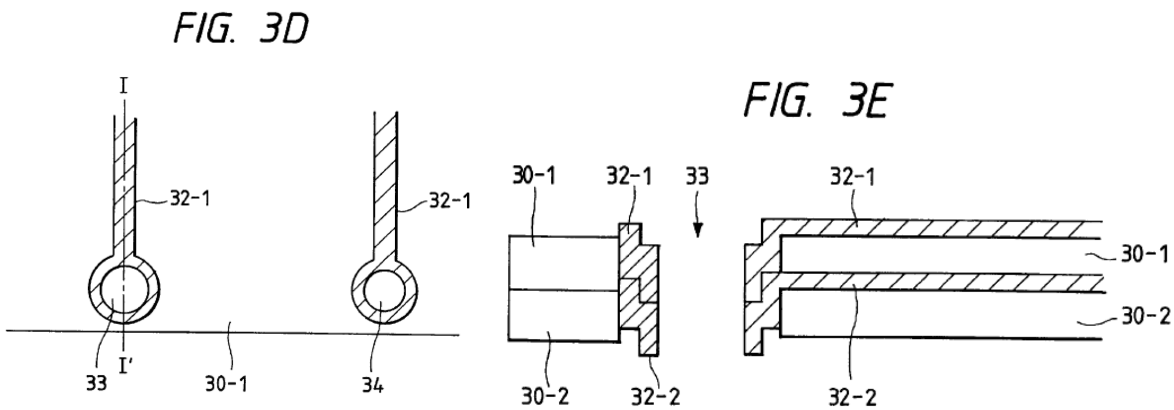
5. Overview of *Shima*

Shima discloses an inductive power/signal transfer system using primary and secondary coils. (Ex. PA-34, Abstract, 1:42-50, 2:12-4:10, 5:62-6:53, 7:17-8:38.)

Shima discloses connecting different coil patterns residing on different layers of PCBs by using through-holes (vias). For example, FIG. 3A (below) is described having "a plurality of thin printed-circuit substrates 30-1 to 30-n" with similar "coil patterns 32-1 to 32-n." (Ex. PA-34, 5:62-6:1, FIGS. 3D-3E (below), 6:13-35.) *Shima* explains that starting and terminating ends of the coil patterns are connected using through-holes 33 and 34, respectively. (*Id.*, 6:4-21.) *Shima* also explains that layers of loop patterns (e.g., 37-1 to 37-n (FIG. 5A (below)) may also "have the respective through-holes [39] connected in such a way that a spiral coil is formed in the direction in which the printed-circuit substrates 30-1 to 30-n are stacked." (*Id.*, 7:17-35.)



(Ex. PA-34, FIGS. 3A, 5A (annotated).)



(*Id.*, FIGS. 3D, 3E.)

6. Claim 28

a. A system for providing power inductively to a portable device comprising a battery and an inductive receiver unit including a receiver coil and a receiver circuit, the system comprising

To the extent the preamble is limiting, *Baarman* discloses this limitation. (Ex. PA-DEC, ¶209.) *Baarman* discloses an "inductive charging system" that has two parts. (Ex. PA-31, 4:52-5:4; Ex. PA-32, 8:19-9:9.) The first part is the charger circuit 6 and the second part is the secondary circuit 8. (Ex. PA-31, 4:52-5:4; Ex. PA-32, 8:19-9:9.) The charger circuit includes a primary coil 15 that provides power to the secondary circuit 8, which can be integrated into a mobile device to charge its battery ("**portable device**"). (Ex. PA-31, 4:52-5:4, 4:17-25; Ex. PA-32, 7:18-21, 8:19-9:9.) The secondary circuit ("**inductive receiver circuit**") includes a receiver coil 30 ("**receiver coil**") for receiving power from the charger circuit to charge a battery. (Ex. PA-31, 4:52-5:4, 4:17-

25; Ex. PA-32, 8:19-9:9.) The circuitry associated with the charger circuit and the receiver circuit is set forth with reference to "FIG. 2."

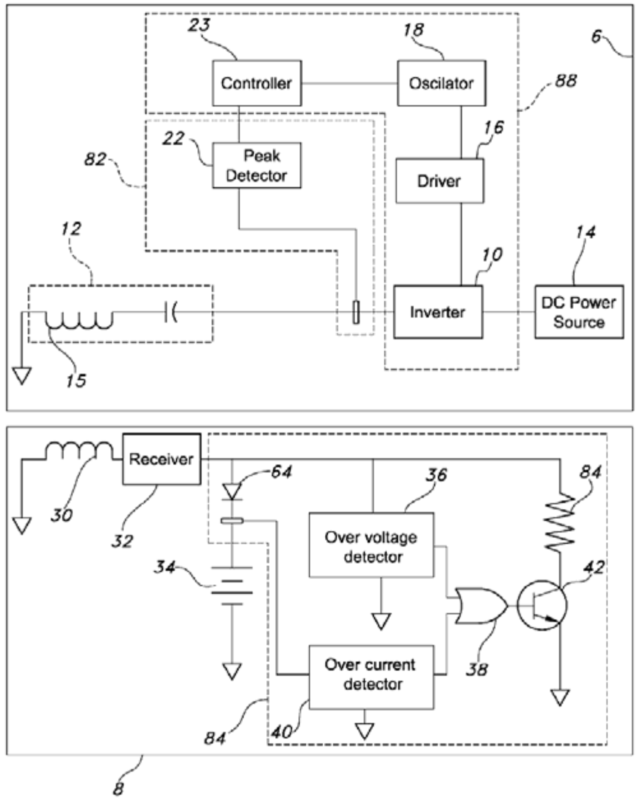


FIG. 2

(Ex. PA-31, Figure 2; Ex. PA-32, Figure 2.) The charger circuit and secondary circuit, together are a "**system for providing power inductively to a portable device comprising a battery**" wherein the secondary circuit is part of the mobile device and has an "**inductive receiver unit including a receiver coil and a receiver circuit**."

b. a primary coil that is substantially planar and parallel to a surface of the system for providing power inductively to the portable device, wherein the primary coil comprises a flexible Printed Circuit Board (PCB), multi-turn coil having multiple layers of substantially similar patterns of substantially spiral-shaped conductors of 1 to 4 ounce copper thickness for each layer and having coil patterns electrically connected with vias between the layers;

Baarman in view of *Hui*, *Odendaal*, *Shima*, and *Hui-027* discloses or suggests this limitation. (Ex. PA-DEC, ¶¶210-230.) As discussed above in Section VI.B.6.a, *Baarman* discloses an "inductive charging system" that includes a charger circuit having a primary coil 15 that provides power to the receiver. (Ex. PA-31, 4:52-5:4; Ex. PA-32, 8:19-9:9.) *Baarman* thus discloses "a **primary coil . . . for providing power inductively to the portable device**." *Baarman* does not explicitly disclose the primary coil being "substantially planar and parallel to a surface of the system for providing power inductively to the portable device" and "wherein the primary coil comprises a flexible Printed Circuit Board (PCB), multi-turn coil having multiple layers of substantially similar patterns of substantially spiral-shaped conductors of 1 to 4 ounce copper thickness for each layer and having coil patterns electrically connected with vias between the layers." However, *Hui*, *Odendaal*, and *Shima* do.

Like *Baarman*, *Hui* discloses a system for inductive charging. (Ex. PA-33, Abstract) In particular, *Hui* discloses a "**primary coil that is substantially planar and parallel to a surface of the system**." For example, *Hui* discloses "[b]ased on two planar windings on two parallel planes as shown in FIG. 3, it has been shown that both energy and signal can be transferred from one planar winding to another" ("**primary coil that is substantially planar**"). (*Id.*, [0008].)

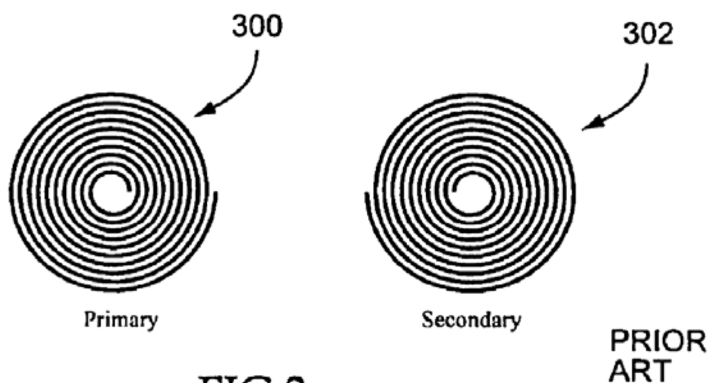


FIG.3

(*Id.*, FIG. 3.) *Hui* further discloses using "one planar winding as a primary charging pad and a separate planar winding as a secondary winding as shown in FIGS. 4a and 4b.

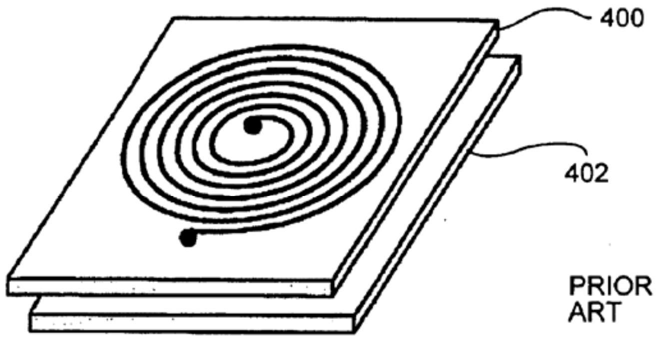
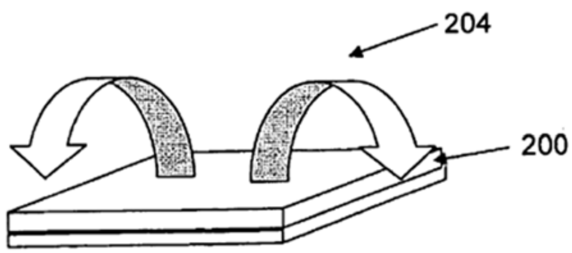


FIG.4(a)

(*Id.*, FIG. 4(a).) As shown above in Figure 4(a), the primary coil is parallel to the surface of the charger for providing power inductively to the receiver ("**primary coil that is substantially planar and parallel to a surface of the system for providing power inductively to the portable device**"). (Ex. PA-DEC, ¶211.)

Hui discloses the benefit of having the primary coil parallel to a surface of the system, which is the "lines of flux of this charging platform flow 'perpendicularly' in and out of the charging surfaces." (Ex. PA-33, ¶[0005].) "This perpendicular flow of flux is <u>very beneficial</u> because it allows the energy transfer over the surface on which the electronic equipment (to be charged) is placed." (*Id.* (emphasis added); Ex. PA-DEC, ¶212.)



(Ex. PA-33, FIG. 2.)

A POSITA looking to maximize the power transfer from the primary coil to the secondary coil for charging a portable device in *Baarman* would have looked to *Hui*, which is similarly directed towards charging of portable electronic devices using a planar inductive platform. (Ex. PA-DEC, ¶213.) Such a POSITA would have been motivated to make the primary coil substantially planar and parallel to a surface of the charger such that it would generate a magnetic field that perpendicular to the surface of the charger because "perpendicular flow of flux is <u>very beneficial</u> [as] it allows the energy transfer over the surface on which the electronic equipment (to be charged) is placed." (Ex. PA-33, ¶[0005] (emphasis added).) A POSITA would have had a reasonable expectation of success in making such a modification given that the modification would have been a straightforward combination of well-known technologies using known methods and techniques familiar to such a skilled person. (*Id.*)

To the extent *Hui* does not disclose a primary coil that is "substantially planar and parallel to a surface of the system for providing power inductively to the portable device," *Odendaal* does. *Odendaal* discloses inductive power transfer technologies/techniques, and like *Baarman*, is in the same technical field as the '371 patent. (Ex. PA-35, Title, Abstract, FIGS. 1A-4, 11-12, 1:5-3:57, 4:50-5:8, 5:24-28, 6:59-64.) Also, like *Baarman*, *Odendaal* discloses features reasonably pertinent to particular problem(s) the inventor for the '371 patent (and a POSITA) was trying to solve. (Ex. PAT-A, 1:60-5:17, 28:11-20; Ex. PA-35, Abstract, 1:5-3:57, 4:50-5:8, 5:24-28, 6:59-64.) Such teachings thus would have been consulted when designing/implementing a contactless/inductive charging system, like *Baarman*. (Ex. PA-DEC., ¶214.)

Odendaal discloses known use of **planar-type inductor coils** in an inductive power transfer system, for, *e.g.*, charging a cellphone battery. (Ex. PA-35, FIGS. 1A-1B, 2A, 2C, 8E, 1:58-2:43.) *Odendaal* describes using a planar resonator for power transfer with characteristics of an integrated inductor-capacitor transformer. (*Id.*, 1:53-57.) The planar resonator includes spirals on opposite sides used for energy transfer "so that a battery of a cellphone could be charged without physical wires." (*Id.*, 1:60-67.) The planar resonator "transfer[s] power across the interface-of-energy-transfer" (IOET) "in either an electric or **magnetic form**, or both." (*Id.*, 2:1-7, 2:7-10 ("can permit transformer action…**without** capacitive energy transfer"), 2:65-3:5, 4:44-5:8, 6:1-18.) "The spiral-shaped conductor may comprise **pcb** spiral-wound conductors" and "a battery charging circuit can be coupled to one of the…spiral shaped conductors, and **load…coupled to the other**…" where "coupling between" the battery and charger "may comprise…**magnetic coupling,** wherein power is transferred by the **coupling of…and/or magnetic flux** across the IOET." (*Id.*, 2:55-64.) Moreover, *Odendaal* discloses that the spiral coils "are preferably integrated into a **planar (flat/thin) structure**" (Ex. PA-35, 3:3-5) and may conform to the housing surface to facilitate charging a device "in close proximity" (*id.*, 2:29-44). Such arrangements disclose coils that are parallel to a system's surface.

In light of such teachings, and state-of-art knowledge, a POSITA would have been motivated, and found obvious, to modify the *Baarman* system to use a "**primary coil**" that is

"substantially planar and parallel to a surface of the system" (and complemented such a design with corresponding planar secondary coil(s) in the portable device) to expand/complement applications compatible with those contemplated by *Baarman* to use thin(ner) devices. (Ex. PA-DEC., ¶216.) Such a modification would have provided options to reduce the volume the coil(s) occupy, device size/weight, as desired by *Baarman*. (Ex. PA-31, 2:7-10, Ex. PA-32, 3:8-10.) Planar coils provided options to reduce the distance between primary/secondary coils (promoting close proximity coupling (*see e.g.*, Ex. PA-35, 2:29-44) for improving power transmission efficiency, reducing energy waste, and shortening charging time. (Ex. PA-DEC., ¶216.) A POSITA would have appreciated that implementing complementary planar coils (primary-secondary) would have promoted efficient energy transmission between the charger and receiver devices, especially where the coils were aligned to allow the perpendicular magnetic field generated by the primary coil(s) to be efficiently received by the receiving coil(s). (Ex. PA-DEC., ¶216.)

A POSITA would have had the skills and rationale in light of the teachings/suggestions of *Baarman-Odendaal*, and a POSITA's state-of-art knowledge, to implement the above-modification while considering design tradeoffs and techniques/technologies with a reasonable expectation of success, especially given that such a modification would have involved known technologies/techniques (*e.g.*, planar coils to facilitate wireless power transfer) to yield the predictable result of providing an inductive powering/charging system with thinner charger units, like that contemplated by *Baarman-Odendaal*. (Ex. PA-DEC., ¶217); *see also KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 416 (2007).

Odendaal further discloses the primary coil may be "a set of **spiral coils**…with each spiral being a conductor trace **on a separate substrate**, such as **flex** or **printed circuit board**" (Ex. PA-35, 2:19-28, 3:41-48 (multi-layer coils)) and that "number of turns of spirals" may be adjusted (*id.*, 6:59-64) ("**a flexible Printed Circuit Board (PCB), multi-turn coil having multiple layers…of substantially spiral-shaped conductors**"). In addition to reasons discussed above for modifying *Baarman* in view of *Odendaal*, a POSITA would have been motivated and found obvious to include these features, *e.g.*, a primary coil made of a flexible PCB having a set of multi-layer spiral-shaped coils, when implementing the *Baarman-Odendaal* system. (Ex. PA-DEC., ¶218.) It would have allowed forming flexible coils/substrate to be used in charger systems having different surfaces (*e.g.*, either rigid or flexible). (Ex. PA-DEC., ¶218; Ex. PA-35, 2:30-44 (disclosing a charger surface being a fabric).) Moreover, multi-layer spiral-shaped coils were known to increase the generated magnetic field. (Ex. PA-DEC., ¶218; Ex. PA-35, 3:41-48.)

A POSITA would have had the skills and rationale in light of the teachings/suggestions of *Baarman-Odendaal*, and state-of-art knowledge, to implement the above-modification while considering design tradeoffs and techniques/technologies with a reasonable expectation of success. Especially given such modification would have involved known technologies/techniques (*e.g.*, flexible PCB having a set of multi-layer spiral-shaped coils) to yield the predictable result of expanding/complementing applications of an inductive powering/charging system, like that contemplated by *Baarman-Odendaal*. (Ex. PA-DEC., ¶219); *see KSR* at 416-18. A POSITA would have been further motivated to implement in the *Baarman* system a primary coil comprising a flexible PCB, multi-turn coil having multiple layers of substantially similar patterns of substantially spiral-shaped conductors in light of the teachings of *Shima*, as explained below.

To the extent the *Baarman-Odendaal* combination does not expressly disclose a primary coil comprising multi-layer spiral-shaped flexible PCB coils having "**multiple layers of substantially similar patterns**" of spiral-shaped conductors and "**having coil patterns electrically connected with vias between the layers**," a POSITA would have found it obvious to do so given that was a common design for interconnecting multi-layer PCB circuit arrangements, as exemplified by *Shima*. (Ex. PA-DEC., ¶220.)

Shima, like *Baarman-Odendaal*, discloses an inductive power/signal transfer system using primary and secondary coils (Ex. PA-34, Abstract, 1:42-50, 2:12-4:10, 5:62-6:53, 7:17-8:38), and thus is similarly in the same technical field as the '371 patent. (Ex. PAT-A, Abstract.) Likewise, *Shima* discloses features reasonably pertinent to particular problem(s) the '371 patent inventor and a POSITA was trying to solve. (Ex. PAT-DEC., ¶221.) Therefore, a POSITA had reasons to consider/consult *Shima* when looking to design/implement the above-discussed *Baarman-Odendaal* system. (*Id.*)

Shima discloses coils having similar spiral patterns that reside on different layers of PCBs ("**coil having multiple layers of substantially similar patterns of substantially spiral-shaped conductors**"), where the coil patterns are connected by through-holes (which a POSITA would have understood to be "vias"). (Ex. PA-DEC., ¶222.) For example, FIG. 3A (below) is described having "a plurality of thin printed-circuit substrates 30-1 to 30-n having similar coil patterns 32-1 to 32-n." (Ex. PA-34, 5:62-6:1, FIGS. 3D-3E (below), 6:13-35.) Starting and terminating ends of the coil patterns are connected using through-holes 33 and 34, respectively. (*Id.*, 6:4-21.) Layers of loop patterns (*e.g.*, 37-1 to 37-n (FIG. 5A (below))) may also "have the respective through-holes [39] connected in such a way that a spiral coil is formed in the direction in which the printed-circuit substrates 30-1 to 30-n are stacked." (*Id.*, 7:17-35.)

FIG. 3A

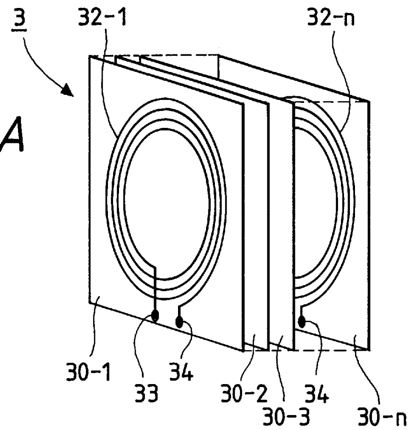


FIG. 5A

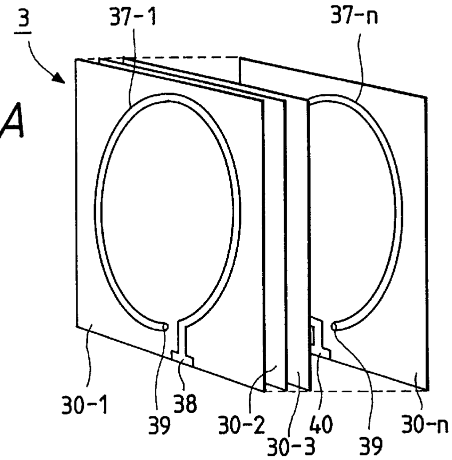


FIG. 3D

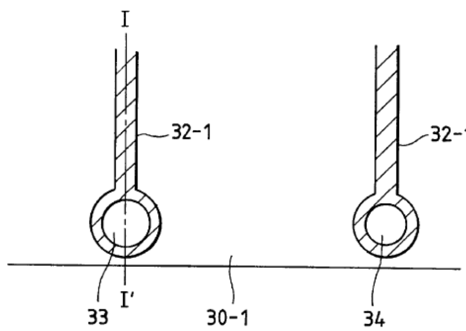
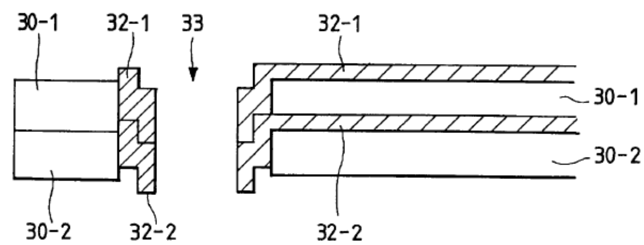


FIG. 3E



(Ex. PA-34, FIGs. 3A, 3D, 3E, 5A.)

In view of *Shima* and *Odendaal*, a POSITA would have been motivated and found obvious to configure/implement the primary coils in the *Baarman* system as a flexible PCB multi-turn coil having layers of substantially similar patterns of substantially spiral-shaped conductors with coil patterns electrically connected with vias between the layer to maintain continuity while providing a compact coil configuration with enhanced efficiency and reduced conductor resistance as suggested by *Shima*. (Ex. PA-DEC., ¶223; Ex. PA-34, 6:47-53, 7:41-44, 8:28-33.) A POSITA would have appreciated the versatility in applications taught by *Baarman* and known stacked PCB coil designs and ways to interconnect them (vias) (*Shima/Odendaal*), and thus been motivated to design/implement various system designs that were consistent with such applications, including thin form factor configurations. Moreover, implementing a coil with layers having substantially similar patterns would have reduced the complexity of designing and manufacturing as compared to a multi-layer coil having different patterns. (Ex. PA-DEC., ¶223.)

A POSITA would have had the skill and rationale in implementing, and reasonable expectation of success in achieving, such a modification, especially since it was known to use vias to connect multi-layered flexible PCBs. (Ex. PA-DEC., ¶224;) Thus, such a modification would have involved applying known technologies/techniques to yield the predictable result of providing a charger with multi-layer flexible PCB primary coils that would have performed power/signal communications consistent with that discussed above for the *Baarman-Odendaal* system. *KSR* at 416-18.

While *Baarman-Odendaal-Shima* discloses/suggests the above-discussed primary coil features, the combination does not expressly disclose that the multi-layer coil has "**1 to 4 ounce copper thickness for each layer**." Nevertheless, a POSITA would have found it obvious to implement such a feature given that copper PCB-coils were well-known and thickness thereof was commonly designed within that range, as exemplified by *Hui-027*. (Ex. PA-DEC., ¶225.)

Hui-027, like *Baarman-Odendaal-Shima*, discloses an inductive power/signal transfer system using primary and secondary coils (Ex. PA-36, Abstract, ¶¶[0001]-[0004], [0030]-[0033], [0039]-[0042], [0065], [0067], Table I, FIGS. 1, 2, 3a, and 3b), and thus is similarly in the same technical field as the '371 patent. (Ex. PAT-A, Abstract.) Likewise, *Hui-027* discloses features reasonably pertinent to particular problem(s) the '371 patent inventor and a POSITA was trying to solve. (Ex. PAT-A, Abstract, Ex. PA-DEC., ¶226.) Therefore, a POSITA had reasons to consider/consult *Hui-027* when looking to design/implement the *Baarman-Odendaal-Shima* inductive charging system discussed above. (Ex. PA-DEC., ¶226.)

Hui-027 discloses PCB coils made of copper of certain thickness. For instance, Table I (below) shows that the PCB coils of FIGS. 3a and 3b (below) have a "Copper Track Thickness" of "70 µm (**2 Oz/ft^2**)" and FIG. 3b illustrates that the "Conductor **Thickness**" corresponds to that of the primary winding. (Ex. PA-36, ¶¶[0004], [0030], FIGS. 3a and 3b.)

TABLE I

Geometric Parameters of the PCB Transformer

Geometric Parameter	Dimension
Copper Track Width	0.25 mm
Copper Track Separation	1 mm
Copper Track Thickness	70 μm (2 Oz/ft^2)
Number of Primary Turns	10
Number of Secondary Turns	10
Dimensions of Ferrite Plates	25 mm × 25 mm × 0.4 mm
PCB Laminate Thickness	0.4 mm
Insulating Layer Thickness	0.228 mm
Transformer Radius	23.5 mm

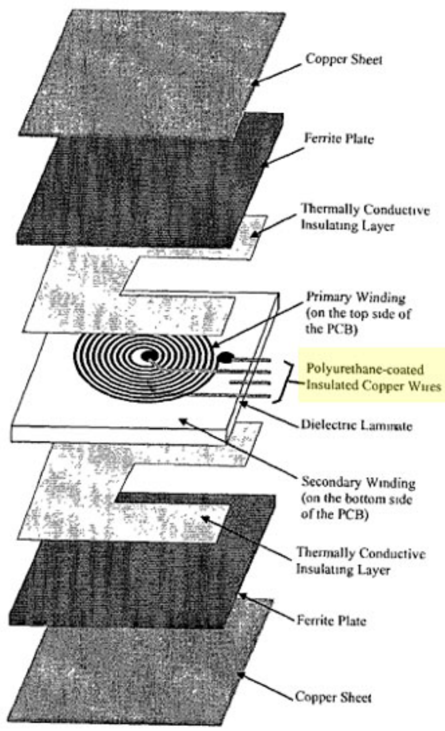


Fig. 3a.

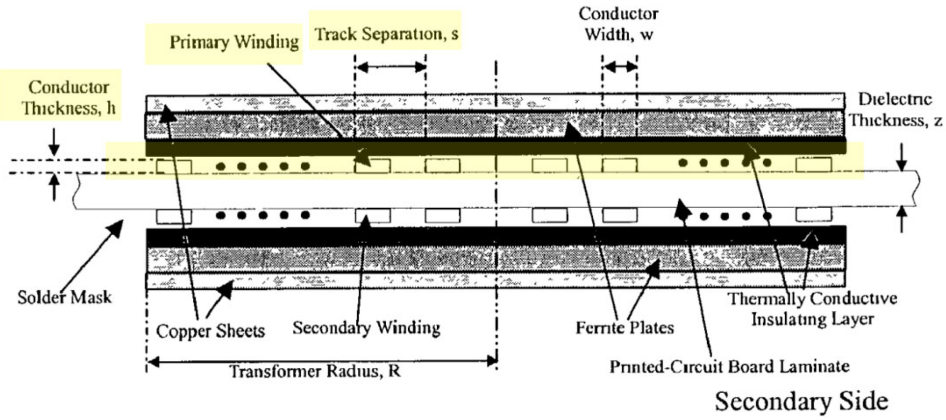


Fig. 3b.

(Ex. PA-36, Table I, FIGs. 3a, 3b (annotated).)

In view of *Hui-027*, a POSITA would have been motivated and found obvious to configure/implement the above-modified primary coil in the *Baarman-Odendaal-Shima* system with spiral-shaped copper conductors having a thickness of a few ounces (*e.g.*, 1 to 4 ounces) for each layer, as suggested by *Hui-027*, especially when the *Baarman-Odendaal*, while disclosing use of PCB coils, does not provide specifics regarding type of coil material and its thickness. (Ex. PA-DEC., ¶228.) Indeed, the '371 patent acknowledges that "[m]ost common PCBs use 1-2 oz copper PCBs." (Ex. PAT-A, 22:1-2.)

Moreover, using a multi-layer coil having "**1 to 4 ounce copper thickness for each layer**" would have been a matter of routine optimization of a result-effective variable (the thickness of copper, which may affect electrical conductivity/weight of the coil), well within a POSITA's grasp and technical ability, as acknowledged by the '371 patent. (Ex. PAT-DEC., ¶229.) *See E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1010 (Fed. Cir. 2018) ("[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.") (quoting *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980)).

Additionally, a POSITA would have had the skill and rationale in implementing, and reasonable expectation of success in achieving, such a modification. (Ex. PAT-DEC., ¶230.) Especially since it was known to use a multi-layer coil having a thickness of a few ounces, *e.g.*, 2 oz. (Ex. PA-36, Table 1; Ex. PAT-A, 22:1-2.) Thus, such a modification would have involved applying known technologies/techniques to yield the predictable result of providing a charger with a (primary) copper coil having a certain thickness, *e.g.*, 2 oz, which would have performed power/signal communications consistent with that discussed above for the *Baarman-Odendaal-Shima-Hui-027* system. *KSR* at 416-18.

c. a drive circuit, including a FET driver, a capacitor and a FET switch, coupled to a DC voltage input and coupled to the primary coil, wherein during operation the drive circuit is configured to apply an alternating electrical current to the primary coil at an operating frequency within a range of 100 kHz to 1 MHz and duty cycle to generate an alternating magnetic field in a direction substantially perpendicular to the surface of the primary coil to provide power inductively to the portable device;

Baarman in view of *Hui* discloses or suggests this limitation. (Ex. PA-DEC, ¶¶231-238.) For example, *Baarman* discloses a charger circuit that provides power to a secondary circuit to charge a battery. (Ex. PA-31, 4:52-5:4, Ex. PA-32, 8:19-9:9.) As shown in Figure 2, reproduced below, the charger circuit includes a frequency controller 80, a primary coil 15, and a feedback detector 82. (Ex. PA-31, 5:5-24; Ex. PA-31, 8:19-9:9.) The frequency controller includes a controller 20, an oscillator 18, a driver 16 ("**a FET driver**"), and an inverter 10. (Ex. PA-31, 5:5-24; Ex. PA-31, 9:10-23.) These components (controller, oscillator, driver, and inverter) collectively drive a tank circuit 12, which includes <u>a capacitor</u> ("**a capacitor**"). (Ex. PA-31, 5:5-24, FIG. 2; Ex. PA-31, 10:1-6, 12:7-14, Figures 2, 4.) Specifically, the inverter 10 provides AC power to the tank circuit 12 from a source of DC power 14 ("**a DC voltage input**"). (Ex. PA-31, 5:5-24, Ex. PA-32, Figure 2, 9:10-23.) The driver 16 provides the signals necessary to operate the switches ("**FET switch**") within the inverter 10. (Ex. PA-31, 5:5-24, FIG. 4B (showing inverter configuration); Ex. PA-32, 9:10-23.) The driver operates at a frequency set by the oscillator 18, which is controlled by the controller 20. (Ex. PA-31, 5:5-24; Ex. PA-32, 9:10-23.)

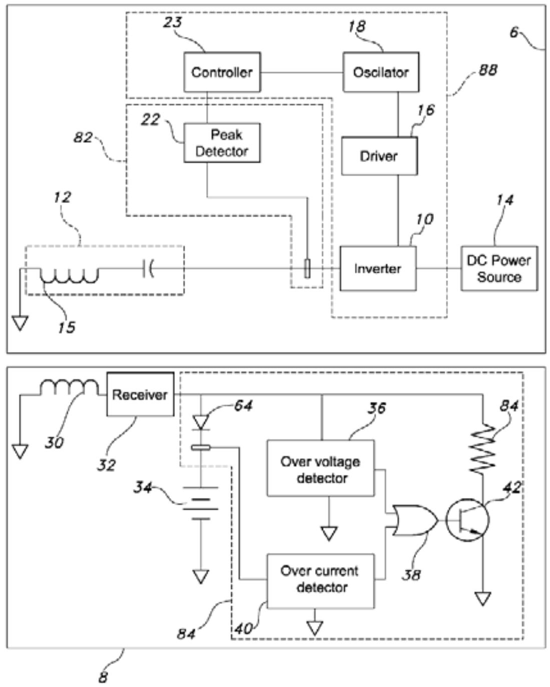


FIG. 2

(Ex. PA-31, Figure 2; Ex. PA-32, Figure 2.) As shown in Figure 2 the driver circuit is coupled to the DC Power Source 14 ("**coupled to a DC voltage input**") and the primary coil 15 ("**coupled to** . . . **the primary coil**"). (Ex. PA-31, 5:5-24, Figure 2; Ex. PA-32, 9:10-23, Figure 2.) Thus, *Baarman* discloses "**a drive circuit, including a FET driver, a capacitor and a FET switch, coupled to a DC voltage input and coupled to the primary coil**."

Baarman also discloses "**during operation the drive circuit is configured to apply an alternating electrical current to the primary coil**." In particular, *Baarman* discloses the inverter 10 (part of the drive circuit) "provides AC (alternating current) power to the tank circuit 12 from a source of DC (direct current) power 14. The tank circuit 12 includes the primary coil 15." (Ex. PA-31, 5:10-15; Ex. PA-32, 9:10-23.) *Baarman* thus discloses the driver circuit applying AC current to the primary coil, as claimed. (Ex. PA-DEC, ¶232.)

Baarman does not explicitly disclose applying an alternating electrical current to the primary coil "**at an operating frequency within a range of 100 kHz to 1 MHz and duty cycle to generate an alternating magnetic field in a direction substantially perpendicular to the surface of the primary coil to provide power inductively to the portable device**." However, *Hui* discloses these limitations.

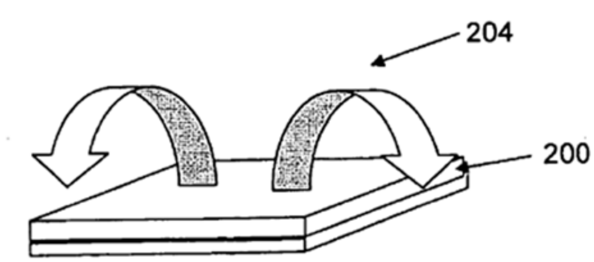
For example, *Hui* discloses:

> By choosing the resonant frequencies of both primary and secondary resonant circuits to be identical or as close as possible, energy transfer between them can be optimized. With the use of a core-based planar inductor in this proposal, the inductance value of Lr can be much greater than that of a coreless spiral winding as in the prior art. Therefore, according to the above equation, the resonant frequencies of both of the primary and secondary circuit can be selected at a relatively low frequency range (e.g. 100 kHz to 450 kHz) instead of 950 kHz as in the case of the prior art.

(Ex. PA-33, [0058], [0012], ("The present invention addresses problem (2) and provides a simple and more effective secondary device to enable energy transfer between the primary planar charging platform and the secondary module more effectively at a much lower operating frequency (eg as low as 100 kHz).").) *Hui* thus discloses applying an alternating electrical current to the primary coil "**at an operating frequency within a range of 100 kHz to 1 MHz and duty cycle**," as claimed. A signal having a frequency necessarily has a "**duty cycle**."

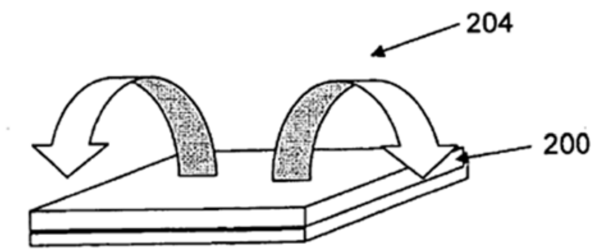
A POSITA would have been motivated to use the frequency range (100 kHz to 450 kHz) of *Hui* as it "offers the designer the freedom to select the appropriate operating frequency for the entire charging system in order to optimize the system performance for meeting various requirements and international standards." (Ex. PA-33, [0058].) Moreover, *Hui* also discloses "[b]y choosing the resonant frequencies of both primary and secondary resonant circuits to be identical or as close as possible, energy transfer can be optimized." (*Id.*)

Hui also discloses generating "**an alternating magnetic field in a direction substantially perpendicular to the surface of the primary coil to provide power inductively to the portable device**," as claimed. For example, *Hui* discloses an "inductive battery charging platform" in Figure 2, where the "lines of flux of this charging platform flow 'perpendicularly' in and out of the charging surfaces." (Ex. PA-33, ¶[0005].) "This perpendicular flow of flux is very beneficial because it allows the energy transfer over the surface on which the electronic equipment (to be charged) is placed." (*Id*. (emphasis added).)



(*Id.*, FIG. 2.)

In one embodiment, *Hui* discloses charging a battery pack in a mobile phone by placing the mobile phone over the "planar charging platform of FIG. 2 (which has the magnetic flux lines flowing into and out of the charging surface perpendicularly)." (*Id.*, ¶[0050].) In particular, an "energy receiving element in the form of a simple planar device is introduced [into] this battery pack structure so that this battery pack can be charged inductively by the planar charging platform of FIG. 2." (*Id.*) The "energy receiving element" includes an "energy pick-up coil," which is "essentially a planar inductor." (*Id.*, ¶[0051].)



(Ex. PA-32, FIG. 2.)

A POSITA looking to maximize the power transfer from the primary coil 26 to the secondary coil 25 for charging a portable device in *Baarman* would have looked to *Hui*, which is similarly directed towards charging of portable electronic devices using a planar inductive platform. (PA-DEC at ¶238.) Such a POSITA would have been motivated to configure the magnetic field generated by *Hsu*'s primary coils 26 to be perpendicular to the surface of the powering device 20 because "perpendicular flow of flux is very beneficial [as] it allows the energy transfer over the surface on which the electronic equipment (to be charged) is placed." (Ex. PA-33, ¶[0005] (emphasis added).) A POSITA would have had a reasonable expectation of success in making such a modification given that the modification would have been a straightforward combination of well-known technologies using known methods and techniques familiar to such a skilled person. (PA-DEC at ¶238.)

d. a sense circuit to monitor current flow through the primary coil during operation of the drive circuit to sense a current modulation in the primary coil from a modulation of a current in the receiver coil; and

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶¶239-241.) For example, *Baarman* discloses the secondary circuit includes a feedback mechanism for providing feedback to the charger circuit. (Ex. PA-31, 5:41-44; Ex. PA-32, 10:8-11:13.) As shown in Figure 2 of *Baarman*, the feedback mechanism includes an over-voltage detector 36 and an over-current detector 40. (Ex. PA-31, 5:41-44; Ex. PA-32, 10:8-11:13.) The overvoltage and overcurrent detectors indicate whether the current or voltage of the battery is above a predetermined amount. (Ex. PA-31, 5:44-49; Ex. PA-32, 10:8-11:13.) The overvoltage and overcurrent detectors are connected to an OR gate 38 which is connected to rectifier and switch 42. (Ex. PA-31, 5:49-53; Ex. PA-32, 10:8-11:13.) The switch 42 is controlled by the OR gate and is connected in series between the rectifier and the resistor, which is connected to ground. (Ex. PA-31, 5:41-59; Ex. PA-32, 10:8-11:13.)

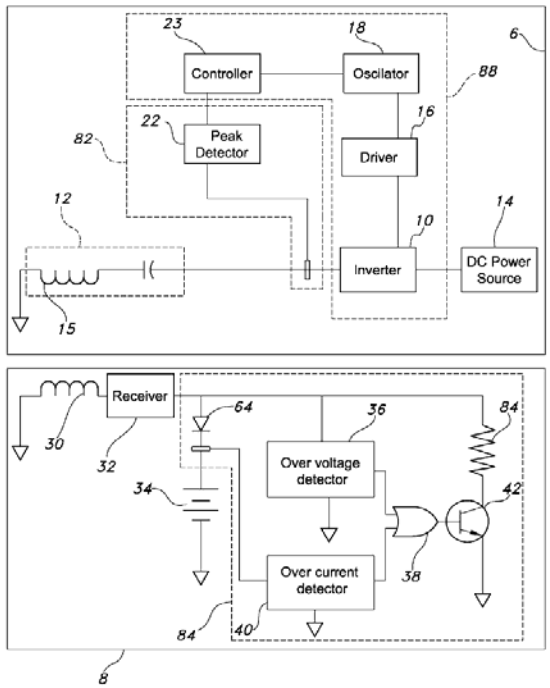


FIG. 2

(Ex. PA-31, Figure 2; Ex. PA-32, Figure 2.)

If either an over voltage or an over current condition is detected in the secondary circuit by the overvoltage or overcurrent detectors, then the OR gate activates switch 42 to shunt power from the rectifier to the resistor 44 to ground, to protect the battery from overvoltage or overcurrent conditions. (Ex. PA-31, 5:60-65; Ex. PA-32, 10:8-11:13.)

When the current is shunted through the resistor in the secondary, as a result of an overvoltage or overcurrent condition, the current through the secondary coil increases which varies the reflected impedance of the secondary circuit resulting in increased current through the primary coil. (Ex. PA-31, 5:66-6:8; Ex. PA-32, 10:8-11:13.) The increase in current through the primary coil is detected by the peak detector in the primary circuit ("**a sense circuit to monitor current**

flow through the primary coil during operation of the drive circuit to sense a current modulation in the primary coil from a modulation of a current in the receiver coil"). (Ex. PA-31, 5:66-6:8; Ex. PA-32, 10:8-11:13.) The controller 20 in the charger then makes an appropriate adjustment to the frequency to correct the over-voltage or over-current state by adjusting the power supplied to the secondary coil. (Ex. PA-31, 5:66-6:8; Ex. PA-32, 10:8-11:13.)

e. a communication and control circuit, including a microcontroller coupled to the drive circuit and the sense circuit, configured to:

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶242.) For example, as shown in Figure 2, *Baarman* discloses the charger circuit includes a controller 20. (Ex. PA-31, 5:5-24; Ex. PA-32, 9:10-24.) *Baarman* discloses the controller may be "a microcontroller, such as a PIC18LF1320, or a more general purpose microprocessor. (Ex. PA-31, 5:5-24; Ex. PA-32, 9:10-24.) *Baarman* also discloses the controller is connected to the oscillator, which controls the frequency of driver ("**a communication and controller circuit, including a microcontroller coupled to the drive circuit**"). (Ex. PA-31, 5:17-24; Ex. PA-32, 9:10-24.)

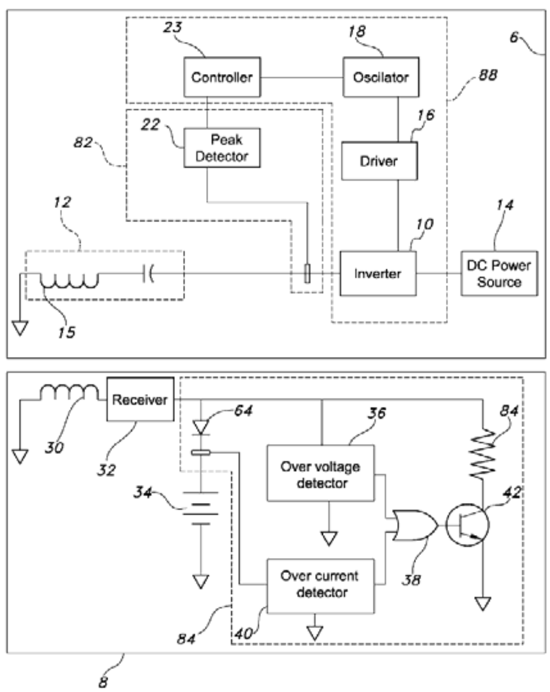


FIG. 2

(Ex. PA-31, Figure 2; Ex. PA-32, Figure 2.) As shown in Figure 2, the controller is coupled to the peak detector 22 ("**a communication and control circuit [] coupled to the [] sense circuit**"). (Ex. PA-31, Figure 2; Ex. PA-32, Figure 2.) Moreover, *Baarman* discloses the controller uses signals from the feedback detector (part of the sense circuit) to "assist in determining the frequency of operation for the oscillator 18, and thereby the frequency of the inverter 10." (Ex. PA-31, 5:25-29; Ex. PA-32, 10:1-6.)

> (1) detect, through the sense circuit, a received communication of information in the current modulation in the primary coil;

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶243.) As discussed in section VI.B.6.d, as a result of an overvoltage or overcurrent condition, the current through the secondary coil increases which varies the reflected impedance of the secondary circuit resulting in increased current through the primary coil. (Ex. PA-31, 5:60-6:8; Ex. PA-32, 11:3-13.) The increase in current through the primary coil is detected by the current sensor in the primary circuit ("**detect, through the sense circuit, a received communication of information in the current modulation in the primary coil**"), thereby providing the controller 20 a signal regarding an over-voltage or over-current state. (Ex. PA-31, 5:60-6:8; Ex. PA-32, 11:3-13.) "The controller 20 then changes the frequency of oscillator 18." (Ex. PA-31, 5:60-6:8; Ex. PA-32, 11:3-13.)

> (2) operate the drive circuit to inductively transfer sufficient power to the inductive receiver unit to activate and power the receiver circuit to enable the receiver circuit to communicate the information in the current modulation in the primary coil;

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶244.) *Baarman* discloses that the controller 20 drives the drive circuit to inductively transfer sufficient power to the inductive receiver unit to activate and power the receiver circuit ("**operate the drive circuit to inductively transfer sufficient power to the inductive receiver unit to activate and power the receiver circuit")**. (Ex. PA-31, 5:9-24, 5:35-38, 6:23-26; Ex. PA-32, 9:10-24, 15:1-5.) The secondary circuit receives this power and in the process of receiving the power and charging the battery, checks "when the current applied to the battery 34 exceeds a threshold value or when the voltage applied to the battery 34 exceeds the threshold value." (Ex. PA-31, 5:34-41; Ex. PA-32, 10:7-11:13.) If there is an overvoltage or over current, that is communicated to the charger circuit through current modulation in the receiver and primary coils. (Ex. PA-31, 5:60-6:8; Ex. PA-32, 10:7-11:13.) Thus, *Baarman* discloses that controller 20 "**enable[s] the receiver circuit to communicate the information in the current modulation in the primary coil**."

(3) from the information communicated by the receiver circuit, determine a power parameter; and

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶245.) Baarman discloses that the controller 20 determines a frequency ("**power parameter**") of the oscillator based on the information communicated by the secondary circuit. (Ex. PA-31, 2:22-28 ("The secondary circuit includes a feedback mechanism to provide feedback to the charger circuit through the inductive coupling of the primary coil and the secondary coil. The charger circuit includes a frequency control mechanism for controlling the frequency of the power applied to the primary coil at least partly in response to the feedback from the feedback mechanism."), 2:38-62 (frequency control mechanism in charger adjusts frequency in response to feedback), 4:65-67, 5:25-33, 5:60-6:8; Ex. PA-32, 10:7-11:13, 3:15-23.)

(4) operate the drive circuit according to the power parameter to provide power inductively from the primary coil to the receiver coil to power the microcontroller and to charge the battery of the portable device, wherein to charge the battery of the portable device the communication and control circuit is further configured to:

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶246.) As discussed in Section VI.B.6.e.3, once a feedback signal is received, the operating frequency of the drive circuit is adjusted based on the received feedback. Therefore, *Baarman* discloses operating the drive circuit according to the power parameter (the frequency) to provide power inductively from the primary coil to the receiver coil to power the microcontroller and to charge the battery of the portable device.

(5) receive additional information in the current modulation in the primary coil from modulation of the current in the receiver coil corresponding to a voltage or current at an output of the receiver circuit while charging the battery of the portable device; and

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶247.) The secondary circuit checks "when the current applied to the battery 34 exceeds a threshold value or when the voltage applied to the battery 34 exceeds the threshold value." (Ex. PA-31, 5:34-41; Ex. PA-32, 10:7-11:13.) If there is an overvoltage or over current, that is communicated to the charger circuit through current modulation in the receiver and primary coils. (Ex. PA-31, 5:60-6:8; Ex. PA-32, 11:3-13.) Furthermore, "as the charge on the battery 34 is increased and a feedback signal is detected, then the system gradually increases the operating frequency of the inverter 10, thereby reducing the power transferred to the battery 34." (Ex. PA-31, 9:6-9; Ex. PA-32, 18:1-6.) "[T]he impedance of the secondary circuit (for example, resulting from changes in resistance) are used to generate a feedback signal." (Ex. PA-31, 9:45-50; Ex. PA-32, 19:6-11.)

> (6) regulate in a closed loop feedback manner, the voltage or current at the output of the receiver circuit in accordance with the received additional information corresponding to the voltage or current at the output of the receiver circuit by adjusting at least one of the operating frequency, the duty cycle, and the DC voltage input to the drive circuit during charging of the battery of the portable device.

Baarman discloses or suggests this limitation. (Ex. PA-DEC, ¶248.) For example, *Baarman* discloses:

> Thus, as the charge on the battery 34 is increased and a feedback signal is detected, then the system gradually increases the operating frequency of the inverter 10, thereby reducing the power transferred to the battery 34. The increase in the operating frequency continues until feedback signals are no longer received, in which case power is provided to the battery 34 over a longer period of time, thereby allowing the battery 34 to charge to a maximum.

(Ex. PA-31, 9:6-14; Ex. PA-32, 18:1-6.) *Baarman* thus disclosing continually adjusting the frequency of the inverter (part of the drive circuit) in a closed loop manner to regulate the current in the receiver circuit until feedback signals are no longer received, in which case the battery is allowed to charge to maximum charge. (Ex. PA-31, 9:6-14; Ex. PA-32, 18:1-6.)

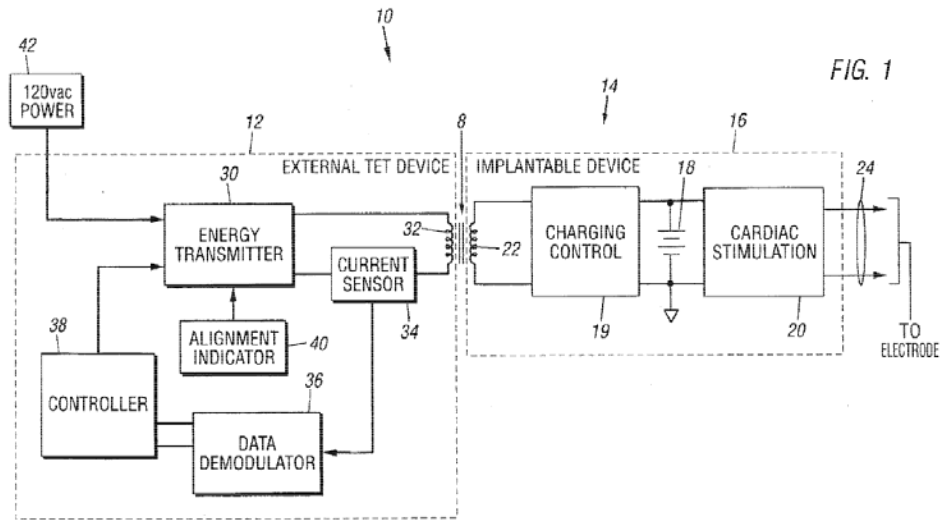
C. SNQ3: *Partovi* in View of *Nedungadi* Discloses or Suggests Claim 30

SNQ3 relies upon a break in priority for claim 30. Specifically, as discussed above in Section VI.A.1.b, claim 30 is not entitled to the filing date of the '876 Application. Therefore, *Partovi* is prior art to claim 30.

1. Overview of *Nedungadi*

Nedungadi issued on February 3, 1998 and thus qualifies as prior art pursuant to pre-AIA 35 U.S.C. § 102(e).

Nedungadi discloses an implantable device, having a battery, that is capable of being inductively charged by an external transcutaneous device (labelled "External TET Device" in Figure 1). (Ex. PA-2, 5:34-56.) As shown in Figure 1 of *Nedungadi* the external TET device has a coil 32 that is used to provide power to the coil 22 of the implantable device. *Id.* *Nedungadi* discloses the implantable device 14 may communicate with the external TET device 12. *Id.* This communication may include the control circuitry 19 in the implantable device "sampl[ing] battery and voltage and current" and then "transmit[ting] that data to TET 12 via coils 32, 22, in order to control the energy transmission between TET device 12 and implantable device 14." *Id.*



(Ex. PA-2, Figure 1.) To transmit the "sampled data," the charging control circuit of the implantable device "alternately disconnects and reconnects the battery from the charging circuit in a predetermined manner, causing the current in the coil 32 of TET device 12 to change in response to the change in load across coil 22." (Ex. PA-2, 5:45-51.) The resulting change in the current of the charging coil 32 can be detected by "current sensor 34 and transmitted to data demodulator 36 . . . [which] decodes voltage and current values and communicates these values to controller 38 which, pursuant to predetermined parameters, control the power output of the transmitter 30." (Ex. PA-2, 5:51-56.)

2. Claim 30

a. A portable device comprising:

To the extent the preamble is limiting, *Partovi* discloses this limitation. (Ex. PA-DEC, ¶¶249-252.) *Partovi* discloses a system for "powering or charging electrical, electronic, battery-operated, mobile, rechargeable batteries." (Ex. PA-1, ¶[0091].) The system includes "two parts." (*Id.*) "The first part is a pad or similar base unit that contains a primary, which creates an alternating magnetic field by means of applying an alternating current to a winding, coil, or any type of current carrying wire." (*Id.*) "[T]he pad can also contain multiple coils or sections to charge or power various devices or to allow charging or powering of devices or batteries placed anywhere on the pad." (*Id.*) *Partovi* discloses many examples of such a charging pad. For example, "FIG. 3 shows a charging pad using multiple coils" whereas "FIG. 4 shows a charging pad using multiple overlapping coil layers." (*Id.*, ¶¶[0121]-[0122].) Further examples of the coil arrangement in the charging pad are set forth with reference to Figures 36-38. (*Id.*, ¶¶[0051]-[0053].)

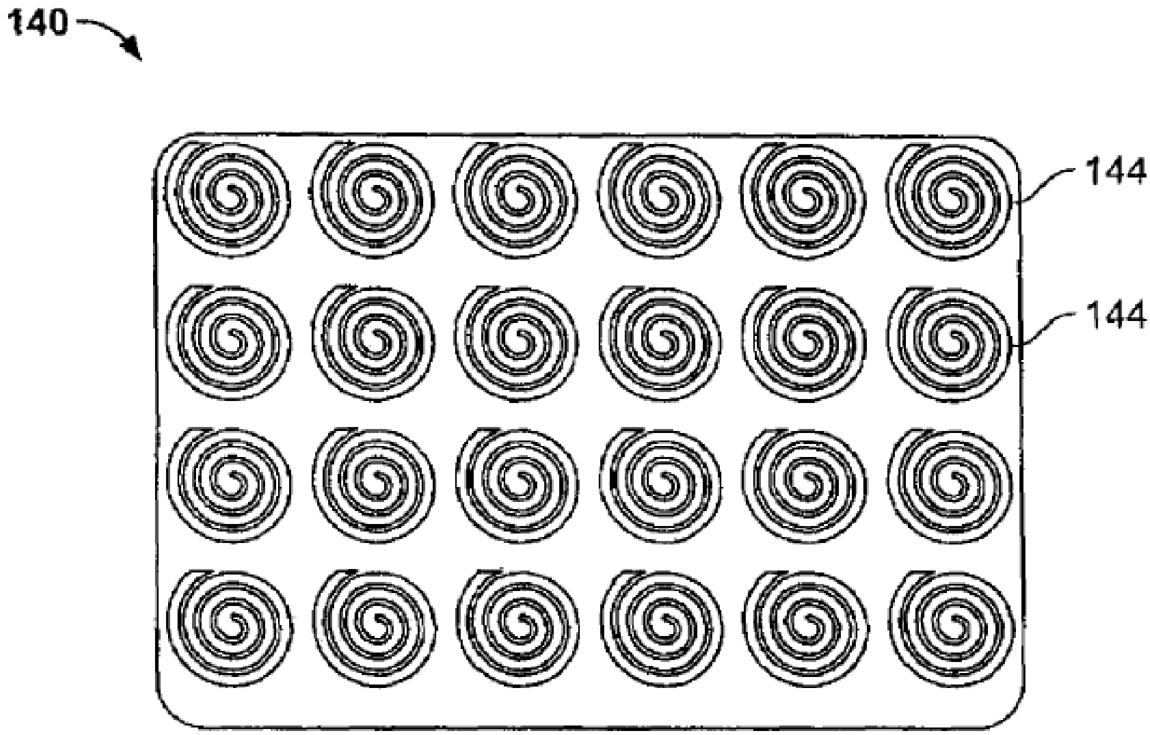


FIG. 3

(*Id.*, FIG. 3.)

"The second part of the system is a receiver that comprises a means for receiving the energy from the alternating magnetic field from the pad and transferring it to a mobile battery, or other device. The receiver can comprise coils, windings, or any wire that can sense a changing magnetic field, and rectify it to produce a direct current (DC) voltage, which is then used to charge or power the device or battery." (*Id.*, ¶[0091].) The "receiver can also contain circuitry to sense and determine the status of the electronic device or battery to be charged, the battery inside a device, or a variety of other parameters and to communicate this information to the pad." (*Id.*, ¶[0092].)

A specific example of the circuitry associated with the charging pad and the receiver is set forth with reference to "FIG. 34," which "shows the main components of a more advanced wireless power/charging system." (*Id.*, ¶[0285].) As shown in Figure 34, charger provides power to a receiver, which is integrated into a mobile device or electronic device battery. (*Id.*, ¶[0285].) Moreover, the primary coil L1 (*see* Figure 34) can be one or more coils of the charging pad. (*Id.*, ¶[0287] ("[a]t the beginning of charging (when a device is placed on a pad first) . . ."), ¶¶[0323]-[0339], [0364] ("If a receiver coil is placed on the pad, it will cause the appropriate charger or power supply coil center port to contact the pad on the flexible film and therefore the appropriate coil is contacted to points A and C in FIG. 34.").) *Partovi* thus discloses a system, comprising a charger and receiver for charging portable devices.

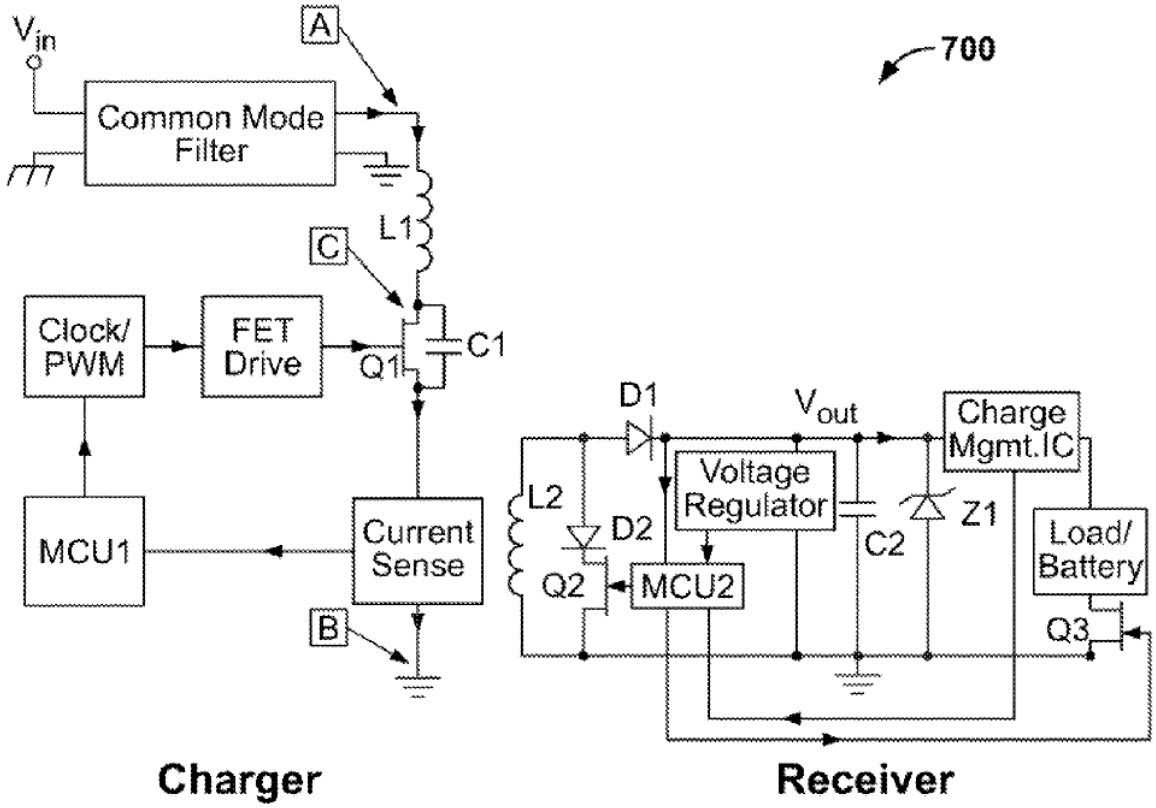


FIG. 34

(*Id.*, FIG. 34.)

The above-described mobile device is the claimed "**portable device**."

b. a battery; and a receiver unit, coupled to the battery, configured to receive inductive power from an inductive charging system including a base unit with a primary coil and associated circuit, the receiver unit comprising:

Partovi discloses this limitation. (Ex. PA-DEC, ¶253.) For example, as shown in Figure 34, a charger ("**base unit**") provides power inductively to a receiver ("**receiver unit**") which is integrated into a mobile device. (Ex. PA-1, ¶[0285].) In particular, *Partovi* discloses the FET Driver may be periodically started and primary coil L1 ("**primary coil and associated circuit**") may be switched at high frequency in order to sense the presence of a nearby device capable of drawing power. (Ex. PA-1, ¶[0290].) *Partovi* further discloses if a receiver is nearby the emitted power from the primary coil L1 will power the receiver circuit and subsequently begin charging the battery coupled to the receiver ("**a receiver unit, coupled to the battery, configured to receive inductive power from an inductive charging system including a base unit with a primary coil and associated circuit, the receiver unit comprising**." (*Id.*, ¶[0295]; *see also id.*, claim 13.)

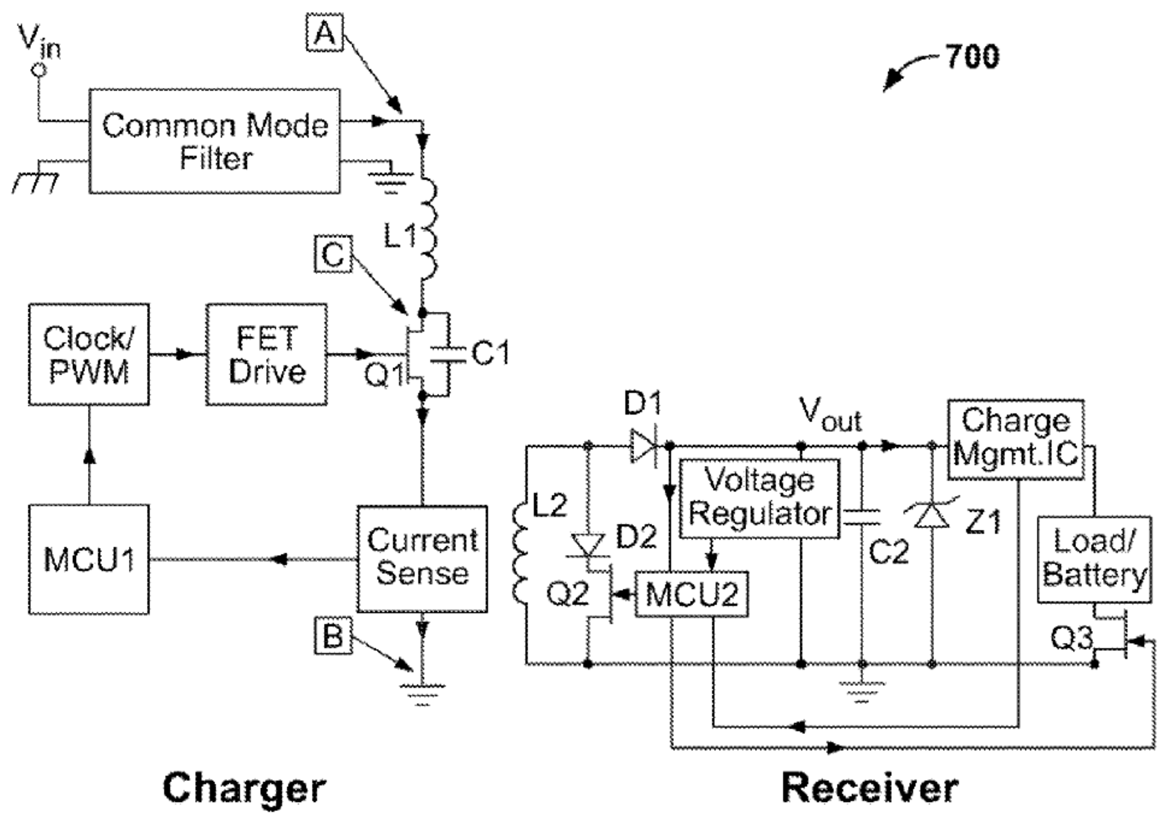


FIG. 34

(*Id.*, FIG. 34.)

c. a receiver coil having a substantially planar shape and located parallel to a surface of the portable device so that an alternating magnetic field, when received through the surface of the portable device from the primary coil in the base unit in a direction substantially perpendicular to the plane of the receiver coil, inductively generates a current in the receiver coil to provide power inductively to the portable device when the portable device is placed on the base unit for charging the battery of the portable device;

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶254-258.) *Partovi*'s Figure 34 receiver includes a receiver coil L2 ("**a receiver coil**"). (Ex. PA-1, FIG. 34.)

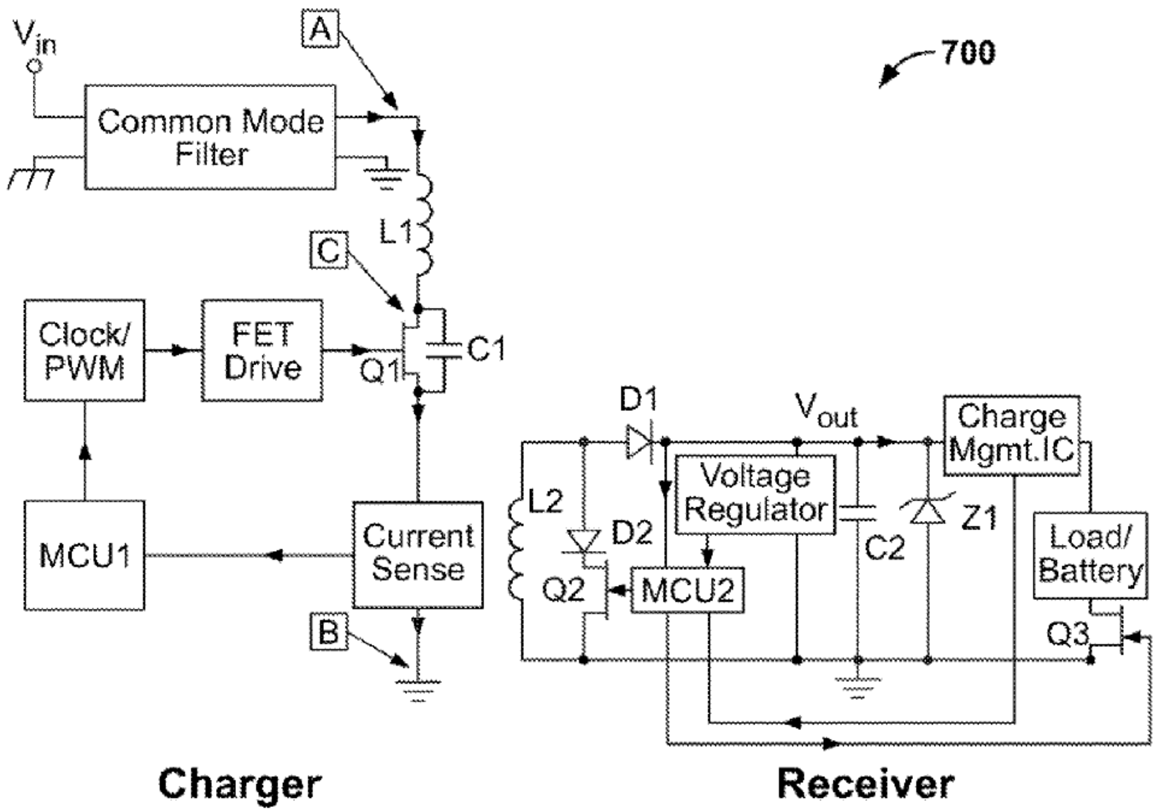


FIG. 34

(*Id.*, FIG. 34.)

The receiver coil is "**substantially planar in shape**." (*Id.*, ¶[0225] ("[T]he system can use a non-ferrite material for both the primary and the secondary (receiver) coils . . . As also described above the coils can be formed in any number of different shapes, including, for example, flat or planar hexagonal shapes, or spirals. The coils can also be distributed in layers of coils, spirals, and other various shapes."); claim 1 ("a receiver unit, including a receiver coil also composed of a non-ferrite material and shaped as a planar spiral coil, which is coupled to or incorporated into a portable device or battery, wherein the secondary coil receives energy inductively from the primary coil and uses it to charge or power the portable device or battery.").)

Furthermore, coil L2 is "**located parallel to a surface of the portable device**." In particular, Figure 16 of *Partovi* shows cell phones 340 ("**portable devices")** placed on a surface of the charging pad 330 and receiving power (*id.*, ¶¶[0031], [0200]) As shown below in Figure 16 of *Partovi*, the mobile device surface and associated receiver coil L2 are parallel to the surface of the charging pad upon which the cellphones sit ("**a receiver coil having a substantially planar shape and located parallel to a surface of the portable device**"). (*Id.*)

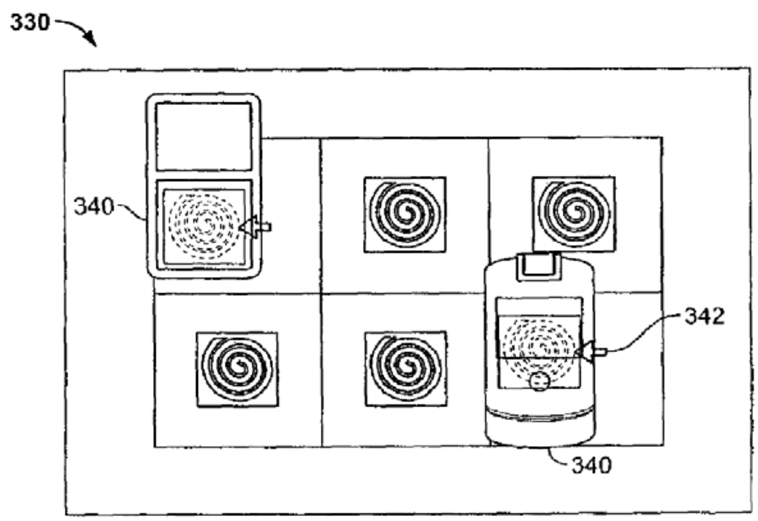


FIG. 16

(*Id.*, Figure 16.)

Partovi also discloses "**an alternating magnetic field, when received through the surface of the portable device from the primary coil in the base unit in a direction substantially perpendicular to the plane of the receiver coil, inductively generates a current in the receiver coil to provide power inductively to the portable device when the portable device is placed on the base unit for charging the battery of the portable device**." For example, *Partovi* discloses the microcontroller MCU1 enables the FET driver to drive the primary coil L1 on the pad "to energize the receiver." (Ex. PA-1, ¶[0298].) The FET driver drives the coil by switching the primary coil through the FET Q1. (*Id.*, ¶[0290].) In one implementation, the operating frequency of the FET drive is "1-2 MHz." (*Id.*, ¶¶[0259], [0263]-[0265].) When the coil is switched, an AC voltage is generated across the primary coil, which results in an AC magnetic field. (*Id.*, ¶[0117].[12]) In other words, an AC electrical current is applied to the primary coil to generate a magnetic field, as claimed. (*See id.*, ¶[0091] ("a pad or similar base unit that contains a primary, which creates an alternating magnetic field by means of applying an alternating current to a winding, coil, or any type of current carrying wire"), claim 13 ("when a current is passed through the primary coil a magnetic field is generated in a direction substantially perpendicular to the plane of the primary coil").) If a receiver is nearby or placed on the charger pad, the power emitted from primary coil L1 will power the receiver circuit which will then charge the battery of the portable device. (*Id.* ¶¶[0295]-[0296], [0291] ("[T]he pad can also contain multiple coils or sections to charge or power various devices or to allow charging or powering of devices or batteries placed anywhere on the pad.").) In particular, the AC magnetic field will induce a current in the receiver coil, which is then used to charge the battery. (*Id.*, claim 13 ("wherein the perpendicular magnetic field inductively generates a current in a matching receiver coil or coils within a mobile device or battery placed close to and aligned with the base unit, to charge or power the mobile device or battery), ¶[0117] ("This field in turn generates a voltage in the coil 120 in the receiver 114 that is rectified and then smoothed by a capacitor to provide power 122 to a load RI 124.").)

This magnetic field is generated "**in a direction substantially perpendicular to the plane of the receiver coil**." For example, a POSITA would have understood that when an AC current is passed through a spiral coil (such as the one in *Partovi*), a magnetic field will be generated that is perpendicular to the surface of the coil. (Ex. PA-DEC, ¶258.) Indeed, claim 13 of *Partovi* confirms this when it states that "when a current is passed through the primary coil a magnetic field is generated in a direction substantially perpendicular to the plane of the primary coil."[13] As discussed above, and shown in Figure 16, *Partovi* discloses that the mobile device surface and the receiver coil are located parallel to the surface of the pad (and the primary coil); therefore, if the magnetic field is substantially perpendicular to the plane of the primary coil, as disclosed by claim

[12] Paragraph 117 merely describes the basic principles of inductive charging applicable to the various inductive charging systems disclosed in *Partovi*.

[13] Patent Owner cannot dispute that Partovi discloses this limitation because Patent Owner claims that the '876 Application (i.e., *Partovi*) provides support for the claims of the '371 Patent.

13, then *Partovi* inherently discloses the magnetic field being substantially perpendicular to the plane of the surface of the receiver coil. (Ex. PA-DEC, ¶258.)

d. a ferrite material layer placed under the receiver coil on a side of the receiver coil opposite to the surface of the portable device;

Partovi discloses this limitation. (Ex. PA-DEC, ¶259.) The description of Figure 34 does not explicitly disclose "**a ferrite material layer placed under the receiver coil on a side of the receiver coil opposite to the surface of the portable device**." However, *Partovi* discloses this elsewhere. For example, *Partovi* discloses "to provide additional immunity, ferrite material (such as those provided by Ferrish-ield Inc.) can be used between the receiver and the battery to shield the battery or device from the EM fields. These materials can be made so as to be thin, and then used during the construction of the integrated battery/receiver." (Ex. PA-1, ¶[0141].) A POSITA would have been motivated to apply the ferrite material described in paragraph [0141] to the implementation shown in Figure 34 of *Partovi* to shield the battery from EM fields. (*Id.*) A POSITA would have understood that the ferrite layer is positioned opposite the charging surface of the portable device in order to allow the receiver coil to be directly exposed to the alternating magnetic field of the primary coil. (Ex. PA-Dec, ¶259.)

e. a receiver circuit powered by the inductive charging system, wherein the receiver circuit comprises:

Partovi discloses this limitation. (Ex. PA-DEC, ¶260.) For example, the Figure 34 implementation has a receiver including a receiver circuit that includes, *inter alia*, a receiver coil L2, a microcontroller MCU2, voltage regulator, battery, and a rectifier circuit D1 ("**a receiver circuit**"). (*Id.*, ¶[0262], (stating D1 is a rectifier).)[14] *Partovi* discloses to detect a receiver, MCU1 periodically starts the FET driver to drive primary coil L1 in the charger, which then emits power. (Ex. PA-1., ¶[0295].) If a receiver is nearby, receiver coil L2 will draw current to power up the microcontroller MCU2 in the receiver and its associated circuitry ("**a receiver circuit powered by the inductive charging system.**") (*Id.*, ¶[0295].)

[14] Figures 34 and 28 of *Partovi* have identical components. Therefore, the description of D1 as a rectifier from Figure 28 is applicable to Figure 34 as the structures shown in the figures are identical. In fact, Figure 28 shows a basic wireless charging system, whereas Figure 34 is an enhancement of the system shown in Figure 28. (Ex. PA-1, ¶¶[0270], [0285].) Thus, the description of Figure 28 is applicable to Figure 34.

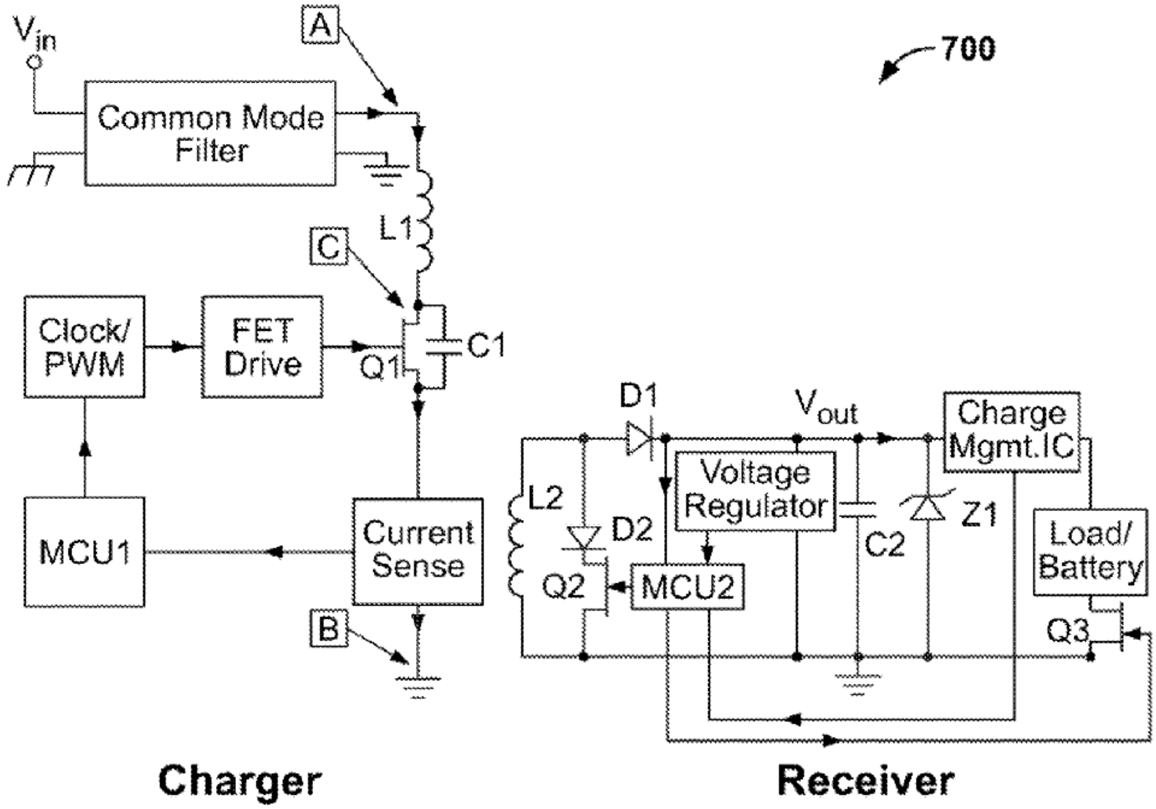


FIG. 34

(*Id.*, FIG. 34.)

f. a receiver rectifier circuit including a rectifier and a capacitor; and

Partovi discloses this limitation. (Ex. PA-DEC, ¶261.) For example, the Receiver shown in Figure 34 of *Partovi* includes a receiver rectifier circuit D1 and a capacitor C2 ("**a receiver rectifier circuit including a rectifier and a capacitor**"). (*Id.*, ¶[0262], (stating D1 is a rectifier).)[15]

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[15] Figures 34 and 28 of *Partovi* have identical components. Therefore, the description of D1 as a rectifier from Figure 28 is applicable to Figure 34 as the structures shown in the figures are identical.

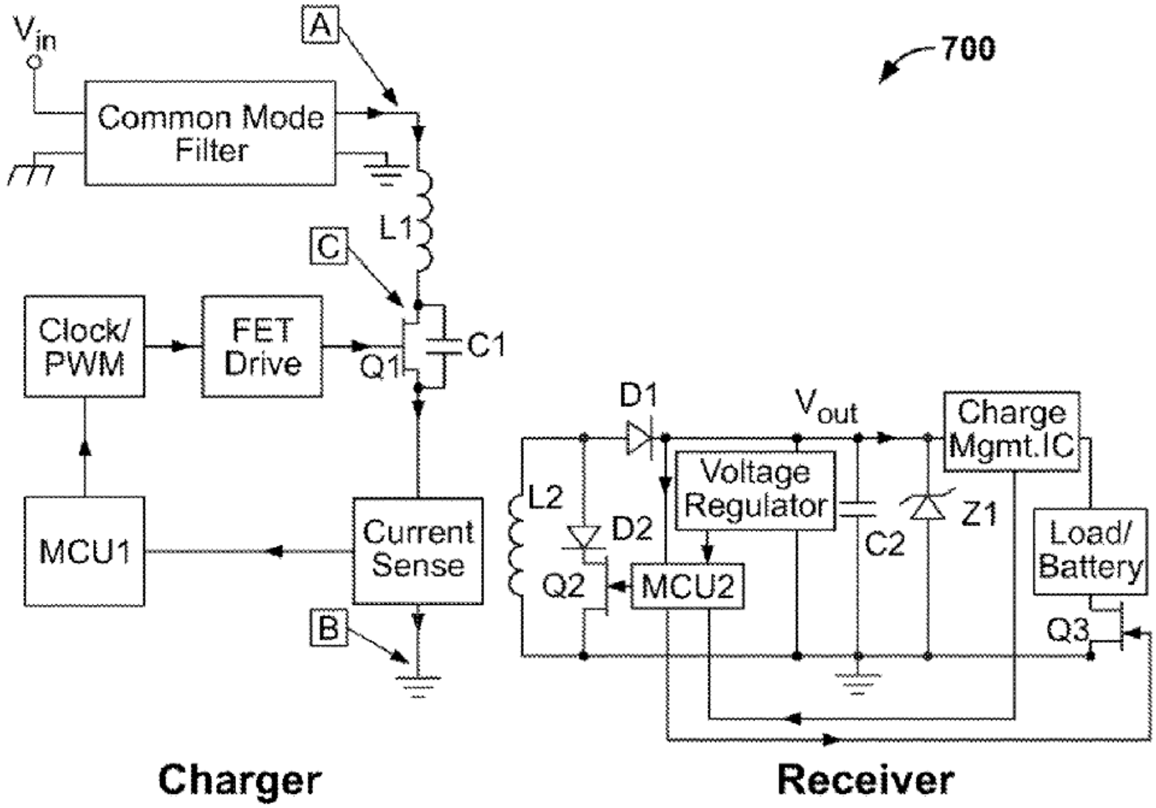


FIG. 34

(*Id.*, FIG. 34.)

g. a receiver communication and control circuit including a microcontroller to modulate the current in the receiver coil to communicate with the base unit while the receiver circuit is being powered by the inductive charging system; and

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶262-264.) *Partovi* discloses microcontroller MCU2 ("**a receiver communication and control circuit including a microcontroller**") that modulates the input impedance of the receiver circuit to communicate with the base unit through the primary coil:

> [t]he charge control circuit in the figure or another chip in the receiver circuit can be pre-programmed so that on power-up, it draws current in a pre-programmed manner. An example of this is the integration of the MCU2 and chip model number 10F220 Programmable IC by Microchip Inc. or another inexpensive microcontroller that upon power-up, executes a predetermined program that modulates the current being drawn in the receiver in a predetermined code (which can be encrypted). This receiver modulation can be detected as a current modulation in the current

> through the L1 by the charger or power supply current sensor in FIG. 34.

(Ex. PA-1, ¶[0295].) As shown in Figure 34 of *Partovi*, MCU2 is coupled to Q2 (a FET switch) to modulate the input impedance of the receiver circuit to communicate with the base unit through the primary coil. (Ex. PA-1, ¶[0262], ("the secondary (receiver) contains circuitry that enables this part to modulate the load as seen by the primary. In accordance with an embodiment this is achieved through modulation of switch Q2 by an MCU2 in the receiver.").)

Partovi also discloses the microcontroller MCU2 monitors the output voltage V_{out} of the rectifier D1, which necessarily occurs during charging, and tries to maintain the output voltage within a pre-programmed range. (Ex. PA-1, ¶¶[0262], [0265], FIG. 34.) In particular, *Partovi* discloses "the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device." (*Id.*, ¶[0130].) To do this, MCU2 modulates the switch Q2 to change the impedance of the receiver circuit which affects the current through the primary coil, which is detected by the current sense circuit ("**modulate the current in the receiver coil to communicate with the base unit**." (*Id.*, ¶[0262]) As the voltage V_{out} is necessarily induced during charging, *Partovi* discloses using "**a microcontroller to modulate the current in the receiver coil to communicate with the base unit while the receiver circuit is being powered by the inductive charging system**." (*Id.*, ¶[0013], [0091], [0118], [0119], [0262] ("As the primary charger or power supply sends power to the secondary receiver, the circuit in the receiver turns on. The power received is rectified and filtered by rectifier D**1** and Capacitor C**2** respectively").)

Partovi further discloses similar features with respect to Figure 38.[16] Concerning Figure 38, *Partovi* discloses "the receiver circuit can note the amount of voltage or power being received and report back to the charger or power supply. This information can be encoded by modulating the input impedance of the receiver circuit by MCU2. This information is then sensed by the charger or power supply sense circuitry, digitized by MCU1 and saved." (Ex. PA-1, ¶[0331].) A POSITA would understand that modulating the input impedance of the receiver circuit discloses

[16] The implantation of Figure 38 incorporates the switching and sense circuity of Figure 34. (Ex. PA-1, ¶[0326].) Therefore, the implementation described in Figure 38 is also applicable to Figure 34.

communications from the receiver unit to the charger through the receiver's coil. (Ex. PA-DEC, ¶264.)

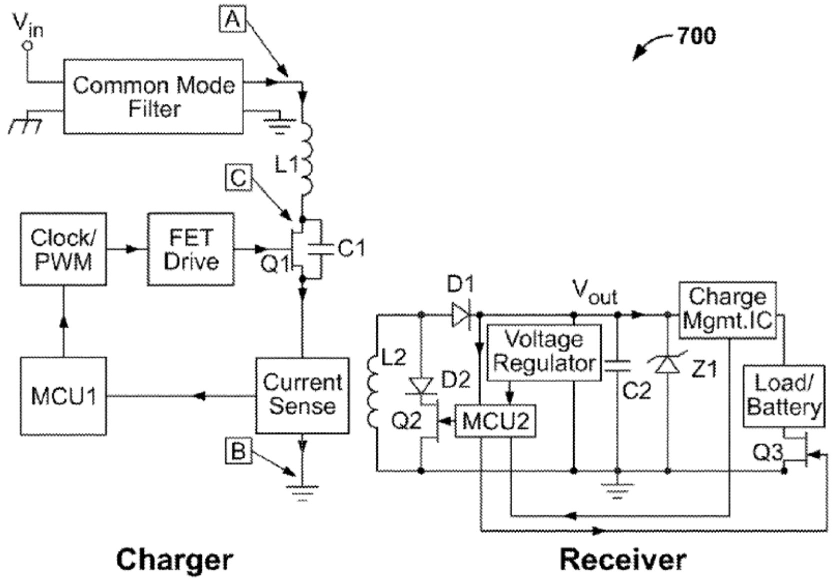


FIG. 34

(Ex. PA-1, Figure 34.)

h. an output disconnect switch to interrupt a flow of current from an output of the receiver unit to the battery;

Partovi discloses this limitation. (Ex. PA-DEC, ¶265.) For example, microcontroller MCU2 can regulate the power and voltage received at the charger control circuit to ensure overvoltage conditions do not occur. (Ex. PA-1, ¶[0285].) In particular, microcontroller MCU2 can control switch Q3 that "can disconnect the battery during communication for higher signal to noise ratio." (Ex. PA-1, ¶[0285].) The switch Q3 is an "output disconnect switch" that can "interrupt a flow of current from an output of the receiver unit to the battery."

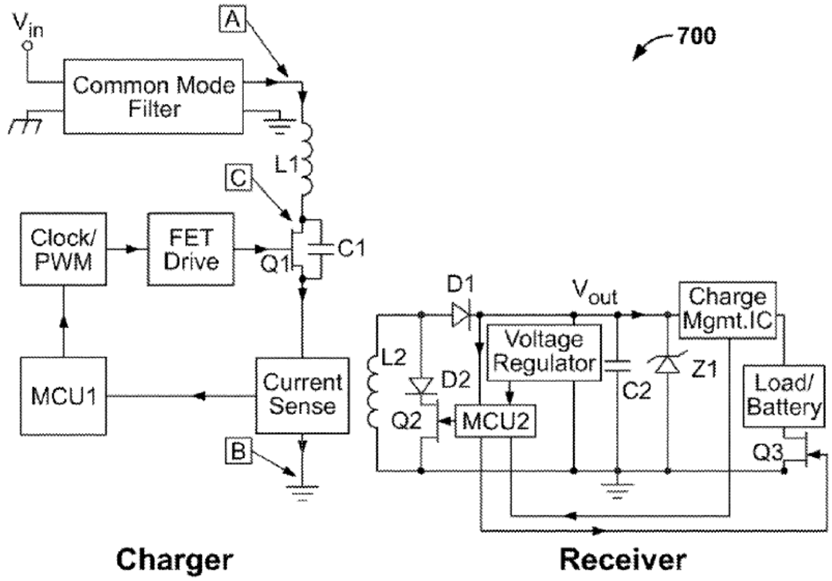


FIG. 34

(Ex. PA-1, Figure 34.)

i. wherein when a current is generated in the receiver coil inductively by the primary coil in the base unit, the current is rectified and smoothed by the rectifier circuit and is used to power and activate the microcontroller and to charge the battery of the portable device;

Partovi discloses this limitation. (Ex. PA-DEC, ¶266.) For example, as discussed in Section VI.C.2.f, the implementation shown in Figure 34 of *Partovi* has a receiver rectifier circuit. *Partovi* discloses "[a]s the primary charger or power supply sends power to the secondary receiver, the circuit in the receiver turns on. <u>The power received is rectified and filtered by rectifier D1 and Capacitor C2 respectively</u>." (Ex. PA-1, ¶[0262].) A voltage regulator receives the power from the rectifier and powers the microcontroller MCU2. (*Id.* ¶¶[0262], [0285].) The output of the rectifier circuit is also provided to a charge management circuit to charge the battery. (*Id.*) As Figures 34 and 28 of Partovi have identical components the description of Figure 28 is applicable to Figure 34. *Partovi* thus discloses "**when a current is generated in the receiver coil inductively by the primary coil in the base unit, the current is rectified and smoothed by the rectifier circuit and is used to power and activate the microcontroller and to charge the battery of the portable device**," as claimed.

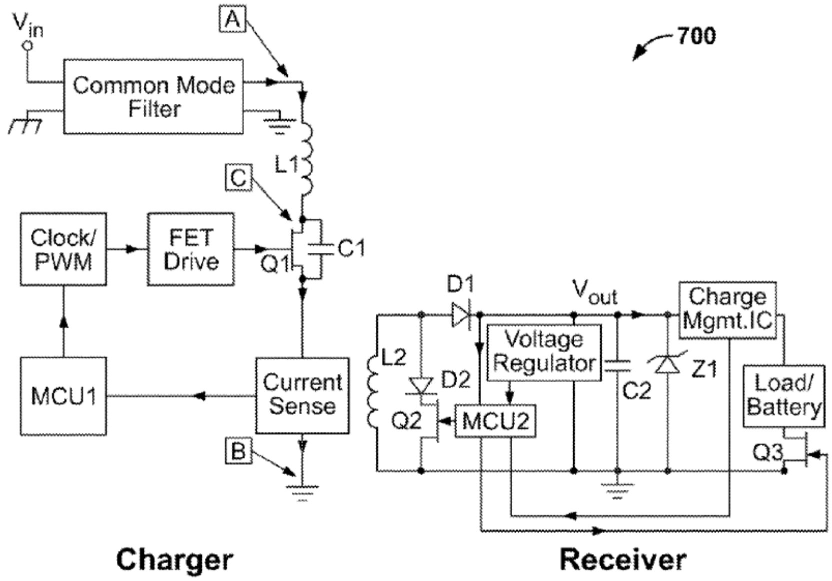


FIG. 34

(Ex. PA-1, Figure 34.)

j. wherein upon powering and activation of the microcontroller by the primary coil in the base unit, the receiver circuit is configured to:

Partovi discloses this limitation. (Ex. PA-DEC, ¶267.) *Partovi* discloses MCU1 can periodically start the FET driver and the primary coil L1 to begin emitting power to any receivers that are nearby. (Ex. PA-1, ¶[0295].) If a receiver is nearby the microcontroller MCU2 in the receiver can be programmed to, on power up, draw current in a pre-programmed manner ("**wherein upon powering and activation of the microcontroller by the primary coil in the base unit**"). (*Id.*) The microcontroller MCU2 then "executes a predetermined program that modulates the current being drawn in the receiver in a predetermined code (which can be encrypted). This receiver modulation can be detected as a current modulation in the current through the L1 by the charger or power supply current sensor in FIG. 34." (*Id.*)

k. communicate to the base unit a power parameter and a voltage or current value at an output of the receiver rectifier circuit induced by the primary coil; and

Partovi discloses this limitation. (Ex. PA-DEC, ¶¶268-271.) The implementation shown in Figure 28[17] of *Partovi* discloses the microcontroller MCU2 monitors the output voltage V_{out} of

[17] Figures 34 and 28 of *Partovi* have identical components. Therefore, the implementation described in Figure 28 is applicable to Figure 34 as the structures shown in the figures are identical.

the rectifier D1 ("**a voltage or current value at an output of the receiver rectifier circuit**") and tries to maintain the output voltage within a pre-programmed range. (Ex. PA-1, ¶¶[0262], [0265], FIG. 34.) For example, "the receiver sends a digital code corresponding to the output voltage and MCU**1** compares this to the earlier output voltage value and makes a determination about which direction and by how many steps to move the frequency." (*Id.*, ¶[0265].) Furthermore, "the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device." (*Id.*, ¶[0130].) To do this, MCU2 modulates the switch Q2 to change the impedance of the receiver circuit which affects the current through the primary coil, which is detected by the current sense circuit ("**communicate to the base unit a** [] **voltage or current value at an output of the receiver rectifier circuit induced by the primary coil**") (*Id.*, ¶[0262])

The voltage V_{out} is "**induced by the primary coil**." (*Id.*, ¶¶[0013], [0091], [0118], [0119], [0262] ("As the primary charger or power supply sends power to the secondary receiver, the circuit in the receiver turns on. The power received is rectified and filtered by rectifier D**1** and Capacitor C**2** respectively").)

Partovi further discloses similar features with respect to Figure 38.[18] Concerning Figure 38, *Partovi* discloses "the receiver circuit can note the amount of voltage or power being received and report back to the charger or power supply. This information can be encoded by modulating the input impedance of the receiver circuit by MCU2. This information is then sensed by the charger or power supply sense circuitry, digitized by MCU1 and saved." (Ex. PA-1, ¶[0327].) A POSITA would understand that modulating the input impedance of the receiver circuit discloses communications from the receiver unit to the charger.

The description of Figure 34 does not explicitly disclose "communicate to the base unit a power parameter." However, *Partovi* elsewhere discloses it. For example, *Partovi* discloses once a receiver is detected nearby the charger, the charger and the receiver begin to exchange information including "voltage requirements of the battery" ("**a power parameter**"). (Ex. PA-1, ¶¶[0112], [0113] ("This information can include a unique ID code that can verify the authenticity

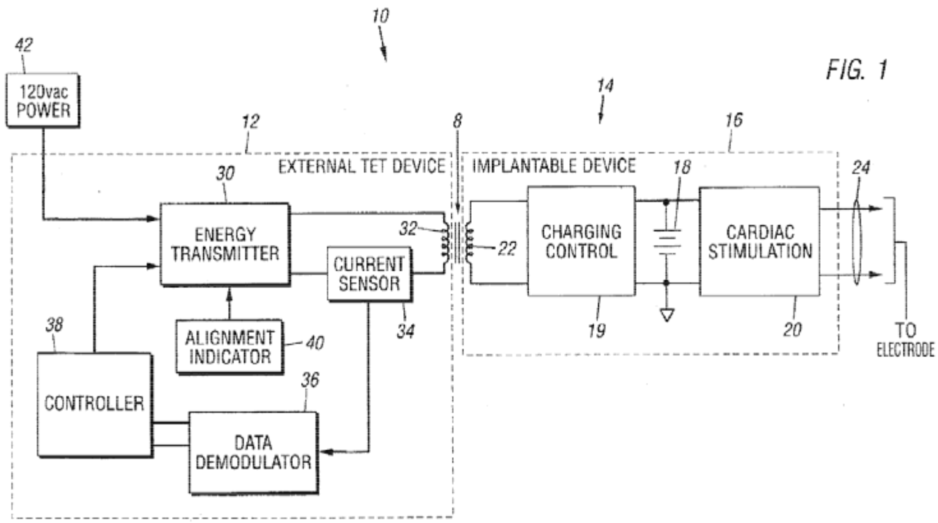
[18] The implantation of Figure 38 incorporates the switching and sense circuity of Figure 34. (Ex. PA-1, ¶[0326].) Therefore, the implementation described in Figure 38 is also applicable to Figure 34.

and manufacturer of the charger or power supply and mobile device or battery, the voltage requirements of the battery or the mobile device, and the capacity of the battery."), [0307].) The verification code can verify the authenticity and manufacturer of the mobile device as well as provide information to the charger regarding the necessary "voltage, power, temperature, or other diagnostic information for achieving reliable charging." (Ex. PA-1, ¶¶[0113], [307].) The implementation described in paragraphs [0112], [0113], and [0307] may be applied to the implementation shown in Figure 34 because Figure 34 of *Partovi* expressly contemplates the portable device and the charger exchanging information to authenticate the portable device (Ex. PA-1, ¶[0297].)

l. periodically communicate to the base unit information corresponding to a presently induced output voltage or current of the receiver rectifier circuit to enable the base unit to regulate in a closed loop manner the output voltage or current of the receiver rectifier circuit during the charging of the battery of the portable device; and

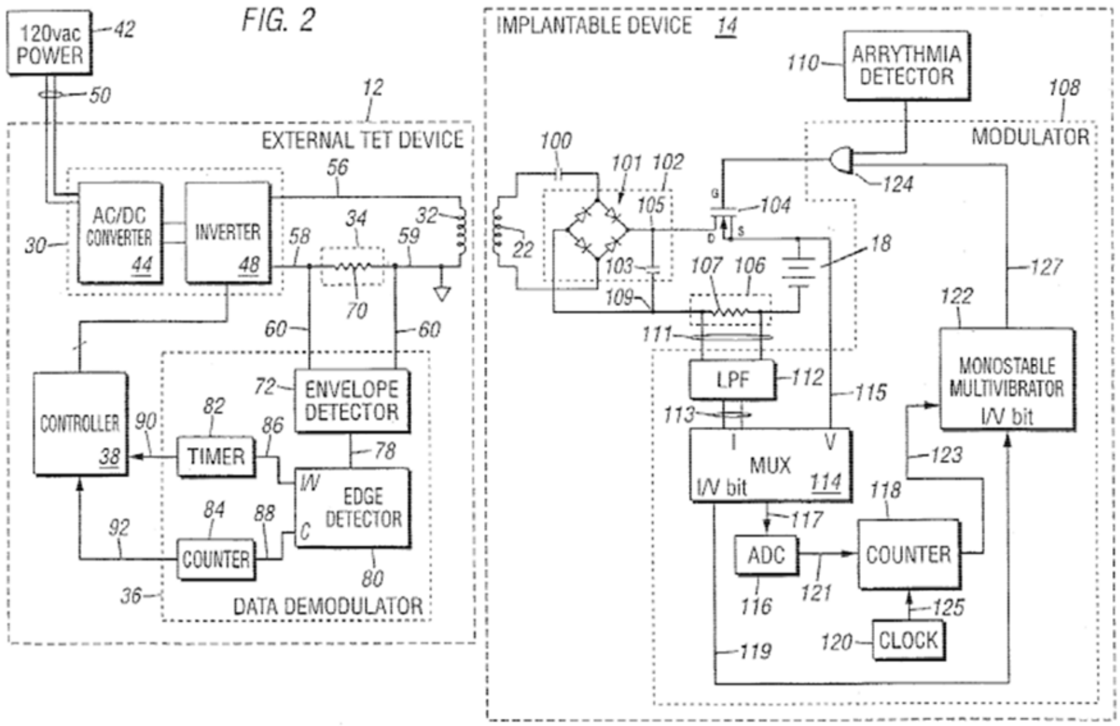
Partovi in view of *Nedungadi* discloses or suggests this limitation. (Ex. PA-DEC, ¶¶272-276.) As discussed above in Section VI.C.2.k, *Partovi* discloses MCU1 receiving information from the receiver including information corresponding to the output voltage of the receiver's rectifier circuit. However, *Partovi* does not disclose the receiver "periodically" communicating this information to the charger.

Nedungadi discloses an inductive charging system for charging a battery. (*See, e.g.*, Ex. PA-2, 1:9-13.) As shown in Figure 1 of *Nedungadi* an external device 12 has a primary coil 32 that is used to provide power to a receiver coil 22 of an implantable device 14. (*Id*., 5-12-40.) *Nedungadi* discloses that the implantable device 14 may communicate with the external TET device 12. (*Id.*, 5:41-45.) For example, the control circuitry 19 in the implantable device "samples battery voltage and current" and "transmits that data to TET 12 via coils 32, 22, in order to control the energy transmission between TET device 12 and implantable device 14." (*Id.*) "The battery voltage is indicative of the level of charge of battery 18." (*Id*., 5:44-45.) The battery voltage is the "**a presently induced output voltage or current of the receiver rectifier circuit**," as claimed.



(*Id.*, FIG. 1.)

In particular, a data modulator 108 in an implantable device 14 senses battery voltage and current at regular intervals (once every minute or two) and communicates those values to the controller 38 in charger (i.e., the external TET device 12). (*Id.* at 8:40-51.) "Depending on those values, the output power" of the charger is regulated by controller 38. (*Id.*) *Nedungadi* therefore discloses periodically communicating battery voltage and current values from the receiver to the controller in the charger that controls power transfer based on those received values ("**periodically communicate to the base unit information corresponding to a presently induced output voltage or current of the receiver rectifier circuit**").



(*Id.*, FIG. 2.)

The description of Figure 38 does not expressly disclose "**enable[ing] the base unit to regulate in a closed loop manner the output voltage or current of the receiver rectifier circuit during the charging of the battery of the portable device**." However, *Partovi* discloses this elsewhere. *Partovi* discloses "the induced voltage/current in the mobile device can be sensed and communicated to the charger to form a closed-loop, and the duty cycle, frequency, and/or voltage of the switch can be adjusted to achieve the desired voltage/current in the mobile device." (Ex. PA-1, [0130].) In the Figure 28 implementation, during the charging process, the receiver MCU2 communicates an output voltage (Vout) of the rectifier to the charger MCU 1, which then adjusts the frequency at which FET 1 is driven. (*Id.*, ¶¶[0262]-[0265].) Therefore, the MCU1 performs closed loop regulation as claimed. The implementation shown in Figure 28 may be applied to the implementation shown in Figure 34 because Figures 34 and 28 have identical components.

A POSITA would have been motivated to adopt *Nedungadi*'s above-identified techniques with *Partovi* so that the power transfer can be controlled in accordance with the charging status of the battery. (Ex. PA-DEC, ¶276.) These techniques (including the periodic exchange of battery voltage between the charger and receiver) allows "control[ling] the delivery of energy to [the] battery [in the portable device]." (Ex. PA-2, 5:7-11.) Furthermore, there are only two options for information transfer from the receiver to the charger: periodic or non-periodic. Thus, there is a finite set of options available for a designer of *Partovi*'s system, and implementing the periodic data transfer option (a feature express in *Nedungadi*) would have been obvious. Uber Techs., Inc. v. X One, Inc., 957 F.3d 1334, 1341 (Fed. Cir. 2020) ("Because terminal-side plotting (as described in Okubo) and server-side plotting (as described in Konishi and claimed in the '593 patent) would have been two of a finite number of known, predictable solutions at the time of the invention of the'593 patent, a person of ordinary skill would have faced a simple design choice between the two, and therefore would have been motivated to combine the teachings of Okubo and Konishi to achieve the limitation.") (emphasis added). A POSITA would have had a reasonable expectation of success in making such a modification to *Partovi* given that the modification would have been a straightforward combination of well-known technologies using known methods and techniques familiar to such a skilled person. (PA-DEC at ¶276.) For example, implementing data transfer from *Partovi*'s receiver "periodically" from the receiver would have been straightforward given *Partovi*'s numerous references to periodic activity. (E.g., Ex. PA-1, ¶¶[0290], [0294].)

m. wherein the communication and control unit is configured to control the disconnect switch to disconnect the flow of current from the output of the receiver unit to the battery during at least some of the communication with the base unit.

Partovi discloses this limitation. (Ex. PA-DEC, ¶277.) For example, microcontroller MCU2 can regulate the power and voltage received at the charger control circuit to ensure overvoltage conditions do not occur. (Ex. PA-1, ¶[0285].) In particular, microcontroller MCU2 can control switch Q3 that "can disconnect the battery during communication for higher signal to noise ratio." (Ex. PA-1, ¶[0285].) *Partovi* thus discloses MCU2 ("**the communication and control unit**") is configured to control the switch Q3 to disconnect the battery from the receiver during communication with the base ("**control the disconnect switch to disconnect the flow of current from the output of the receiver unit to the battery during at least some of the communication with the base unit.**")

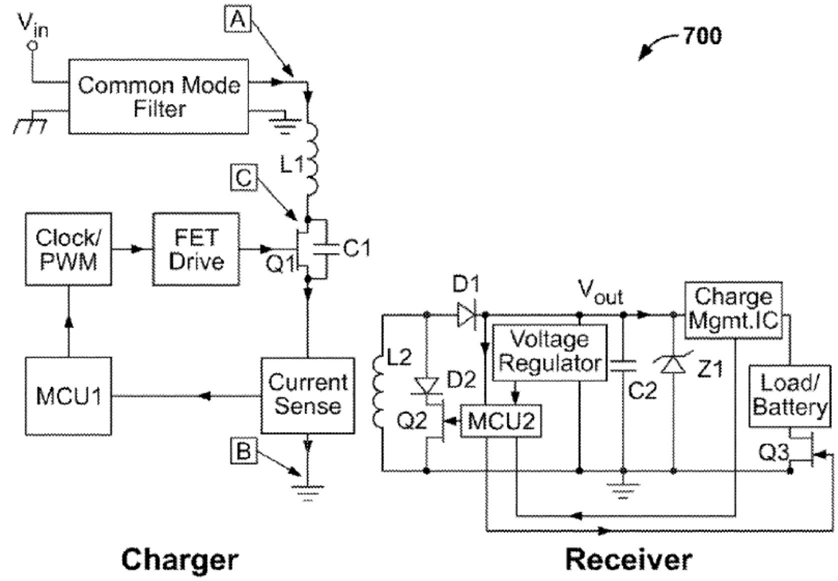


FIG. 34

(Ex. PA-1, Figure 34.)

VII. Detailed Explanation of the Pertinence and Manner of Applying the Prior Art to the Claims

A. Bases for Proposed Rejections of the Claims

The following is a quotation of pre-AIA 35 U.S.C. § 102 that forms the basis for all of the identified prior art:

> A person shall be entitled to a patent unless . . .
>
> (e) the invention was described in — (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for the purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language . . . .

The following is a quotation of pre-AIA 35 U.S.C. § 103(a) that forms the basis of all of the following obviousness rejections:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having

> ordinary skill in the art to which said subject matter pertains. Patentability shall not be negative by the manner in which the invention was made.

The question under 35 U.S.C. § 103 is whether the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention. In *KSR International Co. v. Teleflex Inc*., 550 U.S. 398 (2007), the Court mandated that an obviousness analysis allow for "common sense" and "ordinary creativity," while at the same time not requiring "precise teachings directed to the specific subject matter of the challenged claim[s]." *KSR*, 550 U.S. at 418, 420-421. According to the Court, "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* at 416. In particular, the Court emphasized "the need for caution in granting a patent based on the combination of elements found in the prior art." *Id.* at 401. The Court also stated that "when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." *Id.* at 417.

The Office has provided further guidance regarding the application of *KSR* to obviousness questions before the Office.

> If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

MPEP § 2141(I) (quoting *KSR* at 417.)

The MPEP identifies many exemplary rationales from *KSR* that may support a conclusion of obviousness. Some examples that may apply to this reexamination include:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices in the same way;
- Applying a known technique to improve devices in the same way;
- Choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success ("obvious to try")

MPEP § 2141(III).

In addition, the Office has published *Post-KSR* Examination Guideline Updates. *See* Fed. Reg. Vol. 75, 53464 (the "Guideline Updates"). The Guideline Updates discuss developments after *KSR* and provide teaching points from recent Federal Circuit decisions on obviousness. Some examples are listed below:

> A claimed invention is likely to be obvious if it is a combination of known prior art elements that would reasonably have been expected to maintain their respective properties or functions after they have been combined.

Id. at 53646.

> A combination of known elements would have been prima facie obvious if an ordinary skilled artisan would have recognized an apparent reason to combine those elements and would have known how to do so.

Id. at 53648.

> Common sense may be used to support a legal conclusion of obviousness so long as it is explained with sufficient reasoning.

Id.

B. Proposed Rejections

Pursuant to 37 C.F.R. § 1.510(b)(2), Requester identifies claims 1, 2, 28, and 30 as the claims for which reexamination is requested. The proposed rejections below, in conjunction with the analysis in Sections IV-VI above and the attached declaration of Dr. Baker (Ex. PA-DEC), provide a detailed explanation of the pertinence and manner of applying the prior art to each of claims 1, 2, 28, and 30.

1. Proposed Rejection #1

Claims 1 and 2 are obvious over *Partovi* in view of *Calhoon* under 35 U.S.C. § 103, as shown by the discussion above in Section VI.A and the declaration of Dr. Baker provided in Exhibit PA-DEC.

2. Proposed Rejection #2

Claim 28 is obvious over *Baarman* in view of *Hui*, *Odendaal*, *Shima*, and *Hui-027* under 35 U.S.C. § 103, as shown by the discussion above in Section VI.B and the declaration of Dr. Baker provided in Exhibit PA-DEC.

3. Proposed Rejection #3

Claim 30 is obvious over *Partovi* in view of *Nedungadi* under 35 U.S.C. § 103, as shown by the discussion above in Section VI.C and the declaration of Dr. Baker provided in Exhibit PA-DEC.

VIII. Conclusion

For the reasons set forth above, the Requester has established at least one substantial new question of patentability with respect to claims 1, 2, 28, and 30 of the '371 Patent. The analysis provided in this Request and in the declaration of Dr. Baker (Ex. PA-DEC) demonstrates the invalidity of claims 1, 2, 28, and 30 in view of prior art that was not substantively considered by the Patent Office. Therefore, it is requested that this request for reexamination be granted and claims 1, 2, 28, and 30 be cancelled.

As identified in the attached Certificate of Service and in accordance with 37 C.F.R. §§ 1.33(c) and 1.510(b)(5), a copy of this Request has been served, in its entirety, to the address of the attorney of record.

Respectfully submitted,

PAUL HASTINGS LLP

Dated: July 1, 2024 By: /Naveen Modi/

Naveen Modi (Reg. No. 46,224)