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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

12/737803

Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

As the below named inventor(s), I/we declare that:

This declaration is directed to:

- ☐ The attached application, or
- ☑ United States application or PCT international application number PCT/US2009/054174 filed on 18 August 2009
- ☐ As amended on _____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

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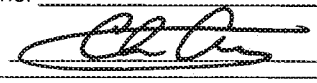
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FULL NAME OF INVENTOR(S)

Inventor one: Christopher B. Austin Date: 2/17/11

Signature  Citizen of: United States of America

Inventor two: _____ Date: _____

Signature: _____ Citizen of: _____

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VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present patent application is a continuation of U.S. Patent Application No. 16/056,041 filed August 6, 2018, which is a continuation of U.S. Patent Application No. 12/737,803, filed February 17, 2011, which application is a national stage filing under 35 U.S.C. § 371 of International Application No. PCT/US2009/054174, filed on August 18, 2009, which claims the benefit of U.S. Provisional Patent Application No. 61/189,353 filed on August 18, 2008, all of which are incorporated herein by reference in their entireties.

BACKGROUND

[0002] In light of the ever-rising costs of energy in the global market, energy consumers of all types seek to reduce the impact such costs to the greatest extent possible. One popular manner of doing so is the use of vehicles that do not rely solely (and in some cases, at all) upon petroleum products as a source of energy. Many such vehicles have been developed that rely exclusively or in large part on batteries that must be recharged from a source of electrical power external to the vehicle. Such vehicles are referred to hereinafter simply as "electric vehicles," it being understood that this term refers to any vehicle requiring an external supply of electrical power to charge the vehicle for normal use. By way of example and without limitation, the term "electric vehicle" therefore refers to vehicles whose primary source of power is electrical batteries, as well as vehicles that have other sources of power (e.g., biofuel, fuel cells, natural gas, compressed air, and the like) in addition to or in lieu of electrical batteries, but that are designed to be supplied with electrical power from an external source to improve efficient operation of the vehicle.

[0003] Unfortunately, significant limitations exist to the widespread utilization of electric vehicles. For example, most households have a small number of appliances, devices, and systems that require a significant draw of electrical power from a power supplier. The introduction of an electrical vehicle as another daily draw of electric power for a household would place unprecedented strain on community power systems, many of which are already incapable of meeting peak demands. This problem is exacerbated by the fact that in some cases, the daily draw of electric power to charge the battery of an electric vehicle may be the highest of a household.

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[0004] Simply put, existing power infrastructure for most communities is incapable of meeting the demand that widespread use of rechargeable electric vehicles would place on the infrastructure. Until electrical power distribution infrastructure is updated to meet this demand (and even after such a time), improvements in energy distribution and utilization for charging electric vehicle batteries are welcome in the art.

SUMMARY OF THE INVENTION

[0005] In some embodiments, a vehicle charger for charging a battery of a vehicle and adapted for communication with a first controller remote from the vehicle and vehicle charger, wherein the vehicle charger comprises an electrical power cord releasably attachable to at least one of the vehicle and a source of power; a second controller electrically coupled to the electrical power cord; and at least one of a transmitter and a receiver coupled to the second controller and adapted for communication with the first controller, the second controller responsive to at least one signal from the first controller by changing a charging state of the vehicle charger.

[0006] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle in the course of a charging session, wherein the vehicle charger comprises a controller; a display coupled to the controller and adapted to display a time; and a user-manipulatable control coupled to the controller and operable by a user to enter a time of day at which the charging session will end, the controller changing the supply of electric power to the vehicle battery during the course of the charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon the time needed to charge the vehicle battery by the time of day entered by the user.

[0007] In some embodiments, a vehicle charger for charging a battery of a vehicle is provided, wherein the vehicle charger comprises a display mounted within the vehicle within reach of a user seated within the vehicle; a user-manipulatable control within reach of the user seated within the vehicle and by which a user can enter a time of day; a controller coupled to the display and to the battery, the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon the time of day entered by the user.

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[0008] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle, wherein the vehicle charger comprises: a controller; and a memory coupled to the controller and in which to save a time of day entered by a user; the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon the time of day entered by the user; and wherein the controller supplies electric power to the battery if a level of battery charge is below a threshold level of battery charge independent of the time of day entered by the user, the controller supplying electric power to the battery until the threshold level of battery charge is reached.

[0009] In some embodiments, a vehicle charger for charging a battery of a vehicle is provided, wherein the vehicle charger comprises a controller; a display coupled to the controller; and a memory accessible by the controller and in which to save a time of day; the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon the time of day; the controller operable to display at least two different screens upon the display, at least one of the screens displaying information regarding a charging session, and at least one of the screens displaying settings at least partially defining the manner of operation of the vehicle charger.

[0010] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle and adapted for communication with a first controller remote from the vehicle and vehicle charger, wherein the vehicle charger comprises a display; a second controller coupled to the display and operable to change a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon a time of day; and at least one of a transmitter and a receiver coupled to the second controller and adapted for communication with the first controller, wherein the second controller displays an indicator indicating a status of communication between the first and second controllers.

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[0011] In some embodiments, a vehicle charger for charging a battery of a vehicle is provided, and comprises a controller; and a display coupled to the controller; the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon a time of day; the controller operable to display on the display an amount of time remaining to complete charging of the battery.

[0012] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle, wherein the vehicle charger comprises a controller; and a display coupled to the controller; the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon a time of day; the controller operable to display on the display an amount of power consumed by the battery during the charging session.

[0013] In some embodiments, a vehicle charger for charging a battery of a vehicle is provided, and comprises a controller; and a display coupled to the controller; the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon a time of day; the controller operable to display on the display a cost of power supplied to the vehicle charger.

[0014] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle in the course of a charging session, wherein the vehicle charger comprises an electrical power cord releasably attachable to at least one of the vehicle and a source of power; a controller; a housing attached to the electrical cord; a display on the housing, coupled to the controller, and adapted to display a time; and a user-manipulatable control coupled to the controller and operable by a user to enter a time of day; the controller changing the supply of electric power to the vehicle battery during the course of the charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon the time of day entered by the user.

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[0015] In some embodiments, a vehicle charger for charging a battery of a vehicle and adapted for communication with a first controller remote from the vehicle and vehicle charger is provided, and comprises a display; a user-manipulatable control; a second controller coupled to the display and operable to change a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging; and at least one of a transmitter and a receiver coupled to the second controller and adapted for communication with the first controller, the second controller responsive to at least one signal from the first controller by changing a charging state of the vehicle charger based at least in part upon the time of day entered by the user.

[0016] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle, wherein the vehicle charger comprises a controller operable to change a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging based at least in part upon a time of day, wherein the controller transmits a signal responsive to detection of an interruption of power supply to the vehicle charger.

[0017] In some embodiments, a vehicle charger for charging a battery of a vehicle is provided, and comprises a controller; a vehicle charger battery coupled to the controller; and an electrical power cord releasably attachable to at least one of the vehicle and the vehicle charger battery to supply power from the vehicle charger battery to the battery of the vehicle, wherein the controller is operable to change a supply of electric power to the vehicle charger battery during the course of a charging session by at least one of increasing a rate of charge of the vehicle charger battery, decreasing the rate of charge of the vehicle charger battery, starting charging of the vehicle charger battery, or stopping charging of the vehicle charger battery based at least in part upon a time of day.

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[0018] Some embodiments of the present invention provide a vehicle charger for charging a battery of a vehicle, wherein the vehicle charger comprises a first core on the vehicle; a second core in a location stationary with respect to the first core, the second core providing an inductive charge to the first core in at least one position of the first core with respect to the second core; at least one sensor positioned to detect the position of the first core with respect to the second core; a display mounted within the vehicle within view of a user seated within the vehicle; and a controller coupled to the display and responsive to signals from the sensor to display at least one indicator on the display indicating a direction in which the vehicle must move for an improved positional relationship between the first and second cores.

[0019] In some embodiments, a vehicle charger for charging a battery of a vehicle is provided, and comprises a controller; a first electrical connector coupled to the battery and the controller and located on one side of the vehicle; and a second electrical connector coupled to the battery and the controller and located on a different side of the vehicle, the first and second electrical connectors both shaped and dimensioned for releasable connection to an electrical power cord supplying power to the vehicle from an external power source.

[0020] Some embodiments of the present invention provide a method of controlling charging of batteries of multiple vehicles each electrically connected to a power generation and distribution system, wherein the method comprises establishing communication with a controller associated with a battery charger of each vehicle; obtaining from each battery charger a time of day by which battery charging for the vehicle associated with the battery charger must be completed; and changing power supply to at least some of the battery chargers based at least in part upon the time of day received from the battery chargers.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 is a schematic diagram of a power generation and distribution system for a community.

[0022] FIG. 2 illustrates a vehicular charging system according to an embodiment of the present invention.

[0023] FIG. 3 illustrates a vehicular charging system according to another embodiment of the present invention.

[0024] FIG. 4 illustrates a vehicular charging system according to another embodiment of the present invention.

[0025] FIG. 5 is a perspective view of a vehicle charger according to an embodiment of the present invention.

[0026] FIG. 6 is a perspective view of a portion of the vehicular charger illustrated in FIG. 5, shown in a first state.

[0027] FIG. 7 is a perspective view of the vehicular charger illustrated in FIGs. 5 and 6, showing the vehicular charger in a second state.

[0028] FIG. 8 is a perspective view of the vehicular charger illustrated in FIGs. 5-7, showing the vehicular charger in a third state.

[0029] FIG. 9 is a perspective view of the vehicular charger illustrated in FIGs. 5-8, showing the vehicular charger in a fourth state.

[0030] FIG. 10 is a perspective view of the vehicular charger illustrated in FIGs. 5-9, showing the vehicular charger in a fifth state.

[0031] FIG. 11 is a perspective view of the vehicular charger illustrated in FIGs. 5-10, showing the vehicular charger in a sixth state.

[0032] FIG. 12 is a perspective view of a portion of a vehicular charger according to another embodiment of the present invention.

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[0033] FIG. 13 illustrates a vehicle display according to an embodiment of the present invention.

[0034] FIG. 14 illustrates another vehicle display according to an embodiment of the present invention.

[0035] FIG. 15 is a schematic electrical diagram of a vehicular charging system according to an embodiment of the present invention.

[0036] FIG. 16 is a schematic electrical diagram of a vehicular charging system according to another embodiment of the present invention.

[0037] FIG. 17 is a schematic electrical diagram of a vehicular charging system according to another embodiment of the present invention.

[0038] FIG. 18 a schematic diagram of a portion of a inductive vehicular charging system according to an embodiment of the present invention.

[0039] FIG. 19 illustrates a vehicular display for the inductive vehicular charging system illustrated in FIG. 18.

[0040] FIG. 20 is a side view of a vehicle and vehicular charger according to an embodiment of the present invention.

[0041] FIG. 21 is a top view of the vehicle and vehicular charger shown in FIG. 19.

[0042] FIG. 22 is a perspective view of the vehicle and vehicular charger shown in FIGs. 19 and 20.

[0043] FIG. 23 is a perspective detail view of the vehicle and vehicular charger shown in FIGs. 19-21.

[0044] FIG. 24 is a flowchart illustrating a method of operation of a vehicular charger according to an embodiment of the present invention.

[0045] FIG. 25 is a flowchart illustrating a method of operation of a vehicular charger according to another embodiment of the present invention.

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[0046] FIG. 26 is a flowchart illustrating a method of operation of a vehicular charger according to another embodiment of the present invention.

[0047] FIG. 27 is a flowchart illustrating a method of operation of a vehicular charger according to another embodiment of the present invention.

[0048] FIG. 28 is a flowchart illustrating a method of operation of a vehicular charging system according to an embodiment of the present invention.

[0049] FIG. 29 illustrates power draw from a power grid over a period of time, as controlled in part by a vehicular power charging system according to an embodiment of the present invention.

DETAILED DESCRIPTION

[0050] Before any embodiments of the present invention are explained in detail, it is to be understood that the present invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the accompanying drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description, and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "mounted," "connected," "supported," and "coupled" and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

[0051] A power generation and distribution system in which vehicle chargers and vehicle charging systems according to the present invention can be used is illustrated schematically in FIG. 1, and is indicated generally at 10. The system 10 includes one or more sources of power 12 that supply a community, such as one or more power plants generating electric power from natural gas, coal, water flow, nuclear power, geo-thermal power, wind, solar power, other power sources, and any combination thereof. Any number of sources of power 12 can supply the electricity needs of the community, and can be located within the community and/or located distant from the community. For example, electric power can be generated in one or more power

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plants located in or nearby the community, whereas additional electric power can be supplied from other more distant power plants as needed in times of peak demand.

[0052] Electric power is distributed from the sources of power 12 in any conventional manner, such as by a number of power lines 14 running from the sources of power 12 to various locations in the community. Electric power can be further distributed within the community by additional power lines 14 and power distribution infrastructure. Such power lines and power distribution infrastructure (in their various forms) are known to those skilled in the art, and are not therefore described further herein.

[0053] Electric power is transmitted over the power lines 14 to a number of different locations 16 in the community, each of which draws and uses the electrical power for various purposes. One or more electric vehicles 18, 618, 1018 are at some of these locations, and draw an amount of electric power for purposes of charging one or more batteries 20, 620, 1020 (see FIGs. 2-4) of each electric vehicle 18, 618, 1018. Each electric vehicle 18, 618, 1018 in the community is releasably connected to the vehicular charging system 10. In the illustrated embodiment of FIGs. 2 and 3, each electric vehicle 18, 618 is releasably electrically and mechanically connected by a respective cord 22, 744 as will be described in greater detail below. In other embodiments (e.g., FIG. 4), one or more of the electric vehicles 1018 are releasably electrically connected to the vehicular charging system 10, but are not mechanically connected thereto. In such cases, the electric vehicles 1018 can be electrically connected by use of induction charging as described in greater detail below.

[0054] A vehicle charging cord 22 according to an embodiment of the present invention is illustrated in FIG. 5, and is shown in use in FIG. 2. The illustrated vehicle charging cord 22 has a first end 24 adapted to releasably connect to an electrical outlet (not shown) of a business, residence, or other building or facility, and a second end 26 adapted to releasably connect to the electric vehicle 18. In this regard, the first end 24 can have, for example, a standard U.S. two-prong or three-prong male electrical connector (i.e., grounded or ungrounded) intended for connection to a 120V AC supply of electric current, a U.S. Type B electrical connector intended for connection to a 220V AC supply of electric current, any electrical connector suitable for a 240V AC supply of electrical current, a Japanese Type B electrical connector meeting JA1-15 electrical standards, a British Type G electrical connector meeting British BS 1363 electrical standards, a European Type F electrical connector meeting CENELEC electrical standards, a French Type E electrical connector meeting French electrical standards, a Chinese Type I

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electrical connector meeting Chinese electrical standards, or a Type D or M electrical connector meeting Indian electrical standards. Any other releasable electrical connector suitable for connection to an electrical outlet of a building or facility, or for connection to a power cord, power device, or other power interface with the electrical system of the building or facility can be used as desired. In this regard, although the first end 24 of the vehicle charging cord 22 shown in FIG. 5 has a U.S. Type B plug, it will be appreciated that the first end 24 can have any number and arrangement of blades, pins, and apertures for releasable mating engagement with an electrical connector of a power cord, power device, or other power interface as just described.

[0055] The second end 26 of the vehicle charging cord 22 can have any suitable plug for releasable connection with a mating electrical connector of the vehicle. In this regard, the second end 26 of the vehicle charging cord 22 can have any number of blades and/or pins for mating with associated apertures of the mating electrical connector of the vehicle, and can also or instead have any number of apertures for mating with associated blades and/or pins of the mating electrical connector of the vehicle. The second end 26 can be connected directly to an electrical connector of a vehicle, or to a power cord, power device, or other power interface with the electrical power system of a vehicle.

[0056] The vehicle charging cord 22 can be any gauge suitable for carrying electric current to charge the vehicle 18 and for also meeting country and local electrical codes. Also, the vehicle charging cord 22 illustrated in FIG. 5 is insulated with flexible plastic or other suitable material.

[0057] The vehicle charging cord 22 illustrated in FIGs. 2 and 5 also has a housing 28 intermediate the ends 24, 26 of the cord 22. In other embodiments, the housing 28 can be located at or define an end of the cord 22, in which case the housing 28 can carry any of the electrical connectors described above with regard to ends 24, 26 of the vehicle charging cord 22.

[0058] The illustrated housing 28 has a substantially parallelepiped shape. Depending at least in part upon the shape and size of the electronics within the housing (described below) for performing any desired electrical transformer function, and the shape and size of the electrical elements used for the control features described below, the housing 28 can be larger or smaller than that shown in FIG. 5, and can have any other shape desired, (e.g., a cube shape, a spherical, elliptical, or other rotund shape, an irregular shape, and the like).

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[0059] With reference now to FIGs. 5-11, and also with reference to FIG. 15 (which illustrates a vehicular charging system utilizing the vehicular charger of FIGs. 2, 5-11, a number of user-manipulatable controls 30 and a display 32 are provided on the housing 28. The illustrated housing 28 also contains electrical components for transforming power supplied thereto (indicated generally at 136), and control circuitry for performing the vehicle battery charging management functions described in greater detail below. The display 32 shown in FIGs. 5-11 and 15 is an LCD display 32, although any other type of display can be used as desired. The user-manipulatable controls 30 include a power button 34, a number of navigation buttons 36, and a select button 38 (see FIGs. 6-11). The power button 34 can be pressed by a user to turn the vehicle charging cord 22 on and off, thereby enabling and disabling the vehicle charging cord 22 to charge one or more batteries 20 of a vehicle 18 connected thereto. The navigation buttons 36 can be pressed by a user to navigate through one or more screens upon the display 32 (described in greater detail below), whereas the select button 38 can be pressed by a user to select one or more options on the screen(s).

[0060] In the illustrated embodiment, four navigation buttons 36 (up, down, left, and right) are positioned around the select button 38, all of which are adjacent the power button 34. However, in other embodiments, the navigation buttons 36, select button 38, and power button 34 can be in any other arrangement on the housing 28. Also, it will be appreciated that the user-manipulatable controls 30 can be buttons as shown in FIGs. 5-11, but can instead or also be any other type of user-manipulatable control. For example, any of the user-manipulatable controls 30 can be dome or tact switch, heat-sensitive, or other types of buttons, can be knobs or dials, and the like. Also, fewer or more user-manipulatable controls 30 can be used in other embodiments, such as for vehicle charging cords 22 not having a power button 34 (i.e., automatically powered upon connection to a power source), vehicle charging cords 22 having more or fewer navigation buttons (depending in some embodiments upon the arrangement of options on screens 32 shown on the display 32), and the like.

[0061] Although a display 32 in conjunction with a number of button-type user-manipulatable controls 34, 36, 40 is employed in the embodiment of FIGs. 2, 5-11 and 15, in other embodiments, the display 32 and any number of the button-type user-manipulatable controls 34, 36, 40 can be replaced by a touch screen (not shown). The touch screen can enable a user to display options, navigate between two or more screens, and select options by inputting

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commands directly into the display 32, and in some embodiments can simplify control of the vehicle charging cord 22.

[0062] With reference now to FIG. 15, in some embodiments, the vehicle charging cord 22 has a controller 44 located within the housing 28 and at least partially controlling operations of the vehicle charging cord 22. The controller 44 in the illustrated embodiment of FIGs. 2, 5-11 and 15 is a programmable processor of any suitable type, but in some embodiments can take other forms such as non-programmable processor, a system of discrete logic elements, and any combination thereof. The illustrated vehicle charging cord 22 also has a transceiver 46 coupled to the controller 44, enabling the controller 44 to communicate with another controller. The other controller can be one or more processors of a personal computer, phone, PDA, or other processor-based device associated with a user of the vehicle charging cord 22, one or more processors of a server or other computer associated with a power utility providing power to the vehicle charging cord 22, and the like). In the illustrated embodiment of FIGs. 2, 5-11 and 15, the other controller is a remote computer of a power utility 48, and is indicated at 50. The controller 50 of the power utility 48 is coupled to a power utility transceiver 52 to enable the power utility 48 to communicate with the controller 44 of the vehicle charging cord 22.

[0063] The transceiver 46 of the vehicle charging cord 22 and the transceiver 52 for the computer of the power utility 48 can each take any suitable form. However, it will be appreciated that the transceiver 52 for the computer of the power utility 48 can be selected to enable the computer of the power utility 48 to communicate with multiple vehicle charging cord controllers 44 of the same or different users. Also, the transceiver 46 of the vehicle charging cord 22 and/or the transceiver 52 for the computer of the power utility 48 can be replaced by a separate transmitter and a separate receiver enabling two-way communication between the controller 50 of the power utility 48 and the controller 44 of the vehicle charging cord 22. Such communication can be via the power lines 14 (see FIG. 1) between the computer of the power utility 48 and the locations 16 at which the vehicle charging cord 22 is used. In this regard, reference herein and in the appended claims to a "receiver" and a "transmitter" is intended to encompass transceivers as well as separate receivers and transceivers.

[0064] Any power line communication (PLC) system or combination of PLC systems adapted for carrying data over power lines 14 can be used for communication between the controllers 44, 50 described above, such as distribution line carrier (DLC) PLC systems, broadband over lines carrier (BLC) systems, low-speed narrow-band communication systems

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(proposed and used in Demand Side Management systems), and the like. Communication between the controller 50 of the power utility 48 and the controller 44 of the vehicle charging cord 22 can be through any number of substations between the power utility 48 and the location 16 at which the vehicle charging cord 22 is used. Also, depending at least in part upon the PLC system(s) used, such communication can be through any number of repeaters as is well known to those skilled in the art of PLC systems.

[0065] The controller 50 of the power utility 48 (with which the controller 44 of the vehicle charging cord 22 communicates) can be located anywhere between the location 16 of the user and the sources of power 12. For example, the controller 50 of the power utility 48 can be located at a facility where power is generated, at an office of the power utility 48, at any of a number of substations between the source of power 12 and the location 16 of the user, and the like.

[0066] By connecting the first end 24 of the vehicle charging cord 22 to an electrical outlet of a building or facility (or to a power cord, power device, or other power interface with the electrical system of the building or facility), communication can be established over the vehicle charging cord 22, the electrical system of the home, building, or other facility (e.g., through wiring and one or more circuit breakers thereof), and low and high-voltage power lines to the power utility 48 and the controller 50 of the power utility 48 described above. In some embodiments, this communication can be established automatically upon plugging in the first end 24 of the vehicle charging cord 22, whereas in other embodiments, this communication is established when the vehicle charging cord 22 is turned on or when a user enters an appropriate command to establish this communication (described in greater detail below), or in any other suitable manner. Communication between processors established automatically upon their connection are well known to those skilled in the art, and are not therefore described further herein.

[0067] As discussed above, communication between the controller 44 of the vehicle charging cord 22 and the controller 50 of the power utility 48 can be over power lines, wiring, or other conductors. However, it will be appreciated that communication along any portion or all of the distance between the controller 50 of the power utility 48 and the vehicle charging cord 22 can include wireless communication. In such cases, any number of wireless transmitters and receivers (and associated antennae) can be used to send and receive communications between the controller 50 of the power utility 48 and the vehicle charging cord 22. By way of example only,

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the vehicle charging cord 22 can have a wireless processor and associated antenna, receiver, and transmitter enabling wireless communication with a wireless service provider, and ultimately to the controller 50 of the power utility 48. Like the PLC communication described above, wireless communication between the controller 50 of the power utility 48 and the vehicle charging cord 22 can be established automatically upon plugging in the first end 24 of the vehicle charging cord 22, when the vehicle charging cord 22 is turned on, or when a user enters an appropriate command to establish this communication (described in greater detail below).

[0068] In some embodiments, the controller 44 of the vehicle charging cord 22 communicates with a user's computer rather than, or in addition to, communicating with the controller 50 of the power utility 48. This communication can be any combination of wired or wireless communication. For example, a residence-based, office-based, or other facility-based PLC system can be used to communicate between the controller 44 of the charging cord 22 and a user's computer (via the electrical system of the residence, office, or other facility). In other embodiments, the vehicle charging cord 22 can have a wireless processor adapted for communication with a user's computer. Such communication can be through any suitable wireless personal area network (WPAN) (using, for example, ZigBee®, Bluetooth®, or any other WPAN wireless technology), wireless local area network (WLAN), and the like. Like the PLC communication described above, communication between the controller 50 of the power utility 48 and the user's computer can be established automatically upon plugging in the first end 24 of the vehicle charging cord 22, when the vehicle charging cord 22 is turned on, or when a user enters an appropriate command to establish this communication (described in greater detail below).

[0069] Upon connection with a user's computer (wireless or otherwise), a user can control the vehicle charging cord 22 in any of the same manners as a power utility 48 described in greater detail below. Alternatively or in addition, communication between the controller 44 of the vehicle charging cord 22 and the controller of 50 of the power utility 48 can be established through the user's computer. Specifically, wired or wireless communication between the controller 44 of the vehicle charging cord 22 and the user's computer can be used in conjunction with a connection between the user's computer and the controller 50 of the power utility 48 to enable communication between the controller 44 of the vehicle charging cord 22 and the controller 50 of the power utility 48. Such communication can thereby enable the power utility

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48 to control the vehicle charging cord 22 (in any of the manners described below) via the user's computer.

[0070] With reference now to FIGs. 6-11, the illustrated vehicle charging cord 22 has a first screen 40 providing information regarding the vehicle charging cord 22, a battery connected thereto, and the status of charging operations of the vehicle charging cord 22. In the illustrated embodiment of FIGs. 2, 5-11 and 15, the screen 40 has a vehicle charging cord status indicator 42, which displays the status of charging operations. The status indicator 42 can indicate whether the vehicle charging cord 22 is charging a battery, the type of charging operations being performed by the vehicle charging cord 22, and/or whether an error in charging the battery has been detected.

[0071] In the state of the vehicle charging cord 22 shown in FIGs. 6, 10, and 11, the vehicle charging cord 22 is not charging a battery connected thereto, nor is the vehicle charging cord 22 programmed or otherwise controlled to charge a battery (described in greater detail below). Accordingly, the status indicator 42 displays "OFF". In the state of the vehicle charging cord 22 shown in FIG. 7, the vehicle charging cord 22 is in the process of charging a vehicle battery in "manual" mode (i.e., not based upon a time of day). Therefore, the status indicator 42 displays "MANUAL CHARGE IN PROCESS" in FIG. 7. In the state of the vehicle charging cord 22 shown in FIG. 8, the vehicle charging cord 22 is in the process of charging a battery based upon one or more instructions that can include a time of day to begin charging the battery and/or a time of day to stop battery charging (discussed in greater detail below). Accordingly, the status indicator 42 displays "PROGRAMMED CHARGE IN PROCESS" in FIG. 8. Finally, in the state of the vehicle charging cord 22 shown in FIG. 9, an error has been detected by the vehicle charging cord 22 in the process of attempting to charge the battery. Therefore, the status indicator 42 display "ERROR – BATTERY FAULT" in FIG. 9. In some embodiments, the vehicle charging cord 22 can have appropriate circuitry to detect a variety of charging problems, including without limitation a damaged battery, a damaged vehicle charging cord 22, a disconnection between the vehicle charging cord 22 and a source of power used to charge the vehicle battery, and/or a disconnection between the vehicle charging cord 22 and the battery to be charged. A large number of conventional circuits capable of detecting such problems exist, and are not therefore described further herein. Such circuits fall within the spirit and scope of the present invention.

[0072] The first screen 40 of the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 also has a communication status indicator 54. The communication status indicator 54 indicates whether communication exists between the controller 44 of the vehicle charging cord 22 and a computer (e.g., a computer of the power utility 48, the user's computer, a mobile phone, PDA, or other processor-based device as described above, and the like). For example, in the "OFF" state of the vehicle charging cord 22 illustrated in FIG. 6, no communication exists between the controller 44 of the vehicle charging cord 22 and a computer, so the communication status indicator 54 displays an appropriate indicator. In the other states of the vehicular charging cord 22 illustrated in FIGs. 7-11, including the states of FIGs. 10 and 11 where the vehicle charging cord 22 is in an "OFF" state but is not set to charge a battery, communication has been established and maintained between the controller 44 and a computer, so the communication status indicator 54 displays an indicator showing this status.

[0073] The first screen 40 of the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 also has a power connection status indicator 56. The power connection status indicator 56 indicates whether an electrical connection exists between the vehicle charging cord 22 and a source of power (e.g., an electrical system of a house, office, facility, or other location) to charge a battery. When the first end 24 of the illustrated vehicle charging cord 22 is unplugged or is connected to an electrical system not providing power to the vehicle charging cord 22, the power connection status indicator 56 displays such an indicator (see, for example, FIG. 6). Otherwise, if a proper power connection is made, the connection status indicator 56 displays an appropriate indicator showing that such a connection has been made (see, for example, FIGs. 7-11).

[0074] A clock 58 is also displayed on the first screen 40 shown in FIGs. 6-9. Any form of clock can be displayed as desired, preferably indicating whether the displayed time is "A.M." or "P.M.". In some embodiments, time on the clock 58 is maintained by the controller 44 of the vehicle charging cord 22, and can be maintained even if no power is supplied to the vehicle charging cord 22 (e.g., when the vehicle charging cord 22 is unplugged) by a battery of the vehicle charging cord 22. Such a battery (not shown) can be connected to the controller 44 of the vehicle charging cord 22, can be located within the housing 28, and in some embodiments can be removed and replaced by a user as necessary via a door or other battery cover (also not shown). In these and other embodiments, the time displayed upon the clock 58 can be retrieved and displayed by the controller 44 from a computer upon establishment of communication with the computer in any of the manners described above.

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[0075] The first screen 40 of the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 also has a battery charge level indicator 60. Using any battery diagnostic circuitry desired, the controller 44 of the vehicle charging cord 22 can detect the level of charge of a battery 20 to which the vehicle charging cord 22 is connected (e.g., by the plug on the second end 26 of the vehicle charging cord 22 described above). The battery charge level indicator 60 illustrated in FIGs. 6-9 is a bar chart displaying charges ranging from 0% to 100%, and also displaying the percentage of full charge of a vehicle battery 20 to which the vehicle charging cord 22 is connected (e.g., 31% in FIG. 6). However, other types of battery charge level indicators 60 can be used in other embodiments.

[0076] For example, the battery charge level indicator 60 can be simply a number (e.g., the percentage of full charge of the battery 20, the exact charge level of the battery in amp-hours or in another unit of measurement, another number representative of the amount of charge of the battery 20 but not necessarily in units conventionally used to indicate battery charge, and the like). As another example, the battery charge level indicator 60 can also or instead include any other chart or visual representation, such as a pie chart, an escalating series of bars having different lengths, a symbol having different colors and/or brightness levels representing different battery charge levels, a gauge with a needle or other pointer, text in any language indicating the level of battery charge (e.g., "empty, very low, low, high, full"), and the like. The battery charge level indicator 60 can comprise any graphics, text, or combination of graphics and text to convey the level of charge of the battery 20 to a user, and can be any size desired on the first screen 40. The controller 44 of the vehicular charging cord 22 can monitor the charge level of the battery 20 being charged, and can update the battery charge level indicator 60 continuously or on a periodic basis.

[0077] In some embodiments, the first screen 40 of the vehicular charging cord 22 also displays the voltage and/or amperage used to charge a battery 20 connected thereto. These voltage and/or amperage indicators are included in the embodiment of the vehicle charging cord 22 shown in FIGs. 2, 5-11 and 15, and are given reference numbers 62 and 64, respectively.

[0078] As also shown in FIGs. 6-9, the first screen 40 of the vehicle charging cord 22 can include other information regarding the status of a battery charging session performed by the vehicular charging cord 22, including the amount of time estimated to completely charge the battery 20 (in minutes, minutes and hours, or in any other format), the estimated or actual amount of power already consumed during the present charging session (in kWh or in any other

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unit of measurement), the actual or estimated cost of charging the connected battery 20 per hour or other unit time, and/or the total actual or estimated cost of the current charging session to the present time. Each of these examples of information is displayed on the first screen 40 shown in FIGs. 6-9, and is indicated with reference numbers 66, 68, 70, and 72, respectively.

[0079] The charge time remaining indicator 66 and the power used indicator 68 can be calculated by the controller 44 in any of a number of manners well known to those in the art of battery charging and electrical power metering technology. In this regard, it will be appreciated that the charge time remaining can be calculated taking into account the non-linear rate of charging for many batteries 20, wherein the rate of battery charge at different levels of battery charge changes. Formulas for such estimates are well known to those skilled in the art of battery charging, and are not therefore described further herein. The charge cost per hour indicator 70 can be retrieved and displayed by the controller 44 from a computer upon establishment of communication with the computer in any of the manners described above, or can be manually entered into the vehicle charging cord 22 by a user using the user-manipulatable controls 30 and an appropriate data entry cell or menu on the display 32 (not shown). In those embodiments in which the charge cost per hour is retrieved from another computer as described above, the controller 44 can retrieve a cost per kWh figure directly from the power utility 48 (e.g., from the controller 50 of a computer of the power utility 48), from the user's computer in which is stored a cost per kWh figure entered there or retrieved by the user's computer, and the like, and can multiply that figure by an estimated kWh level at which the vehicle charging cord 22 will charge the battery 20 to display the charge cost per hour 70 for the current battery charging session. The total cost to the present time for a charging session 72 can be calculated by the controller 44 simply by multiplying the values of indicators 68 and 70 together.

[0080] In some embodiments, any or all of the indicators 66, 68, 70, and 72 can be updated periodically during a charging session, such as every second, minute, or other time interval. Any or all of the indicators 66, 68, 70, 72 can be continually updated by receiving streaming data from the controller 50 of the power utility 48 or from the user's computer. For example, the charge time remaining indicator 66 can be updated by the controller 44 every second or minute based upon battery charge calculations made at the beginning of the charging session or made periodically during the charging session. As another example, the power used indicator can be updated by the controller 44 every second, minute, or in greater periods of time based upon the actual or estimated power delivered via the vehicle charging cord 22. As yet another example,

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the charge cost per hour indicator 70 can be updated every second, minute or other time period based upon cost information retrieved by the controller 44 from the controller 50 of the power utility 48 or the user's computer, and/or can be updated immediately upon receiving streaming or batch-loaded power cost information from the controller 50 of the power utility 48 or the user's computer.

[0081] The first screen 40 of the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 also has a battery charge selector 74 by which a user can select the manner in which the vehicle charging cord 22 will charge a vehicle battery 20. By pressing the navigation buttons 36 and then the select button 38 described above, a user can highlight a desired manner in which the vehicle charging cord 22 will charge a vehicle battery 20 connected thereto. The battery charge selector options illustrated in FIGs. 6-9 include "OFF", "PROGRAMMED CHARGE", AND "MANUAL CHARGE", any of which can be highlighted and selected by a user as just described. Although a radio button format of the battery charge selector 74 is illustrated in the embodiment of FIGs. 2, 5-11 and 15, the battery charge selector 74 can have any other form desired, including without limitation a drop-down or pop-up menu, and the like. Upon selecting the desired charge state as just described, the vehicle charging cord 22 can immediately begin a charging session by beginning to supply current to the battery 20 to which the vehicle charging cord 22 is connected (e.g., by closing a switch 92 coupled to the controller 44 as described in greater detail below), or can begin such a session after a user then presses the power button 34. For example, if the power button 34 is selected after the "MANUAL CHARGE" button has been selected, the controller 44 can causes the switch 92 to close without delay in order to begin charging the vehicle battery 20, whereas if the power button 34 is selected after the "PROGRAMMED CHARGE" button has been selected, the controller 44 can cause the switch 92 to close only after one or more conditions have been met as will be described in greater detail below. In any case, once a user commands and enables the vehicle charging cord 22 to begin charging immediately or to begin charging at a later time based upon a set of instructions as described elsewhere herein, a vehicle charging session begins.

[0082] The operational status of the vehicle charging cord 22 can be displayed by the vehicle charging cord 22 in a number of different manners and locations. For example, the vehicle charging cord status indicator 42 described above can be provided. Alternatively or in addition, one or more graphics (e.g., symbols, colors, and the like) providing the same general status indicators (e.g., off, charging in process, error) can be displayed elsewhere on the housing 28,

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such as through a translucent or transparent portion of the housing 28, through a lens located on the housing 28, and the like. In this regard, one or more graphics can be printed on the interior and/or exterior of the housing 28, can be invisible or substantially not visible to a user when not illuminated, and can be illuminated by one or more lamps, LEDs or other light sources within the housing 28 when such graphics are to be displayed. By way of example only, the controller 44 can display a battery charging symbol such as that shown in FIGs. 7 and 8 in a first charge status display area 76A when a charging session is in process, or when the vehicle charging cord 22 is in the process of charging a battery 20 (as described in greater detail below, the battery 20 may not be actively charging the battery 20 at one or more times during a charging session). As another example, the controller 44 can display an error symbol such as that shown in FIG. 9 in the same or a different charge status display area 76B when any of the battery charging errors described above have been detected. Still other battery charging symbols indicating any other information regarding the status of the vehicle charging cord 22 and its operation can be displayed anywhere on the housing as a supplement to or in addition to the information shown on the display 32 described above. In some embodiments, one or more status display areas 76 as just described can even replace the display 32.

[0083] With continued reference to the illustrated embodiment of FIGs. 2, 5-11 and 15, in some embodiments, the controller 44 of the vehicle charging cord 22 can display two or more different screens upon the display 32. This control enables a user to view substantially more information than that available from other types of displays and from other types of controls and indicators on the housing 28. By way of example only, two such alternative screens 40A, 40B are illustrated in FIGs. 10 and 11, respectively, and can be accessed in a number of different manners. In some embodiments, each screen 40, 40A, 40B is accessed by selecting a navigation button, such as by using navigation button 36 in the illustrated embodiment to highlight a desired navigation button on the screen 40, 40A, 40B. In other embodiments, one or more navigation buttons 36 on the housing 28 are provided to move between screens 40, 40A, 40B, such as forward and back buttons, a single button to scroll though two or more screens 40, 40A, 40B, and the like. Although three different screens 40, 40A, 40B can be shown upon the display 32 in the illustrated embodiment of FIGs. 2, 5-11 and 15, any other number of displays (e.g., 1, 2, 4, or more) can be shown upon the display 32, and can include any number and arrangement of the indicators, selectors, and other information described herein. In still other embodiments, a single screen 40 is provided, only a portion of which is visible on the display 32 at any given time. In

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such cases, other portions of the screen 40 can be viewed by scrolling in any desired direction using one or more navigation buttons 36 or other user-manipulatable controls on the housing 28.

[0084] In the illustrated embodiment of FIGs. 2, 5-11 and 15, the first screen 40 has two navigation buttons 78, 80, each of which causes the controller to display a different screen 40A, 40B when selected by a user in the manner described above. When a first "PROGRAM A CHARGE" navigation button 78 is selected by a user, the controller 44 replaces the first screen 40 with a second screen 40A shown in FIG. 10. This second screen 40A enables a user to change the manner in which the vehicle charging cord 22 will operate to charge one or more batteries 20 connected thereto. The second screen 40A also has navigation buttons 82, 84 that can be selected by a user to return to the first screen 40, whether by making one or more changes to operation of the vehicle charging cord 22 (by selecting the "GO" navigation button 84), or by making no changes to operation of the vehicle charging cord 22 (by selecting the "CANCEL" navigation button 84). In the illustrated embodiment, selection of either navigation button 82, 84 on the second screen 40A will return the user to the first screen 40.

[0085] A valuable feature of the vehicle charging cord 22 of FIGs. 2, 5-11 and 15 is the ability of a user to at least partially control when the vehicle charging cord 22 will begin to charge one or more batteries 20 connected thereto. In many geographic locations, times of day, and times of the year, the ability of power utilities 48 to supply the full power demand of users is limited or is inadequate. Although power utilities can often generate or otherwise obtain additional power at peak periods, such power often comes at a higher price to the power utility 48. Regardless of whether a higher price is paid by the utility, higher power prices are often charged to consumers of the power utility 22 during peak periods. In many cases, power utilities 48 encourage their customers to consume power at non-peak periods, such as a nighttime, and often give significant discounts to those who consume power during such periods. The vehicle charging cord 22 of FIGs. 2, 5-11 and 15 enables the user to take advantage of such cost savings by controlling when vehicle battery charging will occur. Even in those cases where savings to the power consumer are not provided, the vehicle charging cord 22 can be used to reduce power draw upon power utilities 48 at peak times and/or to better manage power consumption.

[0086] With reference to FIG. 10, the second screen 40A (entitled the "Programmed Charge" screen in FIG. 10) can show any amount of the information shown on the first screen 40 described above, such as the vehicle charging cord status indicator 42, the communication status indicator 54, the power connection status indicator 56, and the clock 58. The second screen 40A

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enables a user to select a time at which the vehicle charging cord 22 will begin charging a battery 20 connected thereto. For this purpose, the second screen 40A has a button 86 that can be selected (e.g., by user manipulation of the navigation and select buttons 36, 38 as described above) to set the vehicle charging cord 22 to begin charging at a desired time of day. This time of day can be changed and set by one or more time change buttons 88, such as by using the navigation buttons 36 to highlight one of the time change buttons 88 and by using the select button 38 to change the charge start time 90 displayed on the second screen 40A. Any other manner of changing and selecting a desired time can be used as desired, including without limitation drop down or pull-up menus displaying various charge start times that can be selected.

[0087] Once a charge start time has been selected by a user as just described, the user can select the navigation button 82 described above to return to the first screen 40, and can command the vehicle charging cord 22 to begin a charging session by pressing the power button 34. By doing so, the controller 44 of the vehicle charging cord 22 will compare the start time 90 entered by the user to the current time of day (e.g., displayed by the clock 58 as described above), and will begin charging the battery 20 at the entered charge start time 90. With reference to FIG. 15, the vehicle charging cord 22 can have a relay or other electrical switch 92 coupled to the controller 44 and operable by the controller 40 to close at the charge start time 90. Once the charge start time 90 has been reached, the controller 40 can automatically close the switch 92, thereby supplying a current to the battery 20 for charging the battery 20. The switch 92 can remain closed until the controller 40 detects that the battery 20 is fully or sufficiently charged, until an error in charging is detected (as described above), or in some embodiments until a charge stop time or other triggering event occurs. When any such condition is reached, the switch 92 can open, thereby stopping current flow to the battery 20 and stopping the battery charging process. The vehicle charging cord 22 can be provided with any battery charge circuitry suitable for charging the battery 20. Such battery charge circuitry is well know, and can include one or more voltmeters and/or amp meters for this purpose.

[0088] For example, the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 includes an amp meter 94 and a volt meter 96 electrically coupled to a power line 98 supplying power to the battery 20. The controller 44 can utilize information from the amp meter 94 and/or volt meter 96 to determine whether the battery 20 is fully charged, and to automatically stop charging the battery 20 (e.g., by opening the switch 92) when the battery 20 is fully charged.

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[0089] Accordingly, the vehicle charging cord 22 can be programmed to begin charging a battery 20 connected thereto at any time of day desired by a user. A user can therefore select an off-peak power time, and in some applications when the cost of power is reduced.

[0090] It will be appreciated that the time selected by a user to begin charging the battery 20 may not be the most optimal time for a power utility 48 to supply power for charging the battery 20. For example, in an emergency or during an unexpected surge of power demand, an otherwise off-peak time to begin charging the battery 20 may not be desirable for the power utility 20. As another example, widespread use of the vehicle charging cord 22 may result in surges of power demand at particular off-peak times, such as at midnight, 1 a.m., 2 a.m., or other charge start times that may be commonly selected by users in programming the vehicle charging cord 22 as described above. Another valuable feature of the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 can help to reduce or eliminate these problems. With reference again to FIG. 10, the second screen 40A has another button 100 that can be selected (e.g., by user manipulation of the navigation and select buttons 36, 38 as described above) to set the vehicle charging cord 22 to complete charging by a desired time of day. This time of day can be changed and set by one or more time change buttons 102, such as by using the navigation buttons 36 to highlight one of the time change buttons 102 and by using the select button 38 to change the charge completion time 104 displayed on the second screen 40A. Any other manner of changing and selecting a desired time can be used as desired, including without limitation drop down or pull-up menus displaying various charge start times that can be selected.

[0091] Once a charge start time has been selected by a user as just described, the user can select the navigation button 82 described above to return to the first screen 40, and can command the vehicle charging cord 22 to begin a charging session by pressing the power button 34. In such cases, the controller 44 receives the charge completion time 90 and can delay the start time at which battery charging will commence based upon one or more factors (described below).

[0092] In some embodiments, the controller 44 automatically retrieves power information from a memory 106 coupled to the controller 44. This power information can include the cost of power per unit time, one or more pre-set times, and the like, and can be saved in the memory 106 by the controller 44. The controller 44 can receive the power information from the transceiver 46 of the vehicle charging cord 22, which can receive the power information in communication with the controller 50 and transceiver 52 of the power utility 48 and/or in communication with the user's computer. This communication can occur in any of the manners described above

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regarding the communication between the controllers 44, 50 and/or between the controller 44 and the user's computer. In this regard, the information can be originally produced by the power utility 48, or can be produced by a user entering the information into the user's computer for transfer to the controller 44 and memory 106 of the vehicle charging cord 22.

[0093] The controller 44 can delay the time at which battery charging will begin based upon the power information just described, whether stored in the memory 106 of the vehicle charging cord 22 or retrieved from the power utility 48 without being stored in the memory 106. In some embodiments, the battery charging start determined by the controller 44 can be based upon a threshold cost of power reached over a period of time. This cost of power can be received periodically by the controller 44 from the power utility 48, such as by the controller 44 of the vehicle charging cord 22 polling the controller 50 of the power utility 48, or by the controller 50 of the power utility 48 regularly sending or streaming updated cost of power information to the controller 44 of the vehicle charging cord 22. Upon reaching a desired cost of power (e.g., $0.50/hr., $0.45/hr., $0.40/hr.), the controller 44 of the vehicle charging cord 44 can automatically cause the switch 92 to close, thereby charging the vehicle battery 20. This threshold cost of power can be input by a user into the vehicle charging cord 22 in any of the manners described above in connection with other information entry, such as by another data entry field similar to that of the desired charge start time 90 or the desired charge completion time 104.

[0094] In some embodiments, the controller 44 can also automatically cause the switch 92 to open if a desired cost of power threshold is reached, thereby interrupting battery charging. In such cases, battery charging can resume in the same manner as it began when the cost of power lowers as detected by the controller 44 of the vehicle charging cord 22. Any number of interruptions and resumptions in charging the vehicle battery 20 can take place in this manner.

[0095] In some embodiments, the controller 44 detects a command from the user to begin a charging session, and through communication with the controller 50 of the power utility 48 (whether initiated by the controller 44 of the vehicle charging cord 22 or initiated by the controller 50 of the power utility 48 by periodic polling or in any other manner), provides a signal to the controller 50 of the power utility 48 that a charging session has been requested. Upon receiving this signal, the controller 50 of the power utility 48 can request or otherwise receive the charge completion time 104 from the controller 44 of the vehicle charging cord 22. In some embodiments, additional information regarding the charging session can also be

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received, such as the level of charge of the battery 20 connected to the vehicle charging cord 22, and/or the estimated charge time remaining (discussed above in connection with the charge time remaining indicator 66). Still other information can be received by the controller 50 of the power utility 48, such as the capacity of the battery 20, the battery type, the manufacturer of the battery 20, the model or other identification information of the battery 20, and/or the battery age.

[0096] Any or all of this information can be retrieved by or transmitted to the controller 44 of the vehicle charging cord 44 by communication with a controller 108 of the battery 20 (i.e., for batteries 20 having an integrated circuit or other controller adapted for communication with another controller, otherwise known as "smart batteries") or vehicle. For example, the battery capacity, type, manufacturer, model or other identification information, and/or age can be stored in a memory (not shown) of the battery 20 coupled to and accessible by a controller 108 of the battery 20. This information can be stored in the memory of the battery 20 by the manufacturer, supplier, and/or servicer of the battery 20, or in some embodiments by a user. As another example, any or all of this information can be stored in a memory (not shown) of the vehicle 18 coupled to and accessible by a controller 108 of the vehicle 18. This information can be stored in the memory of the vehicle 18 by the manufacturer, supplier, and/or servicer of the vehicle 18, or in some embodiments by a user. For example, upon installation of a battery into the vehicle 18, the installer can access the controller 108 of the vehicle 18 in a conventional manner to record the battery capacity, type, manufacturer, model or other identification information, and/or age in a memory associated with the vehicle 18. Any of this information can be transmitted to or retrieved by the controller 44 of the vehicle charging cord 22 automatically upon connection to the vehicle 18 or at any other time, and in some embodiments can be stored in the memory 106 of the vehicle charging cord 22. In some embodiments, any of this information can then be retrieved from the memory 106 of the vehicle charging cord 22 and/or from the memory of the vehicle 18 for transmission to the controller 50 of the power utility 48 or for determining when to begin charging a battery 20 based upon any of the embodiments described herein.

[0097] Based upon the battery information obtained by the power utility 48 as described above, the power utility 48 can determine an desirable time to begin charging the battery 20 connected to the vehicle charging cord 22. This time can be based upon a number of factors that are specific to the requested charging session, such as the charge time completion for the requested charging session, as well as other factors that are independent of the requested charging session, such as the current and anticipated power draw by other customers of the

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power utility 48, and/or the current and anticipated cost of power to the power utility 48. Accordingly, based upon the battery information obtained by the power utility 48, the power utility 48 can control when the vehicle charging cord 22 starts to charge the battery 20 connected thereto. This control can occur, for example, by sending a signal from the controller 50 of the power utility 48 to the controller 44 of the vehicle charging cord 22 at a desired start time to trigger closure of the switch 92, or by sending a signal from the controller 50 of the power utility 48 to the controller 44 of the vehicle charging cord 22 to close the switch 92 at a particular future time (which time can be stored in the memory 106 of the vehicle charging cord 22 or can begin a timer counting to that particular time of day), or in other manners. In this manner, the power utility 48 can maintain a degree of control over power draw while still following an instruction by the user to complete a vehicle charging session by a desired time.

[0098] As just described, in some embodiments the power utility 48 can control when the vehicle charging cord 22 begins charging a battery 20 connected thereto. Alternatively or in addition, in some embodiments the power utility 48 can interrupt charging of a vehicle battery 20 in the event that it is desirable to delay the remainder of the charging process, such as during a surge of demand occurring while a battery 20 is being charged, in an emergency, and the like. This interruption can occur, for example, by sending a signal from the controller 50 of the power utility 48 to the controller 44 of the vehicle charging cord 22 at a desired interruption time to trigger the switch 92 to open, or by sending a signal from the controller 50 of the power utility 48 to the controller 44 of the vehicle charging cord 22 to open the switch 92 at a particular future time (which time can be stored in the memory 106 of the vehicle charging cord 22 or can begin a timer counting to that particular time of day), or in other manners. The power utility 48 can resume charging the vehicle battery 20 in the same manner as described above in connection with beginning to charge the vehicle battery 20. Any number of interruptions and resumptions in charging the vehicle battery 20 can take place based upon the desires and needs of the power utility 48 and the power draw upon the power utility 48.

[0099] Although it is desirable in some applications to delay the time at which charging of the vehicle battery 20 will begin based upon any of the embodiments described herein, it is also desirable in many cases to insure that a minimum level of battery power is immediately available to the user. This minimum level of battery power can be needed, for example, in case of emergency, or in the event that the user unexpectedly needs use of the vehicle 18. In such cases, the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 has another valuable feature.

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With particular reference to FIG. 10, the second screen 40A of the illustrated vehicle charging cord 22 has a button 110 that can be selected (e.g., by user manipulation of the navigation and select buttons 36, 38 as described above) to set the vehicle charging cord 22 to immediately begin charging the battery 20 until a minimum threshold level of battery charge has been reached regardless of whether a programmed charge has also been selected as described above. This minimum threshold level of battery charge can be changed and set by one or more charge level buttons 112, such as by using the navigation buttons 36 to highlight one of the charge level buttons 112 and by using the select button 38 to change the minimum threshold level of battery charge 114 displayed on the second screen 40A. Any other manner of changing and selecting a desired minimum level of battery charge can be used as desired, including without limitation drop down or pull-up menus displaying various levels of battery charge that can be selected.

[00100] When the button 110 is selected (and in some embodiments, after the user selects the navigation button 82 described above to return to the first screen 40, and after the user commands the vehicle charging cord 22 to begin a charging session by pressing the power button 34), the controller 44 determines whether the charge level of the vehicle battery 20 connected thereto is below the threshold input by the user. The battery charge level can be determined as described above. If the battery charge level is below the threshold input by the user, or in some cases at or below the threshold input by the user, the controller 44 of the vehicle charging cord 22 automatically causes the switch 92 to close, thereby charging the vehicle battery 20 without delay. If the user has also requested a programmed charge as described above, the vehicle charging cord 22 continues to charge the vehicle battery 20 until the minimum threshold level of battery charge 114 has been reached. At this time, the vehicle charging cord 22 resumes operation in programmed mode. For example, if the charge start time 90 has already passed or if the current cost of power is below the desired cost of power as described above, the controller 44 can continue to charge the vehicle battery 20, and can do so without interruption following battery charging to the minimum threshold level of battery charge as just described. As another example, if the power utility 48 had determined that the vehicle battery 20 should be charged (e.g., based at least in part upon a charge completion time 104 entered by a user as also described above), the controller 44 can continue to charge the vehicle battery 20, and can do so without interruption following battery charging to the minimum threshold level of battery charge as just described.

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[00101] Of course, if the vehicle charging cord 22 is operating in a manual charge mode (e.g., not based upon a time of day as selected using buttons 86 and 100), the vehicle charging cord 22 can begin to charge the vehicle battery 20 immediately after the user presses the power button 34, regardless of the degree to which the battery charge has been depleted.

[00102] In some embodiments, user control over additional functions and features of the vehicle charging cord 22 is enabled by further controls and menus. Additional controls and menus can be shown on the display 32 in either or both of the screens 40, 40A described above, or in any number of additional screens. By way of example only, the vehicle charging cord 22 of the embodiment illustrated in FIGs. 2, 5-11 and 15 has a third screen 40B shown in FIG. 11. This third screen 40B can be a utilities screen accessed by a user when the "UTILITIES" navigation button 80 is selected in a manner as described above. The third screen 40B also has navigation buttons 116, 118 that can be selected by a user to return to the first screen 40, whether by making one or more changes to operation of the vehicle charging cord 22 (by selecting the "GO" navigation button 116), or by making no changes to operation of the vehicle charging cord 22 (by selecting the "CANCEL" navigation button 118). In the illustrated embodiment, selection of either navigation button 116, 118 on the third screen 40B will return the user to the first screen 40.

[00103] With continued reference to FIG. 11, the third screen 40B can show any amount of the information shown on the first screen 40 described above, such as the vehicle charging cord status indicator 42, the communication status indicator 54, the power connection status indicator 56, and the clock 58. The third screen 40B can include a battery charge rate selector 120 enabling a user to change the amperage at which the vehicle charging cord 22 charges a battery 20 connected to the vehicle charging cord 22. This amperage can be changed and set by one or more amperage level buttons 122, such as by using the navigation buttons 36 to highlight one of the amperage level buttons 122 and by using the select button 38 to change the amperage of the vehicle charging cord 22 displayed on the third screen 40B. Any other manner of changing and selecting a charging amperage can be used as desired, including without limitation drop down or pull-up menus displaying various charging amperages that can be selected. Although not shown in FIG. 11, in other embodiments, a similar selector can be used to also or instead change the voltage at which the vehicle charging cord 22 charges a battery 20 connected to the vehicle charging cord 22.

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[00104] Additional features that can be used in any of the vehicle charging cord embodiments described and/or illustrated herein relate to communication settings of the vehicle charging cord 22. For example, the third screen 40B of the vehicle charging cord 22 illustrated in FIGs. 2, 5-11 and 15 includes a selector 124 that can be selected by a user to enable and disable Bluetooth® wireless communication with another controller, such as the processor of a user's computer. In other embodiments, the same or different selector can be used to enable and disable other types of wireless and wired communication with another controller. The third screen 40B of the illustrated embodiment also has a selector 126 that can be selected by a user to enable and disable wireless and/or wired communication with a power utility 48.

[00105] In some embodiments, the controller 44 of the vehicle charging cord 22 can send a communication to the user in the event that one or more different events associated with a vehicle charging session occur. By way of example only, by using conventional power detection circuitry, the controller 44 can detect when a supply of power to the vehicle charging cord 22 has been interrupted, such as in a power failure in the electrical system of the user, at the power utility, or anywhere in between. Identifying and communicating this status to a user can be very important to the user, enabling the user to find another source of electrical power to charge the user's vehicle 18, or at least enabling the user to make appropriate plans based upon the existing level of charge in the vehicle battery 20. As another example, and by using conventional battery diagnostic circuitry, the controller 44 can detect when the battery 20 connected thereto is fully charged or has reached any other level of charge (e.g., a minimum battery charge level as described above). Still other events that can be detected and communicated to the user include a battery fault condition, a problem with the vehicle charging cord 22, and the like.

[00106] Upon detection of any of the events just described, the controller 44 of the vehicle charging cord 22 can send a communication to the user providing notice of the event. For example, the third screen 40B of the vehicle charging cord 22 shown in FIG. 11 includes a selector 128 that can be selected by a user to enable and disable the controller 44 automatically sending a communication indicating that power supply to the vehicle charging cord 22 has been interrupted. As another example, the third screen 40B of the vehicle charging cord 22 shown in FIG. 11 includes a selector 130 that can be selected by a user to enable and disable the controller 44 automatically sending a communication indicating that the battery 20 to which the vehicle charging cord 22 is connected is fully charged.

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[00107] The controller 44 of the vehicle charging cord 22 can communicate any of the events described above in a number of different manners. For example, the vehicle charging cord 22 can have a speaker or other sound emitting device (not shown) coupled to the controller 44 and capable of emitting an auditory alarm when any of the above-described events have occurred. The audible alarm can be emitted once upon the occurrence of the event, or can be emitted upon the occurrence of the event and at periodic times (e.g., every 5 minutes, every hour, and the like) after the occurrence of the event. As another example, the controller 44 of the vehicle charging cord 22 can transmit a wired or wireless signal to the user's computer and/or to the power utility 48 (i.e., to the controller 50 of the power utility 48) in any of the manners of communication described above in connection with the controller 50. Such a signal can automatically trigger a visual or auditory alarm or other notice via the user's computer and/or the controller 50 of the power utility 48, such as by automatically generating a text message or e-mail from the controller 50 of the power utility 48 to a computer, phone, PDA, or other device of the user, by automatically generating a text message or e-mail from the user's computer to a phone, PDA, or other device of the user, by displaying an alert on the user's computer, and the like. Another mode of communication to the user include an automatically generated telephone call from the power utility 48 (triggered by and/or under control of the controller 50) or the user's computer to a phone of the user, followed by an automatically generated voice message communicating the event and played by phone to the user when the phone is answered. Still other modes of alerting the user to any of the events described above are possible, and fall within the spirit and scope of the present invention.

[00108] In the illustrated embodiment of FIGs. 2, 5-11 and 15, the controller 44 of the vehicle charging cord 22 responds to detection of power interruption or completion of battery charge by either causing an e-mail to be sent to the user and/or by generating an auditory alarm from the vehicle charging cord 22 based upon whether respective selectors 132, 134 for such modes of communication are selected on the third screen 40B illustrated in FIG. 11. In other embodiments, other modes of communication can be similarly enabled and disabled by selection of other selectors.

[00109] FIG. 12 illustrates another embodiment of a vehicle charging cord according to the present invention. This embodiment employs much of the same structure and has many of the same properties as the embodiments of the vehicle charging cord described above in connection with FIGs. 2, 5-11 and 15. Accordingly, the following description focuses primarily upon the

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structure and features that are different the embodiments described above in connection with FIGs. 2, 5-11 and 15. Reference should be made to the description above in connection with FIGs. 2, 5-11 and 15 for additional information regarding the structure and features, and possible alternatives to the structure and features of the vehicle charging cord illustrated in FIG. 12 and described below. Structure and features of the embodiment shown in FIG. 12 that correspond to structure and features of the embodiment of FIGs. 2, 5-11 and 15 are designated hereinafter in the 200 and 300 series of reference numbers.

[00110] The embodiment of the vehicle charging cord 222 shown in FIG. 12 provides an example of how the various indicators, selectors, and user-manipulatable controls can take different forms and be located in different positions and arrangements on the housing 228, and how the vehicle charging cord 222 can have any sub-combination of the features and elements described above (e.g., any sub-combination of the various indicators, selectors, and user-manipulatable controls described above). The illustrated vehicular charging cord 222 does not have an LCD display as shown in the embodiment of FIGs. 2, 5-11 and 15, and instead has a number of LED displays and indicators. For example, the illustrated vehicular charging cord 222 utilizes an LED display for the battery charge level indicator 260, clock 258, charge time remaining indicator 266, power used indicator 268, charge cost per hour indicator 270, total cost indicator 272, and charge start time/charge completion time indicator 290, 304 (both of which are combined into a common indicator as shown). As another example, the illustrated vehicular charging cord 222 utilizes individual LED lights for the vehicle charging cord status indicator 242 and the communication status indicator 254. The use of LED displays and LED lights can reduce manufacturing costs of the vehicle charging cord 222, and in some embodiments can provide a design of the vehicle charging cord 222 less susceptible to damage compared to the use of LCD and other displays.

[00111] As described above in connection with the illustrated embodiment of FIGs. 2, 5-11 and 15, the battery charge level indicator 260 and clock 258 can display information in any form desired. For example, the battery charge level indicator 260 shown in FIG. 12 is a numerical percentage of full charge, but can take any of the other forms described above in connection with the battery charge level indicator 60 of the embodiment of FIGs. 2, 5-11 and 15.

[00112] In contrast to the selectors 74 on the first screen 40 in the embodiment of FIGs. 2, 5-11 and 15, the selectors 274 in the illustrated embodiment of FIG. 12 are individual buttons of any conventional type, including any of the button types described above in connection with the

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power, navigation, and select buttons 34, 36, 38 of the embodiment of FIGs. 2, 5-11 and 15. By pressing any of the four buttons 274, a user can start a manual charge, start a programmed charge of the type described above in connection with the charge start time 90 illustrated in FIG. 10 (i.e., start charging at a time entered by the user), start a programmed charge of the type described above in connection with the charge completion time 104 illustrated in FIG. 10 (i.e., start charging based upon power utility control and complete charging by a time entered by the user), and stop the vehicle charging cord 222 from charging a battery 20 connected thereto.

[00113] Also, in contrast to the time change buttons 88, 102 on the second screen 40A in the embodiment of FIGs. 2, 5-11 and 15, the time change buttons 288, 302 in the illustrated embodiment of FIG. 12 are mechanical buttons of any type, including any of the button types described above in connection with the power, navigation, and select buttons 34, 36, 38 of the embodiment of FIGs. 2, 5-11 and 15. By pressing on the buttons 288, 302 to the left of the charge start time/charge completion time indicator 290, 304, the hour of the time displayed by the charge start time/charge completion time indicator 290, 304 can be adjusted, whereas by pressing on the buttons 288, 302 to the right of the charge start time/charge completion time indicator 290, 304, the minutes of the time displayed by the charge start time/charge completion time indicator 290, 304 can be adjusted. In other embodiments, any other number, position, and type of time change buttons can be used to adjust the time on the charge start time/charge completion time indicator 290, 304. Following entry of a desired time, a user can press any of the first three selectors 274 (followed in some embodiments by pressing the power button 234) to begin a charging session.

[00114] Although LEDs are used in the illustrated embodiment of FIG. 12 for various indicators and selectors 258, 260, 242, 254, 266, 268, 270, 272, 290, 304, any other type of light-emitting device can instead be used as desired.

[00115] The various embodiments of the vehicle charging cords 22, 222 described above and illustrated in FIGs. 2, 5-12 and 15 can provide significant advantages relating to the portability of the vehicle charging cords 22, 222. By virtue of the fact that the opposite ends 24, 26 of the vehicle charging cords 22, 222 are releasably connected to an electrical system providing a source of electrical power and to the battery 20 of a vehicle, respectively, and by virtue of the fact that the other components of the vehicle charging cord cords 22, 222 are contained within a housing to define a single integral unit, the vehicle charging cords 22, 222 are portable, can be readily moved from vehicle to vehicle, can thereby be used to charge any number of different

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vehicles, and can be moved into and out of (and can be transported by) vehicles with ease. Also, portable charging cords 22, 222 of the type described above and illustrated in FIGs. 2, 5-12 and 15 can be purchased by a user and can be releasably connected to the battery 20 of a vehicle 18, thereby eliminating the need to service the vehicle 18 or to the electrical system at which the vehicle will be charged. This can be particularly useful in cases where the ability to charge the battery 20 of the vehicle 18 in different locations only having standard electrical outlets (and otherwise not being specially adapted to charge electric vehicles) is important or desirable.

[00116] In other embodiments, either end 24, 26 of the charging cord 22, 222 can be permanently secured to the electrical system of the house, building, or other facility and/or to the vehicle 18, 218, respectively. For example, one end 24 of the charging cord 22, 222 can be permanently secured to the electrical system of the house, building, or other facility (i.e., not intended or adapted for removal by a user, such as by being wired directly into a junction box or circuit breaker of the electrical system of the house, building, or other facility). In such cases, the charging cord 22, 222 can be wound upon and stored in a floor standing, wall-mounted, or ceiling-mounted reel (not shown), such as those disclosed in U.S. Patent No. 6,439,360, the entire disclosure of which is incorporated herein by reference. The reel can be spring-loaded to enable the vehicle charging cord 22, 222 to be easily wound upon the reel for storage, or can be manually turned for this purpose. In such embodiments, the majority, all, or almost all of the length of the charging cord 22, 222 can be defined between the housing 28, 228 and the end 226 of the charging cord 22, 222 intended for connection to the electrical system of the facility. In this manner, the majority or almost all of the vehicle charging cord 22, 222 can be conveniently stored. Such vehicle charging cords provide a significant benefit to users desiring to charge two or more vehicles 18, 218 at the same facility using the same vehicle charging cord 22, 222, such as for charging one vehicle 18, 218 during the day and for charging another vehicle 18, 218 at night using the same vehicle charging cord 22, 222. The use of one vehicle charging cord 22, 222 for two or more vehicles 18, 218 can provide significant cost savings to the user(s) of the vehicles 18, 218.

[00117] As another example, one end 26 of the charging cord 22, 222 can be permanently secured to the vehicle 18, 218 (i.e., not intended or adapted for removal by a user, such as by being permanently connected to one or more wiring harnesses of the vehicle, or by being connected to an electrical junction box or fuse box of the vehicle 18, 218). In such cases, the charging cord 22, 222 can also be wound upon and stored on a reel (not shown) carried by the

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vehicle 18, 218, such as the reels disclosed in U.S. Patent No. 6,439,360 and incorporated by reference above. The reel can be mounted directly to the frame of the vehicle 18, 218, an interior surface of a body part of the vehicle 18, 218, to a bracket or other fixture (e.g., radiator mounting bracket, alternator or battery mounting bracket, and the like) of the vehicle 18, 218, to the front or rear bumper of the vehicle 18, 218, or to any other location providing suitable strength to carry the reel and vehicle charging cord 18, 218. As described above, the reel can be spring-loaded to enable the vehicle charging cord 22, 222 to be easily wound upon the reel for storage on the vehicle, or can be manually turned for this purpose. In such embodiments, the majority, all, or almost all of the length of the charging cord 22, 222 can be defined between the housing 28, 228 and the end 224 of the charging cord 22, 222 intended for connection to the vehicle 18, 218. In this manner, the majority or almost all of the vehicle charging cord 22, 222 can be conveniently stored on the vehicle. The vehicle-mounted vehicle charging cord 22, 222 provides a significant benefit for users needing to charge their vehicle battery 20, 220 in multiple locations, as the vehicle charging cord 22, 222 is conveniently carried by the vehicle 18, 218 from destination to destination.

[00118] Although reel-based vehicle charging cords as just described are described in connection with vehicle charging cords 22, 222 not intended for release by a user from both the vehicle 18, 218 and the electrical system of the facility, it should be noted that the other portable vehicle charging cord embodiments described and/or illustrated herein (i.e., those intended for user release at both ends) can also include a spring-loaded or non-spring-loaded reel as just described. In this manner, such vehicle charging cords 22, 222 can be quickly and conveniently placed in a relatively portable and compact state.

[00119] FIGs. 13, 14, and 16 illustrate an embodiment of a vehicle charging system according to the present invention. This embodiment employs much of the same structure and has many of the same properties as the embodiments of the vehicle charging cord described above in connection with FIGs. 2, 5-12 and 15. Accordingly, the following description focuses primarily upon the structure and features that are different the embodiments described above in connection with FIGs. 2, 5-12 and 15. Reference should be made to the description above in connection with FIGs. 2, 5-12 and 15 for additional information regarding the structure and features, and possible alternatives to the structure and features of the vehicle charging system illustrated in FIGs. 13, 14, and 16 and described below. Structure and features of the embodiment shown in

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FIGs. 13, 14, and 16 that correspond to structure and features of the embodiment of FIGs. 2, 5-12 and 15 are designated hereinafter in the 400 and 500 series of reference numbers.

[00120] Despite the significant advantages provided by the portable vehicle charging cords 22, 222 described above in connection with FIGs. 2, 5-12 and 15, other significant advantages are realized by incorporating the elements and features of the vehicle charging cords 22, 222 into a vehicle 18. With reference to FIGs. 13, 14, and 16, the illustrated vehicle charging system uses much of the same elements and features described above in connection with the various embodiments of the vehicle charging cords 22, 222. In this regard, FIG. 13 illustrates a portion of the dashboard of a vehicle 18, and includes a battery charge level indicator 460 integrated into the same part of the vehicle dashboard as an oil temperature indicator 538. Also integrated into the same portion of the dashboard, by way of example only, is a vehicle charging status indicator 442. The vehicle charging status indicator 442 shown in FIG. 13 can be similar to the charge status display area 76 described above in connection with the vehicle charging cord 22 of FIGs. 2, 5-11 and 15. Accordingly, one or more lights can be used to illuminate the words "MANUAL CHARGING IN PROCESS" when the vehicle battery charging system is in a manual charging mode as described above, whereas one or more other lights can be used to illuminate the words "PROGRAMMED CHARGE IN PROCESS" when the vehicle battery charging system is in a programmed charging mode as also described above. Any other manner of displaying the vehicle charging status indicator 442 can be used as desired, including without limitation an LED or LCD display, one or more lamps adjacent printed graphics, and the like.

[00121] With continued reference to the illustrated embodiment of FIGs. 13, 14, and 16, the illustrated vehicle charging system can include a display 432 located in the console of the vehicle 18. As used herein, the term "console" refers to any portion of the interior of a vehicle (i.e., in the interior passenger cabin of the vehicle) having one or more manual or electronic controls for controlling operation of a vehicle 18 and/or one or more indicators showing the status of vehicle operation. For example, the console of a vehicle 18 can include a dashboard having a speedometer, odometer, RPM gauge, oil temperature gauge, and the like, a navigation screen with associated indicators and/or controls, HVAC indicators and controls, an entertainment center (e.g., radio, DVD or other video system, CD, MP3 or other audio system, and the like) with associated indicators and controls, environmental temperature indicators, travel direction indicators, and the like. The console can be located immediately in front of the driver, to either side of the driver, in central forward area of the vehicle cabin, in an area between the driver's

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seat and an adjacent passenger seat, in an interior location on the roof or otherwise at a higher elevation than a horizontal line of sight of the user, and the like. Also, the console of the vehicle can extend to and be positioned in any combination of these interior vehicle locations, such as a single console including the dashboard and central area between the driver and passenger seats.

[00122] In some embodiments, the selectors and indicators (including any displays) of the vehicle charging system are located in their own dedicated console, whereas in other embodiments, the console carrying such features also carries other vehicle indicators and controls. Also, the selectors and indicators (including any displays) of the vehicle charging system can be located in two or more consoles, if desired, such as one or more indicators located in the dashboard console of the vehicle 18 and the remainder located in another console located between the driver and passenger at the front of the passenger compartment. Any combination of selectors and indicators located in any combination of vehicle consoles is possible, and falls within the spirit and scope of the present invention.

[00123] The display 432 shown in FIG. 14 is a touch screen display 432, and includes many of the same indicators and selectors used in the vehicle charging cord embodiments described above in connection with FIGs. 2, 5-11 and 15. In particular, the display 432 includes a charge time remaining indicator 466, power used indicator 468, charge cost per hour indicator 470, and total cost indicator 472 like those of the vehicle charging cords 22, 222 described and illustrated above. Also, the illustrated display 432 includes another vehicle charging status indicator 442 that can be used in addition to or in place of that shown in FIG. 13, and a communication status indicator 454 and power connection status indicator 456 similar to those described above in connection with the illustrated embodiment of FIGs. 2, 5-11 and 15. Although a clock can also be included on the display 432, a clock is not included in the display 432 of FIG. 14 in lieu of another clock of the vehicle 18 located elsewhere on the dashboard or console of the vehicle 18. This other clock can be connected to the same controller 444 (see FIG. 16) as the rest of the vehicle charging system, thereby providing the controller 444 with the time of day information needed to begin programmed charging operations as described above.

[00124] The display 432 illustrated in FIG. 14 can display multiple screens 440 to be shown upon the display 432, thereby enabling a significantly greater amount of battery and battery charging information to be shown on the display, and/or enabling a greater degree of control over the vehicle charging system. Like the vehicle charging cords 22, 222 described above, navigation between screens 440 on the display 432 is enabled by navigation buttons on the

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screens. For example, the screen 440 shown in FIG. 14 includes two navigation buttons 478, 480 like those of the illustrated embodiment of FIGs. 2, 5-11 and 15 described above. By pressing one of the navigation buttons 478 (entitled "PROGRAMMED CHARGE SETUP"), the screen 440 is replaced by a charge programming screen (not shown) having any or all of the indicators and selectors 42, 54, 56, 58, 82, 84, 86, 88, 90, 100, 102, 104, 110, 112, and/or 114 described above in connection with the second screen 40A in FIG. 10. These indicators and selectors can have the same or any other arrangement upon the programming screen. By pressing the other navigation button 480 (entitled "UTILITIES"), the screen 440 is replaced by a utilities screen (also not shown) having any or all of the indicators and selectors 42, 54, 56, 58, 116, 118, 120, 122, 124, 126, 128, 130, 132, and/or 134 described above in connection with the third screen 40B in FIG. 11. These indicators and selectors can have the same or any other arrangement upon the utilities screen.

[00125] To begin or stop a manual or programmed charging session, the embodiment of the present invention illustrated in FIGs. 13, 14, and 16 can include a single power button that in some embodiments can change text to indicate whether a selection can be made by a user to start or stop a charging session (e.g., changing from "START CHARGE" to "STOP CHARGE" once a user selects "START CHARGE", or changing from "STOP CHARGE" to "START CHARGE" once the user selects "STOP CHARGE"). In other embodiments, such as that shown in FIGs. 13, 14, and 16, the screen 440 can include separate buttons 434A, 434B to start or stop a charging session, such as to start a manual charge if none of the selectors for a programmed charge have been selected on a programming screen, or to start a programmed charge of any type described herein.

[00126] Although the in-console display 432 illustrated in FIG. 14 is a touch screen display 432, the display 432 can be any other type of display, such as the other types of displays described and illustrated herein. For example, the touch screen display 432 can be replaced by a display such as that shown in FIGs. 5-11 or FIG. 12, in which cases the vehicle charging system can include navigation buttons (e.g., adjacent the display 432) enabling a user to navigate through a screen and to select any selectors upon the display 432. As another example, the touch screen display 432 can be replaced by any combination of buttons, switches, dials, or other user-manipulatable controls; LEDs and other lights; and displays (e.g., see FIG. 12).

[00127] A schematic diagram of the vehicle charging system in which an in-console display 432 is utilized and/or in which the in-console vehicle charging selectors and indicators are

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otherwise utilized is shown in FIG. 16. Like the embodiments of FIGs. 2, 5-12 and 15 described above, the system illustrated in FIG. 16 is releasably coupled to a source of power 412 operated and controlled by a power utility 448 having a transceiver 452 and controller 444 (e.g., a computer) that can communicate via a PLC system with the controller 444 of the vehicle charging system. In the illustrated embodiment of FIG. 16, however, the display 432 and other controls and indicators are located in one or more in-cabin consoles of the vehicle 418. Therefore, a power cord 540 having ends 424, 426 described above in connection with the embodiments of FIGs. 2, 5-12 and 15 (but without the housing and other components carried in or on the housing) can be used to releasably connect the battery 420 of the vehicle 418 with the electrical system of the facility used to charge the battery 420 as also described above. As with the earlier-described embodiments, the power cord 540 can be releasably coupled to the vehicle 418, and in other embodiments can instead be stored on-board the vehicle 418 when not in use (e.g., by a cord reel mounted on the vehicle as described above). Also as with the earlier-described embodiments, the power cord 540 can also or instead be releasably coupled to the electrical system of the house, office, or other facility to enable the power cord 540 to be more readily and easily moved within and removed from the facility, or can be permanently connected to the electrical system.

[00128] With continued reference to FIG. 16, the illustrated vehicle charging system also includes a transceiver 446 for communication between the controller 444 on board the vehicle 418 and the transceiver 452 and controller 440 of the power utility 448, a power transformer 536, an amp meter 494, a volt meter 496, a switch 492, and a memory 506 performing the same functions described above in conjunction with the embodiments of FIGs. 2, 5-12, and 15. It should be noted that the controller 444 of the vehicle charging system can be a dedicated controller (e.g., a processor or set of discrete logic elements) separate from the other controllers of the vehicle (e.g., those used to control vehicle startup, vehicle access and security, and engine operation, smart battery controllers, and the like), or can be the same as such other controller(s). Accordingly, the electronics of the vehicle charging system according to some embodiments of the present invention can be fully or partially integrated into one or more other controllers of the vehicle, or can be separate therefrom. In either case, the controller 444 can be located within a housing (not shown), and can be connected via suitable wiring harnesses or other wired or wireless electrical connections to an electrical connector on the vehicle (adapted for releasable mating connection to an external power cord as described above) or to a power cord carried by the vehicle as also described above. Similarly, the memory 506, transceiver 446, and clock can

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be dedicated solely for operation of the vehicle charging system as described in earlier embodiments, or can instead be shared by other systems of the vehicle 418.

[00129] The vehicle charging system shown in FIG. 16 can function in the same manners described above in connection with the embodiments of FIGs. 2, 5-12, and 15, it being understood that communications, power control, programming, and other features of the vehicle charging system are performed on-board the vehicle 418 rather than in a vehicle charging cord as shown in FIGs. 2, 5-12, and 15. Accordingly, power supply and communications in the embodiment of FIG. 16 can include power supply and communications over one or more suitable power cords, wiring harnesses, and the like of the vehicle performing the same functions (including PLC and power transmission functions) as the flexible power cords on both sides of the housings 28, 228 illustrated in FIGs. 2 and 5-12.

[00130] FIG. 3 illustrates another embodiment of a vehicle charging system according to the present invention. This embodiment employs much of the same structure and has many of the same properties as the embodiments of the vehicle charging cord described above in connection with FIGs. 2, 5-12 and 15. Accordingly, the following description focuses primarily upon the structure and features that are different the embodiments described above in connection with FIGs. 2, 5-12 and 15. Reference should be made to the description above in connection with FIGs. 2, 5-12 and 15 for additional information regarding the structure and features, and possible alternatives to the structure and features of the vehicle charging system illustrated in FIG. 3 and described below. Structure and features of the embodiment shown in FIG. 3 that correspond to structure and features of the embodiment of FIGs. 2, 5-12 and 15 are designated hereinafter in the 600 and 700 series of reference numbers.

[00131] The vehicle charging system illustrated in FIG. 3 operates in substantially the same manner as that of FIGs. 2, 5-12 and 15. However, in the illustrated embodiment of FIG. 3, the vehicle charging system is embodied in a cabinet 742. The cabinet 742 performs functions similar to the housings 28, 228 described and illustrated herein, such as to house the controller, transformer, and other electronics of the vehicle charging system. In some embodiments, the cabinet 742 can be wall-mounted and/or floor-mounted (such as that shown in FIG. 3).

[00132] The cabinet 742 of the vehicle charging system can include a display 732 having any of the features and performing any of the functions described above in connection with the displays 32 of the embodiments shown in FIGs. 2, 5-11, 14, and 15. The display 732 can be a

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touch screen display or any other type of display as described herein, and can be accompanied by any number and type of user manipulatable controls (e.g., navigation buttons) as also described herein. Any combination of selectors and indicators (including displays) described and/or illustrated herein can be provided on the cabinet to perform the vehicle charging functions also described herein.

[00133] In some embodiments, the cabinet 742 is provided with a power cord 744 terminating in a plug 624 that can be releasably connected to a vehicle 618 (and to the battery 620 thereof). The plug 624 can take any of the forms described above in connection with the embodiments of FIGs. 2, 5-12, and 15. In some embodiments, the power cord 744 can be stored on a reel (not shown) in or adjacent the cabinet 742. The reel can take any of the forms described above in connection with other embodiments of the present invention. Although the cabinet 742 can provide a convenient location for storage of the power cord 744, the power cord 744 can instead be permanently or releasably coupled to the vehicle 618 for storage on the vehicle 618 when the power cord 744 is not in use. For example, the power cord 744 can be stored upon a reel of the vehicle 618 as described in greater detail above. In those embodiments in which the power cord 744 is intended to be stored and carried by the vehicle 618, the power cord 744 can have an opposite end terminating in a plug (such as any of the plugs described above in connection with plug 26 shown in FIG. 5). The cabinet 742 can be provided with any number of electrical connectors for releasable mating engagement with the plug (and for any number of other plugs on power cords 744 extending to other vehicles 618).

[00134] FIG. 17 illustrates another embodiment of a vehicle charging system according to the present invention. This embodiment employs much of the same structure and has many of the same properties as the embodiments of the vehicle charging system described above in connection with FIGs. 2, 3, and 5-16. Accordingly, the following description focuses primarily upon the structure and features that are different the embodiments described above in connection with FIGs. 2, 3, and 5-16. Reference should be made to the description above in connection with FIGs. 2, 3, and 5-16 for additional information regarding the structure and features, and possible alternatives to the structure and features of the vehicle charging system illustrated in FIG. 17 and described below. Structure and features of the embodiment shown in FIG. 17 that correspond to structure and features of the embodiments of FIGs. 2, 3, and 5-16 are designated hereinafter in the 800 and 900 series of reference numbers.

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[00135] Like the embodiment of FIGs. 2, 3, and 5-16, the vehicle charging system of FIG. 17 also includes a transceiver 846 for communication between a controller 844 and the transceiver 852 and controller 840 of the power utility 848, a power transformer 836, an amp meter 894, a volt meter 896, a switch 892, and a memory 906 performing the same functions described above in conjunction with the embodiments of FIGs. 2, 5-12, and 15. A clock 858, display 832, and associated user-manipulatable controls as described above (or other types and combinations of selectors and indicators, with or without displays) are also included for providing information to the user and for receiving instructions from the user in any of the manners also described above.

[00136] The vehicle charging system of FIG. 17 includes a battery 946 that can be charged in any of the same manual or programmed manners described above in connection with the embodiments of FIGs. 2, 3, and 5-16. The battery 946 is separate from the battery 920 of the vehicle 918, and can have any size sufficient for at least partially charging the battery 920 of the vehicle 918 when connected thereto. Rather than or in addition to charging a battery 920 of the vehicle 918 as described herein in connection with other embodiments of the present invention, the vehicle charging system of FIG. 17 operates to charge the battery 946 that remains at the house, building, or other facility at which vehicle charging takes place. The battery 946 therefore functions as a reservoir of power that can collect and store a charge for later transfer to batteries 946 of one or more vehicles 918. Accordingly, although the battery 946 can have any size suitable for charging a battery 920 of a vehicle 918, in some embodiments the battery 946 has a capacity capable of fully charging the battery 920 of at least one vehicle 918 when the battery 920 of the vehicle 918 has no charge or substantially no charge.

[00137] The battery 946 can be located anywhere in a house, building, or other facility where vehicle battery charging is desired, and in some embodiments is located an a garage in which the vehicle is stored. For example, the battery 946 can be stored in a cabinet also housing the rest of the vehicle charging system (e.g., in a lower portion of the cabinet 742 illustrated in FIG. 3). In some embodiments, the battery 946 can be sufficiently oversized (in voltage, current, or capacity) for completely charging a drained vehicle battery 920 connected thereto so that improved or optimized battery charging conditions can be achieved. The battery 946 can also be oversized to carry sufficient charge for charging two or more fully or substantially discharged vehicle batteries 920. Also, in some embodiments, the vehicle charging system can have one or more power converters (e.g., DC to DC converters) to increase the output voltage of the battery 946 sufficiently for charging the vehicle battery 920.

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[00138] With continued reference to the illustrated embodiment of FIG. 17, the vehicle charging system can include an additional relay or other electrical switch 948 coupled to the controller 844. The switch 948 can enable a user to begin charging the battery 920 of a vehicle 918 connected to the vehicle charging system only when desired. Accordingly, the controller 844 can send a signal to close the switch 948 upon receiving a command from a user (e.g., via a user-manipulatable control having any of the forms described herein) to begin charging the battery 920 of a vehicle 918 connected thereto. Like the other embodiments described and illustrated herein, the switch 948 can be controlled by a user and/or can be controlled by a power utility 948 via the transceivers 846, 852 and controllers 840, 844.

[00139] By virtue of the battery 946 in the embodiment of FIG. 17, control over a community's power draw needed for charging vehicles 918 is greatly increased. Rather than wait until a vehicle 918 is connected to the electrical system of a house, building, or other facility in order to supply power to charge the battery 920 of the vehicle 918, the user or power utility 848 can be free to supply vehicle battery charging power at any convenient time. For example, if the power utility 848 has a period of relatively low daytime demand that is unexpected (such as a drop in power draw during an otherwise peak or high demand time), the power utility 848 can begin charging the battery 946 regardless of whether the vehicle 918 is in another location. This flexibility can enable the power utility 848 to independently send relatively low-cost battery charging power – and/or for the user to independently draw relatively low-cost battery charging power - at times of power surplus regardless of the location of the vehicle 918 to be charged.

[00140] In some embodiments, the vehicle charging system of FIG. 17 can also operate in a manner similar to the embodiments of FIGs. 2, 3, and 5-16, whereby a user can connect the battery 920 of the vehicle 918 for charging, and the battery 920 can be charged in any manual or programmed mode by closure of the switches 892, 948 under control of the controller 844. Such charging can take place without draining the battery 946 described above (such as by a suitable electrical bypass around the battery 946), or can be supplemented by any amount of charge existing in the battery 946. In this regard, if the cost for charging or partially charging the battery 946 of the vehicle charging system is higher than the calculated cost of charging the battery 920 of the vehicle 918 at the desired charging start time (both figures being available to the controller 844 as described above, and being storable in and retrievable from the memory 906 as desired), the controller 844 can control the switches 892, 948 to charge the vehicle battery 920 using the charge from the system battery 946 first. If the opposite is true, the controller 844 can

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control the switches 892, 948 to charge the vehicle battery 920 using power directly from the power utility 848 without draining the system battery 946. These operating conditions can be continually monitored by the controller 844, which in some embodiments can automatically react to changing power supply costs while charging is in process by changing the source of charging current (i.e., system battery 946 or power utility 848).

[00141] The vehicle charging system of FIG. 17 is illustrated in the form of a portable vehicle charging cord, such as the embodiments of FIGs. 2, 5-12, and 15. However, the features of the vehicle charging system of FIG. 17 can be incorporated into any of the vehicle charging system embodiments described and/or illustrated herein, including those illustrated in FIGs. 3, 13, 14, 16, and FIGs. 4, 18, and 19 (described below).

[00142] FIGs. 4, 18, and 19 illustrate another embodiment of a vehicle charging system according to the present invention. This embodiment employs much of the same structure and has many of the same properties as the embodiments of the vehicle charging systems described above in connection with FIGs. 2, 3, and 5-17. Accordingly, the following description focuses primarily upon the structure and features that are different the embodiments described above in connection with FIGs. 2, 3, and 5-17. Reference should be made to the description above in connection with FIGs. 2, 3, and 5-17 for additional information regarding the structure and features, and possible alternatives to the structure and features of the vehicle charging system illustrated in FIGs. 4, 18, and 19 and described below. Structure and features of the embodiment shown in FIGs. 4, 18, and 19 that correspond to structure and features of the embodiments of FIGs. 2, 3, and 5-17 are designated hereinafter in the 1000 and 1100 series of reference numbers.

[00143] The vehicle charging system illustrated in FIGs. 4, 18, and 19 has the same components and features as described above in connection with the on-board vehicle charging system of FIGs. 13, 14, and 16, but is further adapted for charging the battery 1020 of the vehicle 1018 by induction charging. Accordingly, the vehicle charging system illustrated in FIGs. 4, 18, and 19 has a touch screen display 1032 having a charge time remaining indicator 1066, power used indicator 1068, charge cost per hour indicator 1070, and total cost indicator 1072 as described in greater detail in the embodiments above. Also, the illustrated display 1032 includes a vehicle charging status indicator 1042 (not shown in FIG. 19, but in the text banner at the top of the illustrated display 1032 in FIG. 19 when docking is not in process), a communication status indicator 1054, and a power connection status indicator 1056 as described in greater detail in the embodiments above.

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[00144] The display 1032 illustrated in FIG. 19 can display multiple screens 1040 to be shown upon the display 1032, thereby enabling a significantly greater amount of battery and battery charging information to be shown on the display, and/or enabling a greater degree of control over the vehicle charging system. Navigation between screens 1040 on the display 1032 is enabled by navigation buttons on the screens 1040. For example, the screen 1040 shown in FIG. 19 includes two navigation buttons 1078, 1080 for navigation to programming and utility screens as described in greater detail in the embodiments above. Also, the screen 1040 has separate buttons 1034A, 1034B to start or stop a charging session.

[00145] Although the in-console display 1032 illustrated in FIG. 19 is a touch screen display 1032, the display 1032 can be any other type of display, such as the other types of displays described and illustrated herein. For example, the touch screen display 1032 can be replaced by a display such as that shown in FIGs. 5-11 or FIG. 12, in which cases the vehicle charging system can include navigation buttons (e.g., adjacent the display 1032) enabling a user to navigate through a screen and to select any selectors upon the display 1032. As another example, the touch screen display 1032 can be replaced by any combination of buttons, switches, dials, or other user-manipulatable controls; LEDs and other lights; and displays (e.g., see FIG. 12).

[00146] With reference now to FIG. 4, the vehicle charging system of FIGs. 4, 18, and 19 utilizes a conventional battery induction charging system in order to charge the battery 1020 of the vehicle 1018, and includes a charging pad 1150 having a power supply core (not shown) energized to supply power via induction to a power receiving core of the vehicle (shown schematically at 1152 in FIG. 18). By way of example only, an inductive vehicular battery charger system that can be used is disclosed in U.S. Patent No. 6,525,510, the entire contents of which are incorporated herein by reference. The power supply core of the charging pad 1150 is electrically connected to and receives power from a vehicular charger that is the same as that described above in connection with the embodiment of FIG. 3. In particular, the core of the charging pad 1150 is electrically connected to the electrical system of the house, building, or other facility at which charging is to take place via a below-ground or above-ground power line 1144 extending to a cabinet 1142 having any of the selectors and indicators (including display(s)) described above in connection with FIG. 3. In this regard, any of the alternative vehicle charger features and structures also described above in connection with the embodiment of FIG. 3 can also be applied in the inductive vehicular charging system of FIGs. 4, 18, and 19.

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[00147] As is well known to those in the art of inductive battery charging, proper alignment between the power supply core and the power receiving core of the battery charger is important for efficient battery charging. In the illustrated embodiment of FIGs. 4, 18, and 19, this alignment can be achieved by user operation of the vehicle 1018. In particular, one or more sensors 1154 can be provided on the vehicle 1018 and can be positioned to detect the presence and proximity of the vehicle charging pad 1150 and core thereof. The sensors 1154 can be inductive sensors adapted to detect the presence of metallic elements 1156 in the vehicle charging pad 1150 or having known positions with respect to the vehicle charging pad 1150 and core. Alternatively, the sensors 1154 can be Hall Effect sensors adapted to detect the magnetic field of magnets or electromagnets having known positions on or with respect to the vehicle charging pad 1150 and core. In other embodiments, the sensors 1154 can be RFID sensors adapted to detect the position of one or more RFID transmitters having known positions on or with respect to the vehicle charging pad 1150 and core. Still other types of sensors 1154 can instead be used, including without limitation optical sensors, eddy current sensors, and ultrasonic sensors for use in conjunction with optical, eddy current, and ultrasonic sensing and position systems, all of which operate on principles well-known to those skilled in the art. By detecting the distance between the sensor(s) 1154 on the vehicle 1018 and one or more reference points on the charging pad 1150 (or having known positions with respect to the charging pad 1150), the position of the sensor(s) 1154 with respect to the charging pad 1150 can be identified via triangulation. Triangulation systems operating to detect the relative position of objects based upon any of these technologies are well-known to those skilled in the art, and are not therefore described further herein.

[00148] In other embodiments, the locations of the sensors 1154 and the elements 1156 (e.g., metallic elements 1156, magnets or electromagnets, RFID transmitters, and the like, as described above) detected by the sensors 1154 can be reversed, whereby one or more of the sensors 1154 can be located on the charging pad 1150 or located at known positions with respect to the charging pad 1150 for detecting one or more elements 1156 (e.g., metallic elements 1156, magnets or electromagnets, RFID transmitters, and the like, as described above) of the vehicle 1018.

[00149] The controller (not shown) of the inductive vehicle charging system illustrated in FIGs. 4, 18, and 19 receives signals from the sensor(s) 1154 described above, and based upon a conventional triangulation algorithm as described above, determines the direction in which the

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vehicle 1018 must move for desired alignment of the vehicle 1018 (and power receiving core connected to the battery 1020 of the vehicle 1018) with respect to the charging pad 1150 and core thereof. Upon making this determination, the controller can display directional instructions to the user. In the illustrated embodiment of FIGs. 4, 18, and 19, directional indicators 1160 are displayed on the same touch screen display 1032 described above, along with a text line 1162 noting the direction the vehicle 1018 should move for proper charging alignment. In other embodiments, this information can be provided on another display (e.g., on a display located in a console of the vehicle 1018), or can be located on another type of display (not necessarily a touch screen). Also, in some embodiments, this information can be presented without a display 1032, such as by illumination of one or more LEDs or other lights to illuminate an arrow or other symbol, text, or any combination of symbols and text providing directional instructions to the user.

[00150] By way of example only, the touch screen display 1032 illustrated in FIG. 19 presents text 1162 indicating the direction in which the user should move the vehicle 1018 for proper charging alignment, presents arrow symbols 1160 in any combination (e.g., forward, rearward, left, right) around a graphical depiction of the vehicle 1164, and also displays a graphical depiction of the front wheels 1166 turned in the direction needed for proper charging alignment. Any combination of these and other alignment symbols and text instructions 1168 can be displayed to the user to indicate how the vehicle 1018 should be moved for proper charging alignment. Such symbols and/or text 1168 can be updated continuously or periodically as the position of the sensors 1154 and vehicle 1018 change with respect to the charging pad 1150 and core thereof, until alignment within a predetermined acceptable error calculated by the controller is achieved. In some embodiments, the control(s) selected to begin a charging session (e.g., the "START CHARGE" selector 1034A on the touch screen display 1032 of the illustrated embodiment) are disabled until such alignment is achieved.

[00151] By utilizing the sensors 1154, sensed elements 1156, and alignment indicators 1168 as just described, proper alignment of the vehicle 1018 with respect to the charging pad 1150 can be conveniently and quickly achieved without requiring the user to leave the vehicle 1018. Also, a charging session can be started without the need to plug in the vehicle 1018.

[00152] Although the induction-based vehicle charging system described above in connection with FIGs. 4, 18, and 19 is presented in the context of an on-board vehicle charging system (i.e., where the display 1032, and other indicators and selectors are located in one or more consoles of

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the vehicle 1032, it should be noted that the vehicle alignment features described above can be used in connection with any of the other vehicle charging systems herein.

[00153] Another feature of the present invention regards the location at which a cord-based vehicle charging system is attached to the vehicle. As described above, some vehicle charging systems according to the present invention utilize a cord 22, 222, 540, 744, 944 that is releasably or permanently attached to the vehicle 18, 218, 418, 618, 818. It will be appreciated that such a tethered connection can present the danger of a user accidentally moving the vehicle 18, 218, 418, 618, 818 before disconnecting the cord 22, 222, 540, 744, 944 from the vehicle 18, 218, 418, 618, 818. Depending upon the position and orientation of the electrical connector of the vehicle 18, 218, 418, 618, 818 to which the cord 22, 222, 540, 744, 944 is connected, and the manner in which the opposite end of the cord 22, 222, 540, 744, 944 is attached to the electrical system of the house, building, or other facility, such movement can create significant damage to the vehicle 18, 218, 418, 618, 818, cord 22, 222, 540, 744, 944, and/or the electrical system of the house, building, or other facility. In some embodiments of the present invention, this damage can be mitigated or avoided by virtue of the position of the electrical connector of the vehicle 18, 218, 418, 618, 818.

[00154] With reference now to FIGs. 20-23, another embodiment of the present invention is illustrated, and is presented in the context of the vehicle charging cords 22, 122 in the embodiments of FIGs. 2, 5-12, and 15 by way of example only. In this regard, the features described below in connection with FIGs. 20-23 can be utilized in conjunction with any of the vehicle charging systems disclosed herein in which a power cord 22, 222, 540, 744, 944 is attached to a vehicle 18, 218, 418, 618, 818 for purposes of charging the battery 20, 222, 422, 622, 822 of the vehicle 18, 218, 418, 618, 818.

[00155] As shown in FIGs. 20-22, the plug 26 of the vehicle charging cord 22, 222 releasably connects to the electrical connector 170 of the vehicle 18, 218. In the illustrated embodiment of FIGs. 20-22, the electrical connector 170 of the vehicle is located in a front surface 172 of the vehicle 18, 218. Accordingly, in the event a user moves the vehicle 18, 218 in a rearward direction without disconnecting the vehicle charging cord 22, 222, the opportunity for the plug 26 of the vehicle charging cord 22, 222 to automatically disconnect by virtue of rearward movement of the vehicle 18, 218 is significantly increased. Of course, a significant factor in the amount of shear and tension force exerted upon the plug 26, vehicle charging cord 22, 222, and electrical connector 170 prior to this disconnection is the location of the other end of the vehicle

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charging cord 22, 222. In those embodiments where the other end (e.g., plug 24) of the vehicle charging cord 22, 222 is connected to the electrical system of a house, building, or other facility substantially in front of the vehicle 18, 218, this force can be significantly less than the disconnection force needed in those embodiments in which the other end of the vehicle charging cord 22 is connected at a location laterally disposed from the vehicle 18, 218. However, for those applications in which the vehicle 18, 218 must be backed up to exit the vehicle charging area, this location of the electrical connector 170 can significantly reduce the amount of disconnection force compared to locations of the electrical connector 170 located on a side or rear of the vehicle 18, 210.

[00156] Although not illustrated, in some embodiments, the electrical connector 170 of the vehicle 18, 218 is located in a rear surface 174 of the vehicle 18, 218. Accordingly, in the event a user moves the vehicle 18, 218 in a forward direction without disconnecting the vehicle charging cord 22, 222, the opportunity for the plug 26 of the vehicle charging cord 22, 222 to automatically disconnect by virtue of forward movement of the vehicle 18, 218 is significantly increased. As described above, a significant factor in the amount of shear and tension force exerted upon the plug 26, vehicle charging cord 22, 222, and electrical connector 170 prior to this disconnection is the location of the other end of the vehicle charging cord 22, 222. In those embodiments where the other end (e.g., plug 24) of the vehicle charging cord 22, 222 is connected to the electrical system of a house, building, or other facility substantially behind the vehicle 18, 218, this force can be significantly less than the disconnection force needed in those embodiments in which the other end of the vehicle charging cord 22 is connected at a location laterally disposed from the vehicle 18, 218. However, for those applications in which the vehicle 18, 218 must be moved forward to exit the vehicle charging area, this location of the electrical connector 170 can significantly reduce the amount of disconnection force compared to locations of the electrical connector 170 located on a side or front of the vehicle 18, 218.

[00157] In some embodiments, a clearance or light interference fit is provided between the plug 24 of the vehicle charging cord 22, 222 and the electrical connector 170 (located in a front or rear surface 172, 174 of the vehicle 18, 218 as described above), thereby providing a reduced amount of force needed to disconnect the plug 24 from the electrical connector 170. In some embodiments, a force needed for disconnection of the plug 24 from the electrical connector 170 is no greater than about 20 pounds (measured in a direction parallel to motion of the plug 24 with respect to the electrical connector 170 during connection) to avoid or reduce damage to the

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vehicle charging cord 22, 222, electrical connector 170, and vehicle 18, 218. In other embodiments, this force is no greater than about 10 pounds to avoid or reduce damage to the vehicle charging cord 22, 222, electrical connector 170, and vehicle 18, 218. In still other embodiments, this force is no greater than about 5 pounds to avoid or reduce damage to the vehicle charging cord 22, 222, electrical connector 170, and vehicle 18, 218.

[00158] As indicated above, the angle at which the force of disconnection is applied upon the electrical connector 170 and plug 24 can have a significant impact upon the shear and tension forces experienced by the electrical connector 170 and plug 24 when the vehicle 18, 218 is moved without unplugging the vehicle charging cord 22, 222. To reduce or mitigate these forces, the orientation of the electrical connector 170 with respect to the vehicle 18, 218 is selected to fall within a range of angles measured from a forward direction of the vehicle 18, 218. In particular, in some embodiments, the electrical connector 170 is oriented so that an angle 176 (see FIG. 21) between the forward direction of the vehicle 18, 218 (defined by proper alignment of the vehicle under normal operating conditions) and the direction of motion of the plug 24 with respect to the electrical connector 170 during connection is no greater than about 50 degrees. In other embodiments, this angle 176 is no greater than about 40 degrees to reduce or mitigate the disconnection force. In still other embodiments, this angle 176 is no greater than about 30 degrees to reduce or mitigate the disconnection force. In combination with the maximum disconnection forces according to some embodiments as described above, these orientation angles 176 of the electrical connector 170 can help to ensure damage-free disconnection of the vehicle charging cord 22, 222 from the electrical connector 170 of the vehicle 18, 218 regardless of whether the electrical connector 170 is located in the front or rear surface 172, 174 of the vehicle 18, 218 as described above.

[00159] In some embodiments, the vehicle 18, 218 is provided with two or more electrical connectors 170 in different locations (e.g., different sides) on the exterior of the vehicle 18, 218, any of which can be connected to a vehicle charging cord 22, 222 to charge the battery 20, 220 of the vehicle 18, 218. For example, one electrical connector 170 can be located in a front surface 172 of the vehicle 18, 218, and another electrical connector 170 can be located in a rear surface 172 of the vehicle 18, 218. Both such electrical connectors 170 can be connected to the battery 20, 220 and controller 44, 244 of the vehicle 18, 218 by suitable power wiring (e.g., wiring harnesses) extending along the vehicle 18, 218. In such embodiments, a user can choose to connect the vehicle charging cord 22, 222 to the electrical connector 170 closest to the

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location at which the vehicle charging cord 22, 222 is connected to the electrical system of the house, building, or other charging facility, or can connect the vehicle charging cord 22, 222 to the electrical connector 170 oriented at the smallest angle with respect to such a location upon accidental movement of the vehicle 18, 218. This ability to choose between two or more electrical charging connectors 170 can present significant convenience to the user while helping to prevent damage to the vehicle charging cord 22, 222 and vehicle 18, 118 upon accidental movement of the vehicle 18, 118 while still plugged in.

[00160] The illustrated embodiment of FIGs. 20-23 is presented with reference to a vehicle charging cord 22, 222 intended for releasable connection at an electrical connector 170 of the vehicle 18, 218. However, it should be noted that the same principles of disconnect force, disconnect angle, and cord-to-vehicle interface location apply regardless of whether the vehicle charging cord 22, 222 is intended to be disconnected at the vehicle 18, 218. In this regard, some embodiments of the present invention provide a vehicle charging cord 22, 222 that is not intended for disconnection from the vehicle 18, 218 (as presented above in connection with earlier-described embodiments). However, in such embodiments, the vehicle charging cord 22, 222 and/or the electrical wiring of the vehicle 18, 218 can be provided with an electrical connector that can automatically disconnect upon experiencing a threshold force. Any electrical connector located in the wiring of the vehicle 18, 218 or in the cord extending therefrom to a source of electrical power can be used. For example, in embodiments in which a power cord extending from the vehicle 18, 218 can be retracted onto a reel located on the vehicle 18, 218 as described above, the power cord can have a releasable electrical connection at a point along the length of the cord. As another example, the power cord can be provided with a releasable electrical connector located at the housing 28, 228 or cabinet 742, 1142 of the vehicle charging system. In any such case, the power cord can automatically disconnect upon experiencing a threshold force such as those described above, thereby preventing damage (or further damage) to the vehicle 18, 218 or the electrical system of the house, building, or other charging facility. Such disconnection can be frangible, meaning that the cord and/or connector is at least partially destroyed upon disconnection, or can be re-connectable by a user or service technician.

[00161] In some embodiments, the electrical connector 170 is located in a surface of the vehicle 18, 218 that is recessed with respect to adjacent (e.g., surrounding) exterior body surfaces of the vehicle 18, 218. This feature can help to reduce exposure of the electrical connector 170 to the environment around the vehicle 18, 218. In these and other embodiments, the electrical

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connector 170 is located behind a door 178 that can either slide or pivot with respect to the electrical connector 170 in order to reveal the electrical connector 170 for connection and charging. The door 178 can also help to reduce exposure of the electrical connector 170 to the environment around the vehicle 18, 218. In some embodiments, the door 178 can be opened manually by a user pushing, pulling, and/or rotating the door 178. However, in other embodiments, the door 178 can be at least partially opened remotely by a cable, solenoid and associated power wiring, mechanical linkage, and other elements connected to a user-manipulatable control in the vehicle 18, 218. Any mechanism used to open a fuel door for a gasoline or diesel-powered vehicle can be used for this purpose, and falls within the spirit and scope of the present invention.

[00162] As described in greater detail above, the controller 44, 244 of the vehicle charging cords 22, 222 can communicate with a controller 108 of the vehicle 18, 218, such as by PLC-based communication. As an alternative or in addition to such communication, the vehicle charging cord 22, 222 (and all other vehicle charging cords described and/or illustrated herein) can enable such communication by dedicated wiring in the same cord 22, 222. An example of such a cord 22, 222 is illustrated in FIGs. 20-23, and with particular reference to FIG. 23. In this embodiment, the plug 26 of the vehicle charging cord 26 has two communication pins 180 in addition to power and ground blades 182. The communication pins 180 are electrically coupled to wires or other electrical lines extend along the cord 22, 222, and can extend into and establish electrical communication with sockets 184 of the electrical connector 170. By this connection, communication along the cord 22, 222 on one or more electrical lines separate from power and ground lines of the cord 22, 222 can be established. It will be appreciated that such communication lines can be appropriately shielded for better performance, in some embodiments. Also, any number of such communication lines and associated pins 180 can be provided on the cord 22, 222. Furthermore, although pins 180 are illustrated in the embodiment of FIGs. 20-23, any other type of electrical connector (e.g., sockets adapted for connection to pins on the electrical connector 170) can instead be used. Such communication lines can also be used on the opposite end of the cord 22, 222 for communication between the controller 44, 244 and a controller 50, 250 of a power utility 48, 248, and can be used in any of the cord-based vehicle charging system embodiments disclosed herein.

[00163] Operation of a vehicle charging system according to an embodiment of the present invention to perform a manual charging session will now be described with reference to FIG. 24.

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By way of example only, operation will be described in connection with the illustrated embodiment of FIGs. 2, 5-11, and 15, it being understood that any portion or all of the operation described in connection with FIG. 24 can be applied in any of the other vehicle charging system embodiments described and/or illustrated herein. With continued reference to FIG. 24, power is first established 11 to the vehicle charging cord 22, such as (in some embodiments) by plugging the vehicle charging cord 22 into an electrical outlet of the house, building or other facility at which charging is to take place, or by pressing the power button 34 in these and other embodiments. Upon receiving power, the controller 44 can retrieve any charge settings 13 previously entered and saved into memory 106, and can display such settings when the appropriate screen(s) 40 are shown upon the display 32. Next, the controller 44 can receive charge time and other settings 15 entered by a user via the display 32 and associated navigation buttons 36, 38, and in some embodiments can store such settings in memory 106 (at 17).

[00164] Following a command to start a manual battery charging session (at 19) based upon a start time selected by a user (such as by the user selecting selector 86 in the second screen 40A shown in FIG. 10 and entering a charge start time in selector 90), the controller 44 can continue to compare the time of the clock 58 with the charge start time entered by the user (at 21) until the start time is reached by the clock 58. Until the start time is reached, the controller continues to delay 23 charging of the battery 20 connected thereto. Once the start time is reached, the controller 44 closes the electrical switch 92 at 25, and begins charging the battery 20. Next, using the battery diagnostic circuitry described above, the controller 44 determines the charge level of the battery 20 at 27. If a determination is made that the battery 20 is not fully charged at 29, the controller 44 continues to keep the electrical switch 92 closed, thereby continuing to charge the battery 20 at 31. Otherwise, the controller 44 ends the charging session by opening the electrical switch 92 at 33.

[00165] Operation of a vehicle charging system according to another embodiment of the present invention to perform a programmed charging session will now be described with reference to FIG. 25. In this embodiment, additional features are provided compared to the charging session described above in connection with FIG. 24. By way of example only, operation will be described in connection with the illustrated embodiment of FIGs. 2, 5-11, and 15, it being understood that any portion or all of the operation described in connection with FIG. 25 can be applied in any of the other vehicle charging system embodiments described and/or illustrated herein. With continued reference to FIG. 25, power is first established 11 to the

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vehicle charging cord 22, such as (in some embodiments) by plugging the vehicle charging cord 22 into an electrical outlet of the house, building or other facility at which charging is to take place, or by pressing the power button 34 in these and other embodiments. Upon receiving power, the controller 44 can retrieve any charge settings 13 previously entered and saved into memory 106, and can display such settings when the appropriate screen(s) 40 are shown upon the display 32.

[00166] Next, at 35, the controller 44 can employ the battery diagnostic circuitry described above to detect one or more properties of the battery 20 connected to the vehicle charging cord 22, such as the charge level of the battery 20, the voltage of the battery 20, the condition of the battery 20 (e.g., whether the battery 20 is faulty), and the like, and can display (at 37) any or all of this information to the user in any of the manners described above in connection with the embodiment of FIGs. 2, 5-11, and 15. The controller 44 can also establish communication with the controller 108 of the vehicle 18 at 39, and can retrieve information regarding the battery 20 (e.g., battery make, model, age, and the like) at 41 via the controller 108 of the vehicle 18 or directly from a memory of the vehicle 18.

[00167] At step 43, the controller 44 can receive charge time and other settings entered by a user via the display 32 and associated navigation buttons 36, 38, and in some embodiments can store such settings in memory 106 (at 45). The controller 44 can also display the charge time remaining 66 at 47. Following a command to start a programmed battery charging session (at 49) based upon a start time selected by a user (such as by the user selecting selector 86 in the second screen 40A shown in FIG. 10 and entering a charge start time in selector 90), the controller 44 can continue to compare the time of the clock 58 with the charge start time entered by the user (at 51) until the start time is reached by the clock 58. Until the start time is reached, the controller continues to delay 53 charging of the battery 20 connected thereto. Once the start time is reached, the controller 44 closes the electrical switch 92 at 55 to begin charging the battery 20.

[00168] Next, at 57, the controller 44 compares the time of the clock 58 with an end time setting that can be entered into the vehicle charging cord 22 according to some alternative embodiments of the present invention. If the end time has been reached, the controller 44 ends the charging session by opening the electrical switch 92 at 65. Otherwise, if the end time setting has not yet been reached, battery charging continues, and using the battery diagnostic circuitry described above, the controller 44 determines the charge level of the battery 20 at 59. If a

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determination is made that the battery 20 is not fully charged at 61, the controller 44 continues to keep the electrical switch 92 closed, thereby continuing to charge the battery 20 at 63. Otherwise, the controller 44 ends the charging session by opening the electrical switch 92 at 65.

[00169] Operation of a vehicle charging system according to another embodiment of the present invention to perform a programmed charging session will now be described with reference to FIG. 26. By way of example only, operation will be described in connection with the illustrated embodiment of FIGs. 2, 5-11, and 15, it being understood that any portion or all of the operation described in connection with FIG. 26 can be applied in any of the other vehicle charging system embodiments described and/or illustrated herein. With continued reference to FIG. 26, power is first established 11 to the vehicle charging cord 22, such as (in some embodiments) by plugging the vehicle charging cord 22 into an electrical outlet of the house, building or other facility at which charging is to take place, or by pressing the power button 34 in these and other embodiments. Upon receiving power, the controller 44 can retrieve any charge settings 13 previously entered and saved into memory 106, and can display such settings when the appropriate screen(s) 40 are shown upon the display 32.

[00170] Next, at 35, the controller 44 can employ the battery diagnostic circuitry described above to detect one or more properties of the battery 20 connected to the vehicle charging cord 22, such as the charge level of the battery 20, the voltage of the battery 20, the condition of the battery 20 (e.g., whether the battery 20 is faulty), and the like, and can display (at 37) any or all of this information to the user in any of the manners described above in connection with the embodiment of FIGs. 2, 5-11, and 15. The controller 44 can also establish communication with the controller 108 of the vehicle 18 at 39, and can retrieve information regarding the battery 20 (e.g., battery make, model, age, and the like) at 41 via the controller 108 of the vehicle 18 or directly from a memory of the vehicle 18.

[00171] At step 43, the controller 44 can receive charge time and other settings entered by a user via the display 32 and associated navigation buttons 36, 38, and in some embodiments can store such settings in memory 106 (at 45). Following a command to start a programmed battery charging session (at 49) based upon a battery charging end time selected by a user (such as by the user selecting selector 100 in the second screen 40A shown in FIG. 10 and entering a charge end time in selector 104), the controller 44 can establish communication with the power utility 48 at 67, and can transmit (or enable the power utility 48 to retrieve) the charge time settings, any other settings, and the battery property information to the power utility 48 at 69.

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[00172] Next, the controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can calculate the power required to fully charge the battery 20 based at least in part upon the level of charge of the battery 20 at 71. The controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can then calculate the amount of time needed to fully charge the battery 20 based upon the power required to do so, and can thereby estimate the time of day at which charging can begin based at least in part upon the battery charging end time and the estimated duration of time necessary to fully charge the battery 20 (at 73).

[00173] At step 75, the controller 44 can continue to compare the time of the clock 58 with the charge start determined as described above until the start time is reached by the clock 58. Until the start time is reached, the controller continues to delay 77 charging of the battery 20 connected thereto. Once the start time is reached, the controller 44 closes the electrical switch 92 at 79 to begin charging the battery 20.

[00174] Next, at 81, the controller 44 compares the time of the clock 58 with an end time setting that can be entered into the vehicle charging cord 22 according to some alternative embodiments of the present invention. If the end time has been reached, the controller 44 ends the charging session by opening the electrical switch 92 at 83. Otherwise, if the end time setting has not yet been reached, battery charging continues, and using the battery diagnostic circuitry described above, the controller 44 determines the charge level of the battery 20 at 85. If a determination is made that the battery 20 is not fully charged at 87, the controller 44 continues to keep the electrical switch 92 closed, thereby continuing to charge the battery 20 at 89. Otherwise, the controller 44 ends the charging session by opening the electrical switch 92 at 83.

[00175] Operation of a vehicle charging system according to another embodiment of the present invention to perform a programmed charging session will now be described with reference to FIG. 27. By way of example only, operation will be described in connection with the illustrated embodiment of FIGs. 2, 5-11, and 15, it being understood that any portion or all of the operation described in connection with FIG. 27 can be applied in any of the other vehicle charging system embodiments described and/or illustrated herein. With continued reference to FIG. 27, power is first established 11 to the vehicle charging cord 22, such as (in some embodiments) by plugging the vehicle charging cord 22 into an electrical outlet of the house, building or other facility at which charging is to take place, or by pressing the power button 34 in these and other embodiments. Upon receiving power, the controller 44 can retrieve any charge

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settings 13 previously entered and saved into memory 106, and can display such settings when the appropriate screen(s) 40 are shown upon the display 32.

[00176] Next, at 35, the controller 44 can employ the battery diagnostic circuitry described above to detect one or more properties of the battery 20 connected to the vehicle charging cord 22, such as the charge level of the battery 20, the voltage of the battery 20, the condition of the battery 20 (e.g., whether the battery 20 is faulty), and the like, and can display (at 37) any or all of this information to the user in any of the manners described above in connection with the embodiment of FIGs. 2, 5-11, and 15. With this information, the controller 44 can determine whether the battery 20 is defective or otherwise has a fault at 91, and can communicate a battery fault message to the user in any of the manners also described above in connection with the embodiment of FIGs. 2, 5-11, and 15 if a fault exists (at 93). The controller 44 can also establish communication with the controller 108 of the vehicle 18 at 95, and can retrieve information regarding the battery 20 (e.g., battery make, model, age, and the like) at 97 via the controller 108 of the vehicle 18 or directly from a memory of the vehicle 18.

[00177] At step 99, the controller 44 can receive charge time and other settings entered by a user via the display 32 and associated navigation buttons 36, 38, and in some embodiments can store such settings in memory 106 (at 101). Following a command to start a programmed battery charging session (at 103) based upon a battery charging end time selected by a user (such as by the user selecting selector 100 in the second screen 40A shown in FIG. 10 and entering a charge end time in selector 104), the controller 44 can establish communication with the power utility 48 at 105, and can transmit (or enable the power utility 48 to retrieve) the charge time settings, any other settings, and the battery property information to the power utility 48 at 107.

[00178] Next, the controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can calculate the power required to fully charge the battery 20 based at least in part upon the level of charge of the battery 20 at 109. The controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can then calculate the amount of time needed to fully charge the battery 20 based upon the power required to do so, and can thereby estimate the latest time of day at which charging can begin based at least in part upon the battery charging end time and the estimated duration of time necessary to fully charge the battery 20 (at 111). Also, at 113, the controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can set an acceptable threshold cost of power (e.g., per unit time) at or below which battery charging will begin. In some embodiments, this threshold cost of power is entered by a

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user into the vehicle charging cord 22 in any of the manners of user interface described herein, or can be set by the power utility 48 based upon the desired maximum power cost determined by the power utility 48.

[00179] At step 115, the controller 44 can compare the time of the clock 58 with the latest estimated charge time, and at step 117 can compare the current cost of power (e.g., per unit time) with the threshold cost of power determined at step 113. If the latest estimated charge start time has been reached or if the threshold cost of power has been reached, the controller 44 closes the electrical switch 92 at 119 to begin charging the battery 20. Otherwise, the controller 44 continues to delay 121 charging of the battery 20 connected thereto.

[00180] Next, at 123, the controller 44 can check or otherwise determine whether communication has been lost with the controller 50 of the power utility 48. If communication has been lost, the controller 44 can send a communication fault message to the user in any of the manners described above in connection with the embodiment of FIGs. 2, 5-11, and 15 (at 125). Otherwise, the controller 44 can check or otherwise determine whether the supply of power to the vehicle charging cord 22 has been interrupted at 127. If the supply of power has been interrupted, the controller 44 can send a power interrupt fault message to the user in any of the manners also described above in connection with the embodiment of FIGs. 2, 5-11, and 15 (at 129).

[00181] On a continuing basis as the battery 20 is being charged, the controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can monitor the cost of power supplied to the battery 20, and can compare this cost with the threshold cost of power described above (at 131). If the cost of power supplied to the battery 20 exceeds the threshold cost of power, the controller 44 of the vehicle charging cord 22 or the controller 50 of the power utility 48 can interrupt charging of the battery at 133, such as by opening the electrical switch 92 of the vehicle charging cord 92. Otherwise, using the battery diagnostic circuitry described above, the controller 44 determines the charge level of the battery 20 at 135. If a determination is made that the battery 20 is not fully charged at 137, the controller 44 continues to keep the electrical switch 92 closed, thereby continuing to charge the battery 20 at 139. Otherwise, the controller 44 ends the charging session by opening the electrical switch 92 at 141.

[00182] Four examples of vehicle charging operation according to embodiments of the present invention are described above in connection with FIGs. 24-27. It should be noted any sub-

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combination of the steps described in connection with FIGs. 24-27 can be performed in other embodiments. Also, although the steps of the various processes presented above are described as occurring in a particular order, a number of the steps of each process can occur in different orders without departing from the spirit and scope of the present invention. Furthermore, steps and combinations of steps described in combination with one or more of the embodiments of FIGs. 24-27 can be employed in the processes of the other embodiments of FIGs. 24-27. For example, the battery fault check and notification steps 91, 93, the communication fault and notification steps 123, 125, and/or the power interruption fault check and notification steps 127, 129 in the process illustrated in FIG. 27 can be utilized in any of the other embodiments disclosed herein, including those of FIGs. 24-26.

[00183] Also, in the various processes described and illustrated herein, the controller 44 is described as performing a number of functions. Based upon the ability of those vehicle charging systems herein to communicate with a processor of a power utility, any of these functions can instead or also be performed by the processor of the power utility communicating and controlling the vehicle charging cords 22 or systems.

[00184] As described above, the use of any of the vehicle charging systems described and/or illustrated herein can provide significant control to a user in determining the conditions under which vehicle battery charging will occur. This control can result in cost savings to the user without impacting the user's daily routine. However, other benefits accrue to power utilities providing power to users of these vehicle charging systems. By at least partially controlling the time at which battery charging will occur and/or by having the ability to interrupt and re-start battery charging by a large number of users in a community, the power utility can better distribute power usage over a period of time, thereby providing significant cost savings to the power utility.

[00185] An example of how a power utility can control multiple vehicle charging systems according to the present invention is illustrated in FIGs. 28 and 29. By way of example only, operation will be described in connection with users employing vehicle charging cords 22, 222 such as those illustrated in FIGs. 2, 5-11, and 15, it being understood that any portion or all of the operation described in connection with FIGs. 28 and 29 can be applied in any of the other vehicle charging system embodiments described and/or illustrated herein.

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[00186] With reference first to FIG. 28, the controller 50 of the power utility 48 (which can be defined by one or more servers and associated computer equipment) can communicate with the vehicle charging cords 22, 222 of multiple users, and can continuously or periodically update a queue or other list of on-line users who have requested a battery charge session as described above (at 143).

[00187] In some embodiments, the controller 50 sorts the on-line users based upon one or more factors, such as the charge time end setting (i.e., earlier charge time end settings having priority), the estimated charge time needed for fully charging each battery 20 (i.e., longer charge times having priority), the time at which the battery charge session was requested, and the like. By way of example only, the controller 50 in the process of FIG. 28 checks at 145 whether any of the batteries 20 that are on-line have a very low charge, such as a charge below a minimum level set by the user at selector 112 on the second screen 40B shown in FIG. 10, or a charge below a minimum level set by the power utility 48. As another example, the controller 50 in the process of FIG. 28 checks at 149 whether the estimated time to fully charge any battery 20 is equal to or greater than the time available for battery charging (i.e., to the battery charge completion time entered by the user at selector 100 on the second screen 40B shown in FIG. 10). If the controller 50 determines that a battery 20 has a very low charge or will require a charging duration equal to or greater than the charging time available, the controller 50 can flag or otherwise indicate that the vehicle charging cord 22, 222 has priority over other vehicle charging cords 22, 222 (at 147 and 151, respectively).

[00188] The controller 50 can also remove a priority designation from any on-line vehicle charging cord 22, 222 no longer meeting this criteria (at 153), such as on-line charging cords 22, 222 that have been supplied with power based upon the fact that their respective batteries 20 had a very low charge, but that now have supplied their batteries 20 with a sufficient minimum threshold charge. At step 155, the queue of on-line vehicle charging cords 22, 222 can be re-ordered based upon the determination of which vehicle charging cords 22, 222 are flagged as having priority (described above), and upon any of the other factors also described above.

[00189] Next, the controller 50 at 157 can determine whether the total power draw from the community or the total power draw of all vehicle charging cords 22, 222 exceeds a threshold maximum level of power draw. This maximum level of power draw can be set by a power utility 48 based upon a threshold level of power cost to the power utility 48, the maximum output of power that can be supplied by the power utility 48 to the community, an amount of power

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budgeted by the power utility 48 for charging vehicle batteries via the vehicle charging cords 22, 222, other factors, and any combination thereof. If the total power draw does not exceed the maximum level of power draw set by the power utility 48, and if the queue of vehicle charging cords 22, 222 awaiting charging is empty (at 159), the controller 50 can re-initiate the vehicle charging cord management process by again updating the vehicle charging cord queue at 143. Otherwise, the controller 50 of the power utility 48 can send signals at 161 to one or more vehicle charging cords 22, 222 to begin charging their respective batteries 20 by closing their electrical switches 92. Such signals can be sent to any vehicle charging cords 22, 222 flagged with priority, and then to any other vehicle charging cords 22, 222. In either case, such signals are sent to vehicle charging cords 22, 222 in the order presented in the vehicle charging queue (ordered as described above). Following this step, the controller 50 can re-initiate the vehicle charging cord management process by again updating the vehicle charging cord queue at 143.

[00190] If the total power draw described above exceeds the maximum level of power draw set by the power utility 48 as determined by the processor at step 157, and if any vehicle charging cords 22, 222 are not flagged as having priority (check by the processor 50 made at step 163) as described above, the controller 50 can send signals to one or more vehicle charging cords 22, 222 not flagged as having priority to at least temporarily stop charging the batteries 20 connected thereto (e.g., by opening the electrical switches 92 of such vehicle charging cords 22, 222) at step 165. In some embodiments, such signals can be sent by the power utility in batches, such as signals sent to two or more of such vehicle charging cords 22, 222 at a given time or under a common command. Following this step, the controller 50 can re-initiate the vehicle charging cord management process by again updating the vehicle charging cord queue at 143. Otherwise, if the processor 50 determines that all vehicle charging cords 22, 222 are flagged as having priority at 163, the controller 50 can re-initiate the vehicle charging cord management process by again updating the vehicle charging cord queue at 143.

[00191] In light of the fact that the vehicle charging cord management process illustrated in FIG. 28 can be performed on a continual basis, it will be appreciated that the steps described above in connection with FIG. 28 can be carried out in a number of different orders without departing from the spirit and scope of the present invention.

[00192] With reference now to FIG. 29, an example application of the vehicle charging cord management process of FIG. 28 is provided. FIG. 29 illustrates the total power draw (in kW) of a community upon a power utility 48 over a 24-hour period of time. As shown in FIG. 29, the

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maximum preferred power draw of the power utility 48 described above in connection with FIG. 28 is 200 kW. As also shown in FIG. 29, the power draw of the community varies significantly over the 24-hour period, peaking around 3pm and falling to a lowest level between 2am and 3am. Any number of factors can define this power draw over the 24-hour period, including without limitation the number of users using air conditioning or electrical heating units during the day and the times at which such units are operated by the users, the times at which any large manufacturing operations begin and end operations, and the like. For example, the second peak shown in FIG. 29 can be the result of one or more manufacturing plants in a community drawing significant power during a second shift.

[00193] Based upon the amount of power drawn from the power utility 29 as shown in FIG. 29, the power utility 48 can control and operate a number of vehicle charging systems according to the present invention based upon non-peak time periods and upon other factors as described above (charge time end settings, estimated charge times needed to fully charge batteries 20, times at which battery charge sessions were requested, and the like). For example, a first group of users requesting charge sessions at 2pm (point 167 in FIG. 29) can have priority over other groups of users requesting charge sessions at 4pm and 6pm (points 169 and 171), respectively. Accordingly, once the controller 50 of the power utility 48 determines that the power draw by the community has fallen below the preferred maximum level of power draw (e.g., step 157 in FIG. 28; point 173 in FIG. 29), the controller 50 can send signals to the vehicle charging systems of the first group of users to begin battery charging. Taking this additional power draw into account, the controller 50 of the power utility 48 can later determine that the power draw by the community has fallen further (point 175 in FIG. 29), and that the vehicle charging systems of the second user group can be turned on. However, if the total power draw by the community rises again, such as based upon a large draw from a manufacturing facility operating a second shift, the controller 50 of the power utility 48 can temporarily turn off the vehicle charging systems of the second user group and then the first user group in series (points 177 and 179, respectively), and can turn on the vehicle charging systems of the first and second user groups in series once the total power draw by the community falls again (points 181 and 183, respectively).

[00194] Although the third user group requested charging sessions much earlier as described above, the total power draw by the community remained too high to permit the controller 50 of the power utility 48 to turn on the vehicle charging systems of the third user group until 11pm. At this point (185 in Fig. 29), the total power draw taking into account the first and second

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groups of users falls sufficiently to permit the controller 50 to turn on the vehicle charging systems of the third user group while still remaining below the preferred maximum power draw described above. The batteries corresponding to the first, second, and third groups of users illustrated in FIG. 29 become fully charged at different times, and cause battery charging to stop at points 187, 189, and 191, respectively.

[00195] Application of a vehicle charging system management process (using vehicle charging systems of the present invention) is shown by way of example in FIG. 29. It will be appreciated that a similar process can be implemented for any other power draw profile of a community, and that any number of charging initiations, interruptions, and re-initiations can occur for any number of users or groups of users throughout the course of a 24-hour period based at least in part upon the needs of the users and any preferred maximum level of power draw determined by the power utility.

[00196] The embodiments described above and illustrated in the figures are presented by way of example only and are not intended as a limitation upon the concepts and principles of the present invention. As such, it will be appreciated by one having ordinary skill in the art that various changes in the elements and their configuration and arrangement are possible without departing from the spirit and scope of the present invention. For example, the vehicle charging systems described above and illustrated in connection with the embodiments of FIGs. 2, 5-11 and 15; FIG. 3; FIGs. 4, 18, and 19; FIG. 12; FIGs. 13, 14, and 16; FIG. 17; FIGs. 20-23; FIG. 24, FIG. 25, FIG. 26, FIG. 27, and FIGs 28 and 29 each have a number of features, elements, and/or steps. Although these features, elements, and steps are described and illustrated in connection with each embodiment, it should be noted that any sub-combination of such features, elements, and steps can be utilized in other embodiments of the present invention. The particular combination of features, elements, and steps in each illustrated embodiment is presented by way of example only, and does not indicate or imply that embodiments of the present invention must have all such features, elements, and steps.

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I claim:

1. A method of charging a battery of a vehicle, the method comprising:
connecting an electrical power cord of a vehicular battery charger to at least one of the vehicle and a source of power;
establishing wireless communication between a controller of the vehicular battery charger and a portable controller of a user remote from the vehicle and the vehicular battery charger;
supplying power from the source of power to the vehicular battery charger;
supplying power to the battery of the vehicle via the vehicular battery charger;
interrupting supply of power to the vehicular battery charger;
generating a signal responsive to interrupting supply of power to the vehicular battery charger;
transmitting the signal wirelessly to the portable controller; and
alerting the user of the interruption of power supply via the portable controller responsive to transmitting the signal wirelessly to the portable controller.

2. The method of claim 1, wherein generating the signal comprises generating the wireless signal from the controller of the vehicular battery charger.

3. The method of claim 1, wherein transmitting the wireless signal comprises transmitting the wireless signal from the controller of the vehicular battery charger.

4. The method of claim 1, wherein alerting the user comprises alerting the user via at least one of a group consisting of an e-mail and a text.

5. The method of claim 1, further transmitting to the portable controller another signal indicative of a level of charge of the battery.

6. The method of claim 1, further comprising transmitting another signal from the portable controller to begin charging the battery.

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7. The method of claim 1, further comprising transmitting another signal from the portable controller to delay charging of the battery to a time of day.

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8. A system for charging a battery of a vehicle, the system comprising:

a battery charger having

an electrical power cord releasably attachable to at least one of the vehicle and a source of power;

at least one of a group consisting of a transmitter and a receiver;

a controller electrically coupled to the electrical power cord and to the at least one of the group consisting of the transmitter and the receiver, the controller responsive to detection of a predetermined threshold level of charge of the battery having been reached by sending at least one signal indicative of the threshold level of charge of the battery via the at least one of the group consisting of the transmitter and the receiver;

a portable controller remote from the vehicle and battery charger, the portable controller adapted for wireless communication with the controller of the battery charger via the at least one of the group consisting of the transmitter and the receiver of the battery charger;

wherein the portable controller generates a notification to a user indicating the threshold level of charge of the battery following and as the result of the at least one signal indicative of the threshold level of charge of the battery.

9. The system of claim 8, wherein the notification is an indicator on a display viewable by the user.

10. The system of claim 9, wherein the display is electrically coupled to the controller of the battery charger.

11. The system of claim 8, wherein the notification is at least one of a group consisting of a text and an e-mail automatically generated to the user.

12. The system of claim 8, wherein the portable controller is adapted to send signals to the controller of the battery charger to start and stop charging of the battery.

13. The system of claim 8, wherein the threshold level of charge of the battery is a full charge of the battery.

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14. The system of claim 8, wherein the threshold level of charge of the battery is a level of charge lower than a full charge of the battery.

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15. A method of charging a battery of a vehicle, the method comprising:

connecting an electrical power cord of a vehicular battery charger to at least one of the vehicle and a source of power;

establishing wireless communication between a controller of the vehicular battery charger and a portable controller of a user remote from the vehicle and the vehicular battery charger;

supplying power to the battery of the vehicle via the vehicular battery charger;

detecting a predetermined level of charge of the battery after supplying an amount of power to the battery;

generating a signal responsive to detecting the predetermined level of charge of the battery;

transmitting the signal wirelessly to the portable controller; and

alerting the user that the predetermined level of charge of the battery has been reached responsive to transmitting the signal wirelessly to the portable controller.

16. The method of claim 15, wherein the signal includes data indicative of the level of charge of the battery.

17. The method of claim 15, wherein transmitting the wireless signal comprises transmitting the wireless signal from the controller of the vehicular battery charger.

18. The method of claim 15, wherein alerting the user comprises alerting the user via at least one of a group consisting of an e-mail and a text.

19. The method of claim 15, wherein the predetermined level of charge is a fully-charged level of the battery.

20. The method of claim 15, wherein the predetermined level of charge is less than a fully-charged level of the battery.

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ABSTRACT

A vehicle battery charger and a vehicle battery charging system are described and illustrated, and can include a controller enabling a user to enter a time of day at which the vehicle battery charger or system begins and/or ends charging of the vehicle battery. The vehicle battery charger can be separate from the vehicle, can be at least partially integrated into the vehicle, can include a transmitter and/or a receiver capable of communication with a controller that is remote from the vehicle and vehicle charger, and can be controlled by a user or another party (e.g., a power utility) to control battery charging based upon a time of day, cost of power, or other factors.

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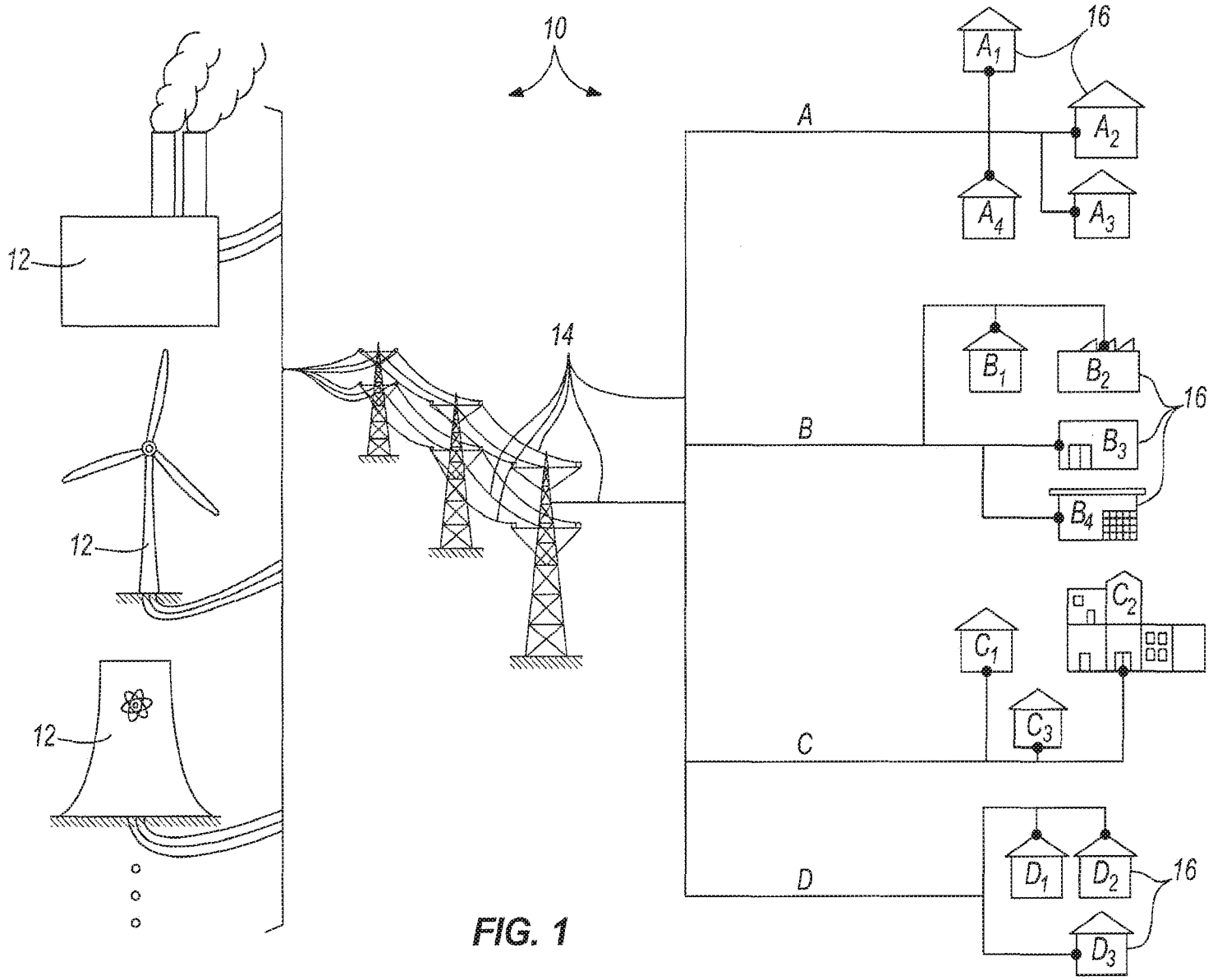


FIG. 1

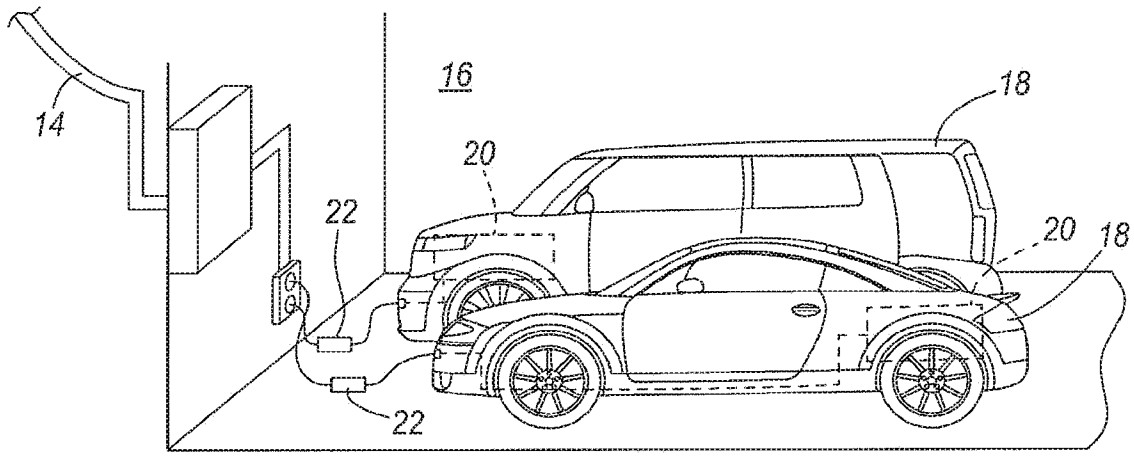


FIG. 2

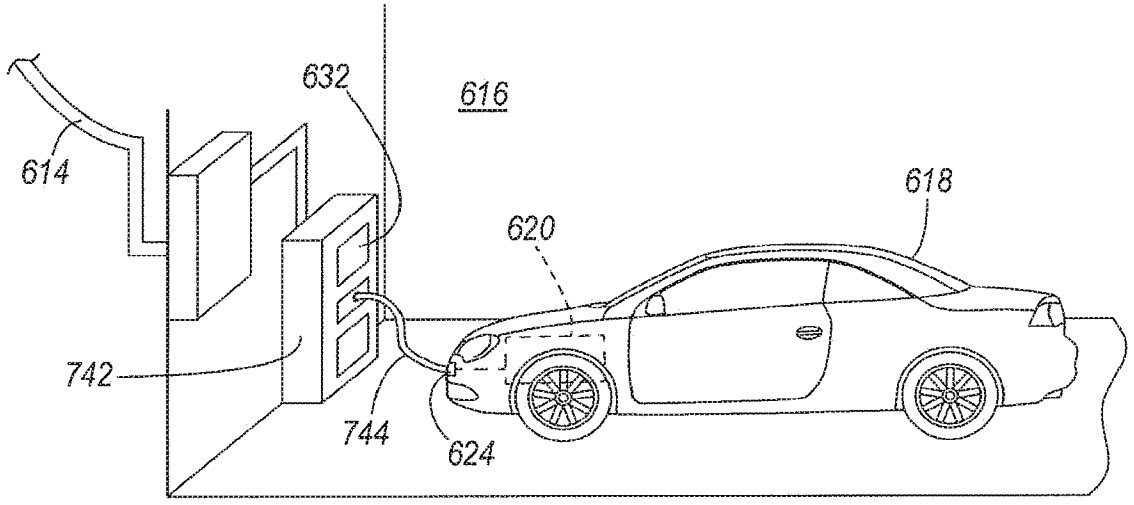


FIG. 3

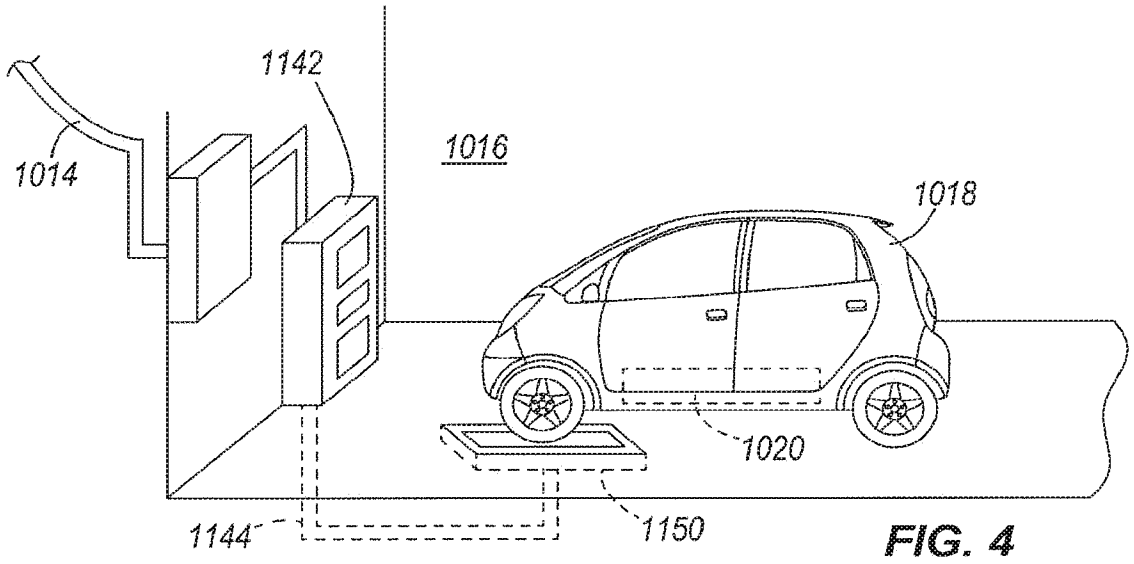


FIG. 4

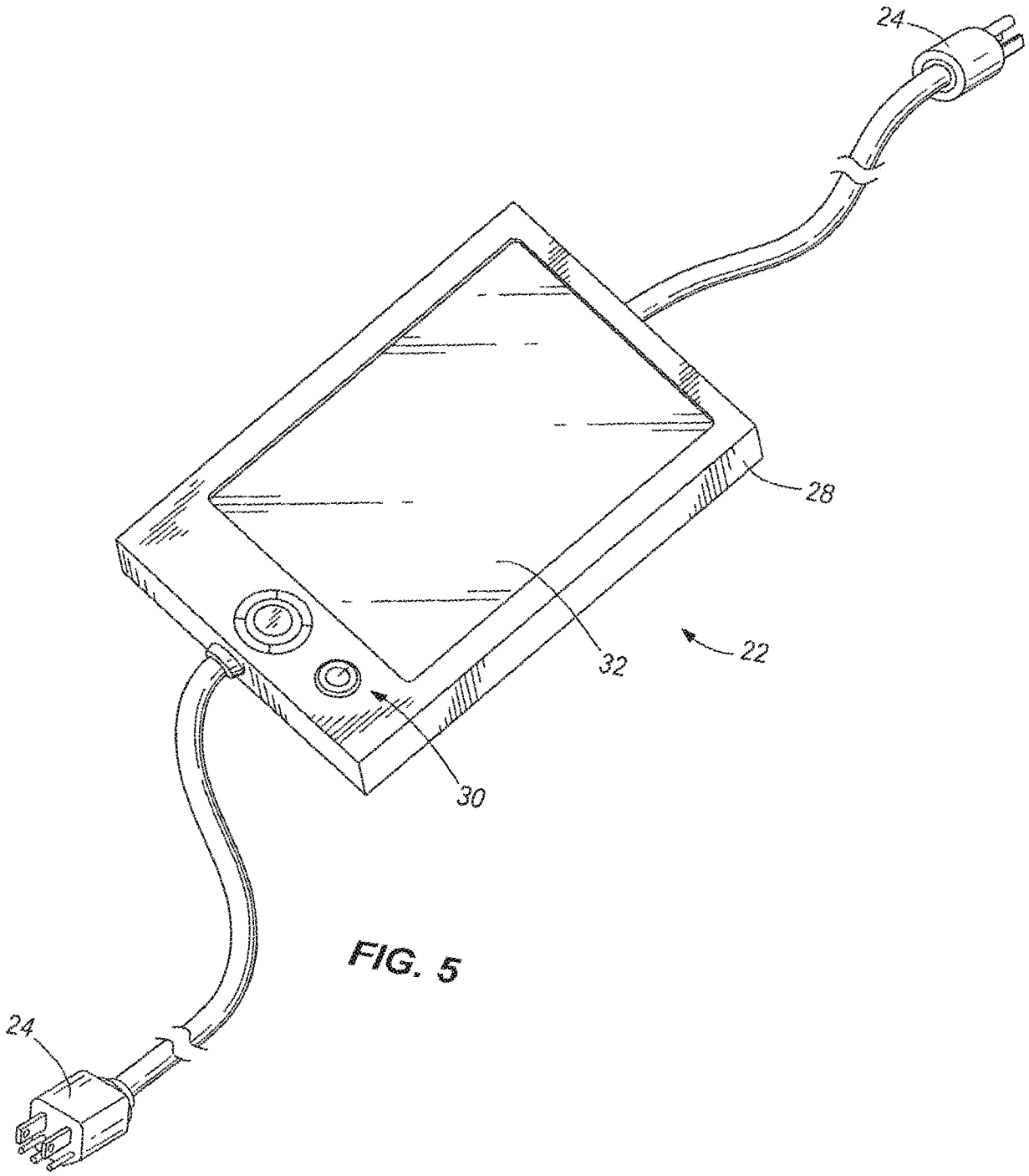


FIG. 5

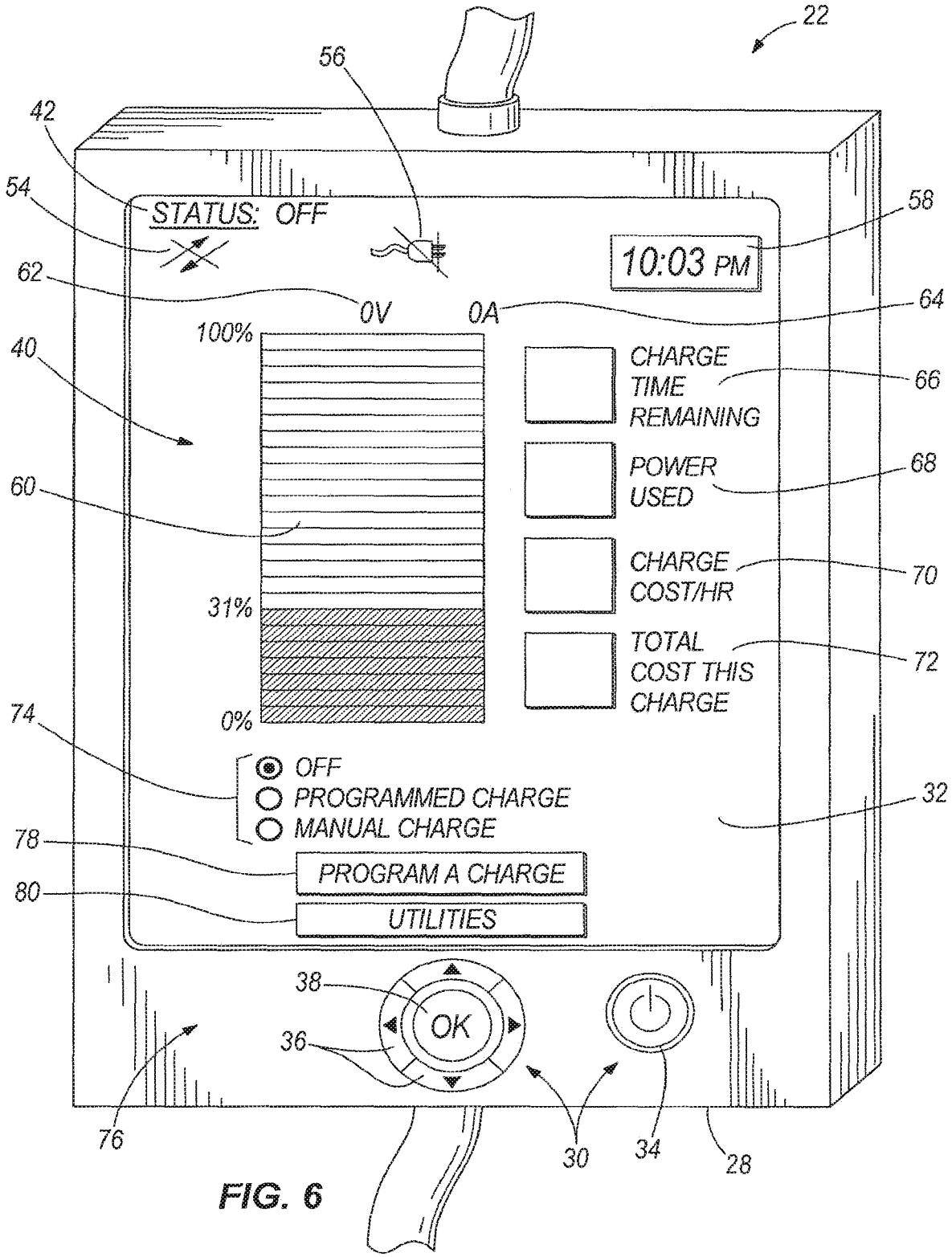

22
56
42
54
STATUS: OFF
58
10:03 PM
62
0V
0A
64
100%
40
CHARGE TIME REMAINING
66
60
POWER USED
68
CHARGE COST/HR
70
31%
TOTAL COST THIS CHARGE
72
0%
74
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
36
76
30
34
28

FIG. 6

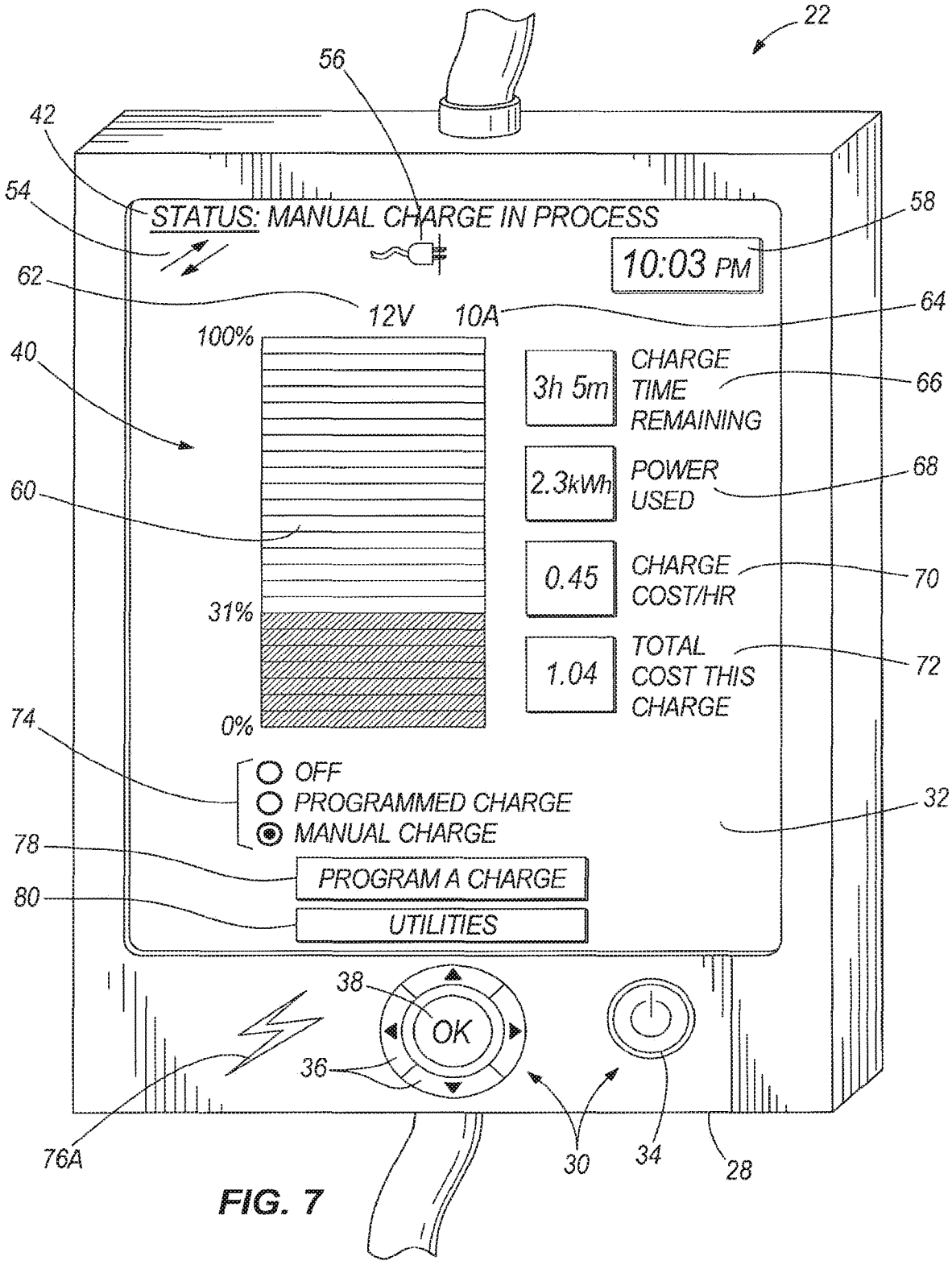

22
56
42
54
STATUS: MANUAL CHARGE IN PROCESS
58
10:03 PM
62
12V
10A
64
100%
40
3h 5m
CHARGE TIME REMAINING
66
60
2.3kWh
POWER USED
68
0.45
CHARGE COST/HR
70
31%
1.04
TOTAL COST THIS CHARGE
72
74
0%
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
36
76A
30
34
28

FIG. 7

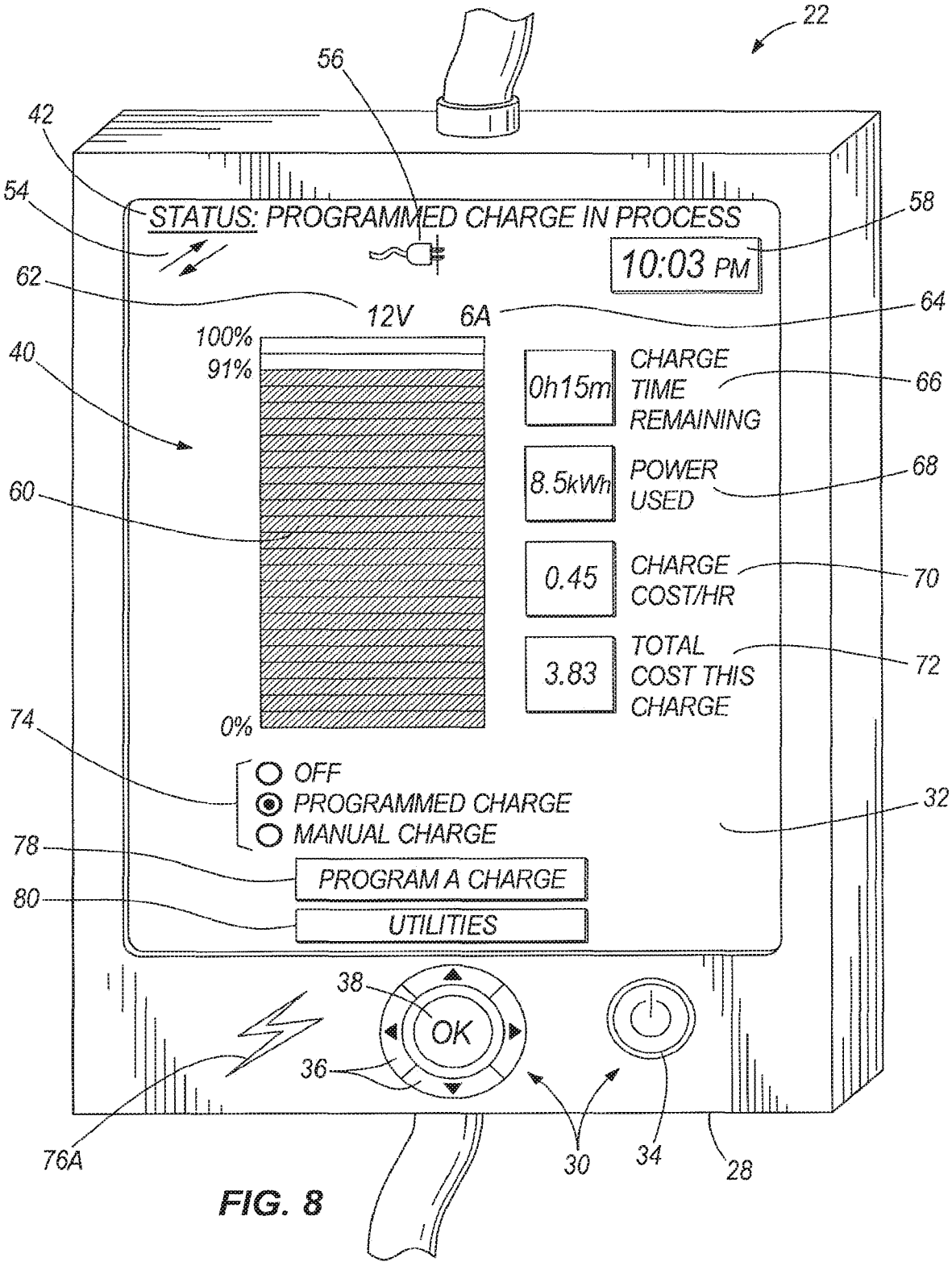

22
56
42
54
STATUS: PROGRAMMED CHARGE IN PROCESS
58
10:03 PM
62
12V
6A
64
100%
91%
40
0h15m
CHARGE TIME REMAINING
66
8.5kWh
POWER USED
68
60
0.45
CHARGE COST/HR
70
3.83
TOTAL COST THIS CHARGE
72
0%
74
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
36
76A
30
34
28

FIG. 8

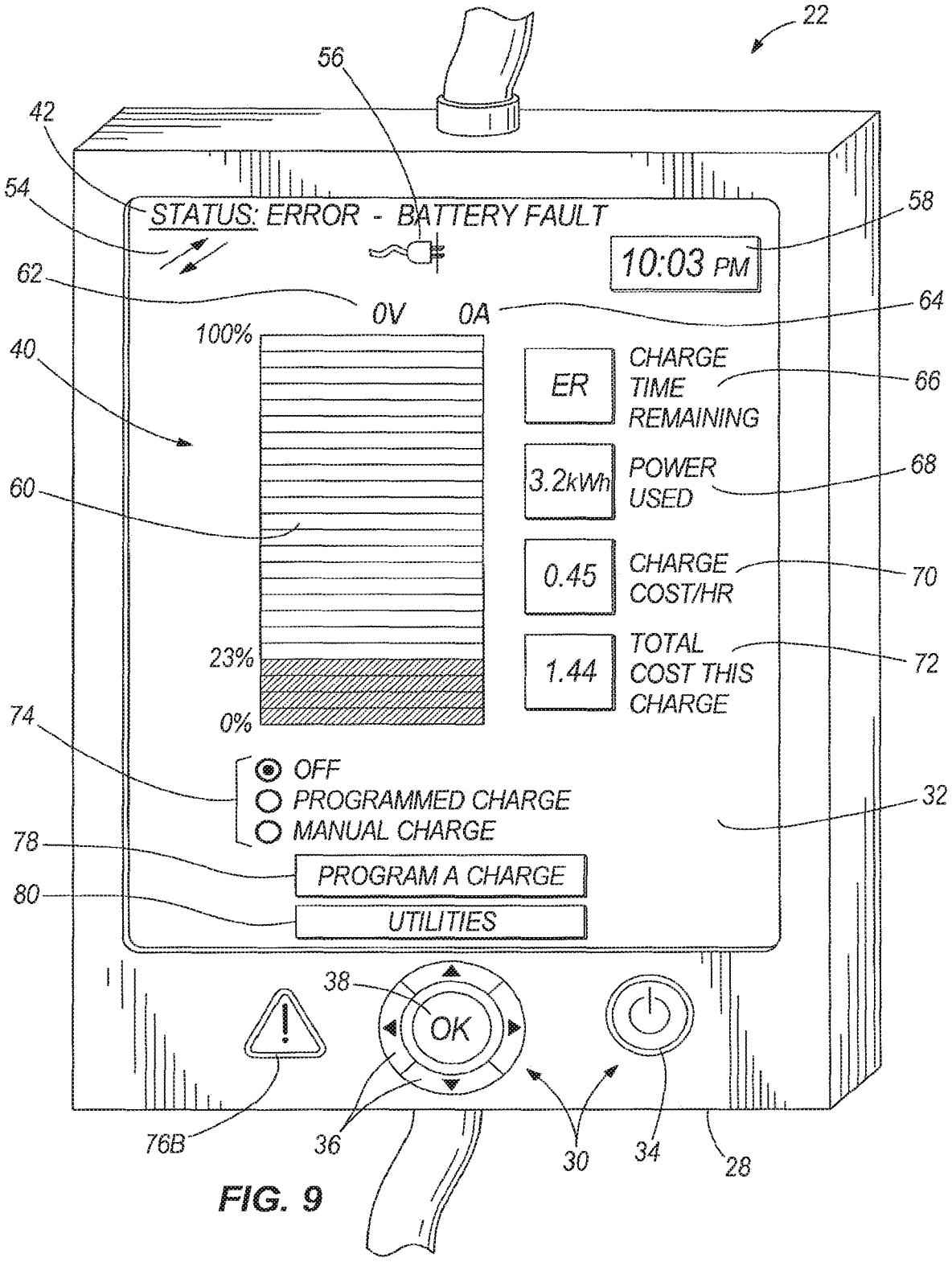

22
56
42
54
STATUS: ERROR - BATTERY FAULT
58
10:03 PM
62
0V
0A
64
100%
40
ER
CHARGE TIME REMAINING
66
3.2kWh
POWER USED
68
60
0.45
CHARGE COST/HR
70
23%
1.44
TOTAL COST THIS CHARGE
72
0%
74
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
76B
36
30
34
28

FIG. 9

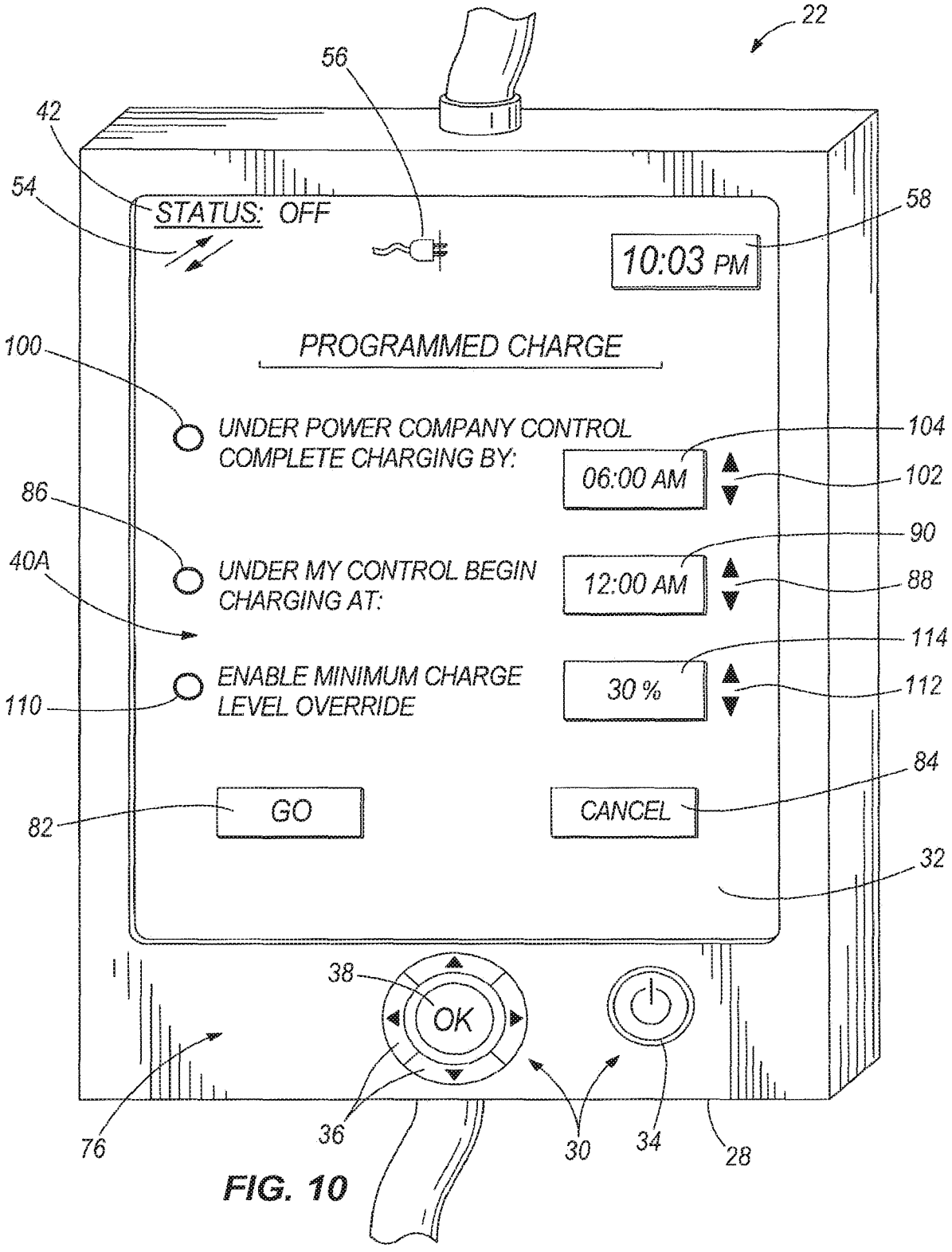

22
56
42
54
STATUS: OFF
58
10:03 PM
PROGRAMMED CHARGE
100
UNDER POWER COMPANY CONTROL
COMPLETE CHARGING BY:
104
06:00 AM
102
86
UNDER MY CONTROL BEGIN
CHARGING AT:
90
12:00 AM
88
40A
114
ENABLE MINIMUM CHARGE
LEVEL OVERRIDE
30 %
112
110
84
GO
CANCEL
82
32
38
OK
76
36
30
34
28

FIG. 10

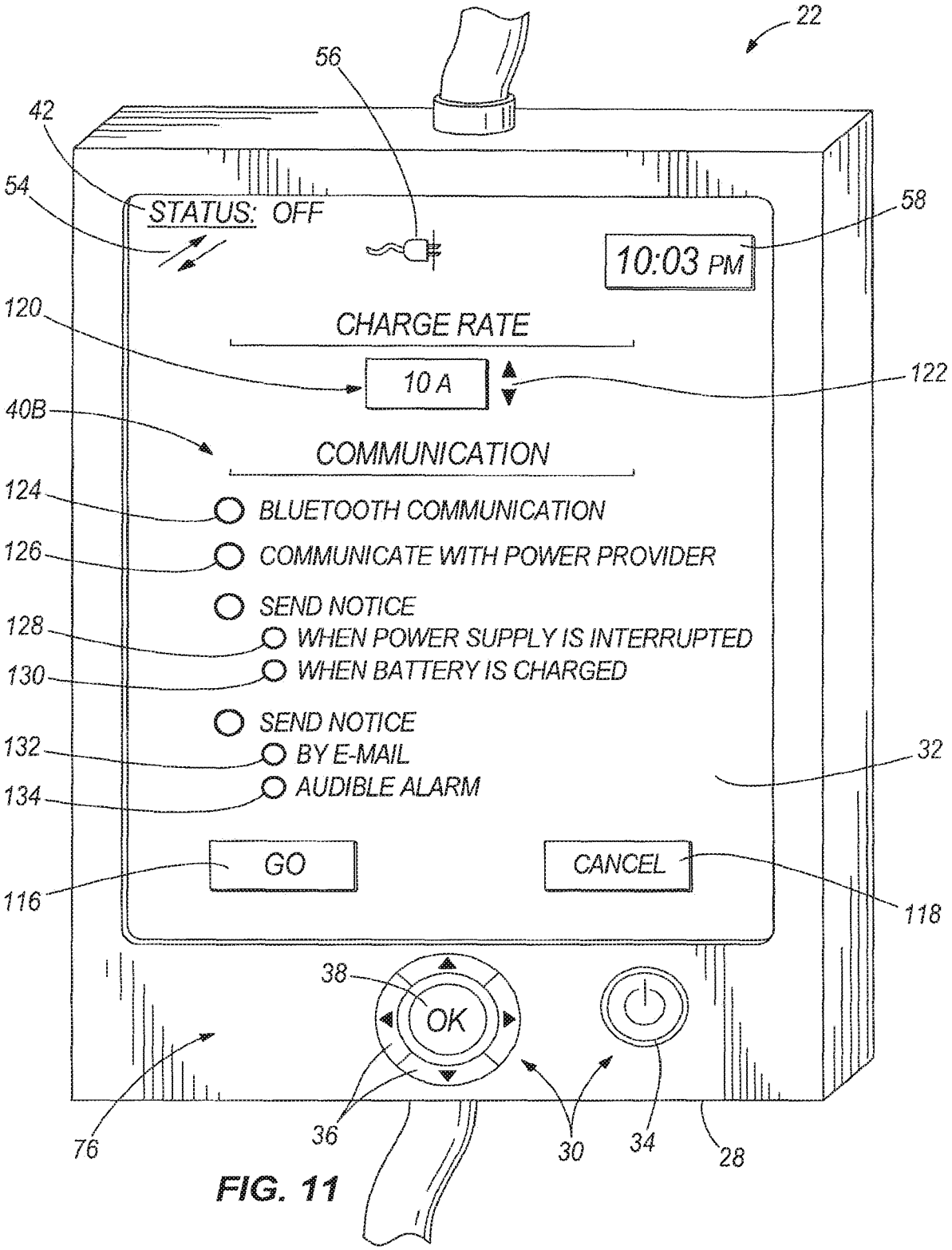

22
56
42
54
STATUS: OFF
58
10:03 PM
120
CHARGE RATE
10 A
122
40B
COMMUNICATION
124
BLUETOOTH COMMUNICATION
126
COMMUNICATE WITH POWER PROVIDER
SEND NOTICE
128
WHEN POWER SUPPLY IS INTERRUPTED
130
WHEN BATTERY IS CHARGED
SEND NOTICE
132
BY E-MAIL
134
AUDIBLE ALARM
32
GO
CANCEL
116
118
38
OK
76
36
30
34
28

FIG. 11

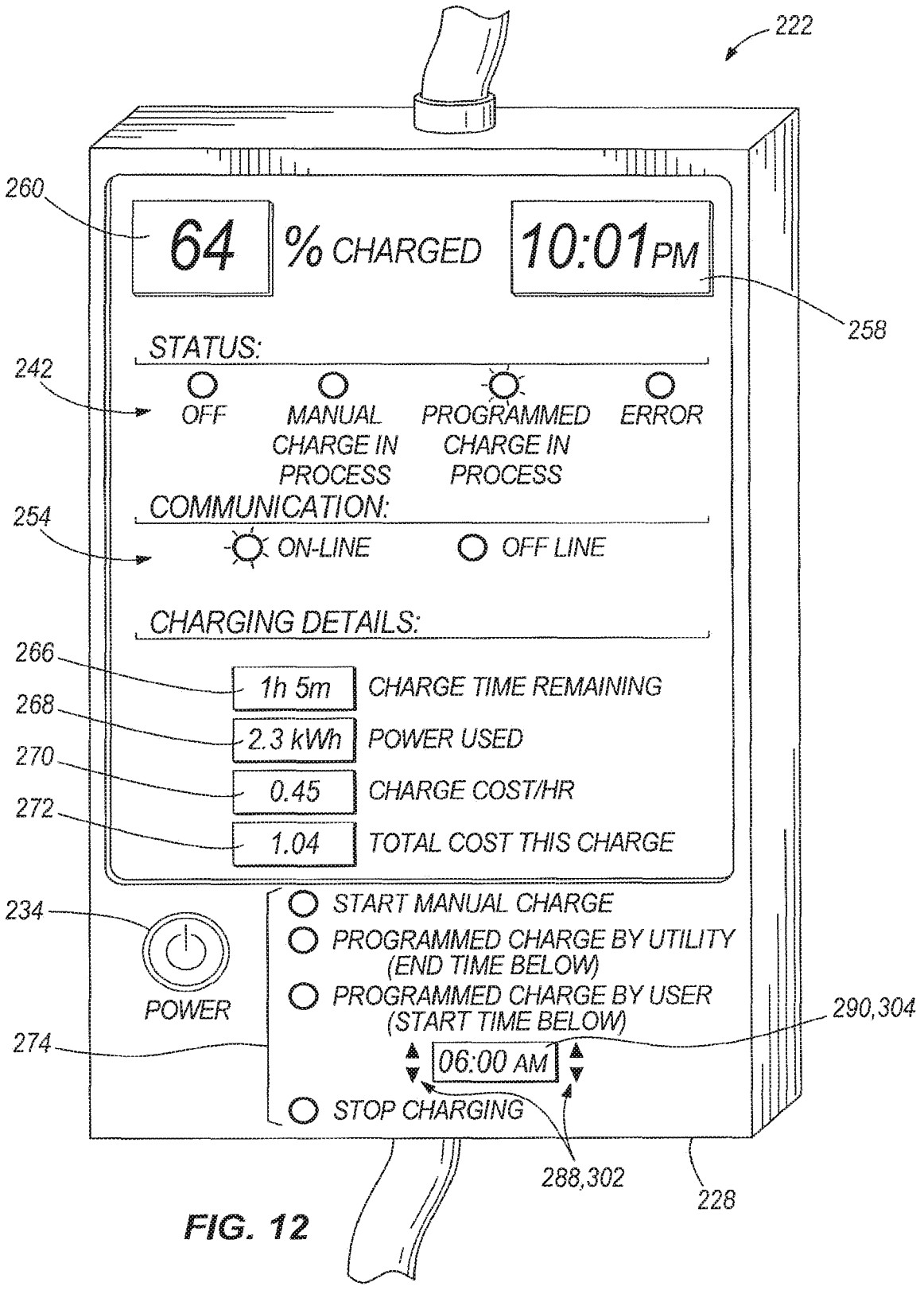

222
260
64
% CHARGED
10:01 PM
258
STATUS:
242
OFF
MANUAL CHARGE IN PROCESS
PROGRAMMED CHARGE IN PROCESS
ERROR
COMMUNICATION:
254
ON-LINE
OFF LINE
CHARGING DETAILS:
266
1h 5m
CHARGE TIME REMAINING
268
2.3 kWh
POWER USED
270
0.45
CHARGE COST/HR
272
1.04
TOTAL COST THIS CHARGE
234
POWER
START MANUAL CHARGE
PROGRAMMED CHARGE BY UTILITY (END TIME BELOW)
PROGRAMMED CHARGE BY USER (START TIME BELOW)
290,304
274
06:00 AM
STOP CHARGING
288,302
228

FIG. 12

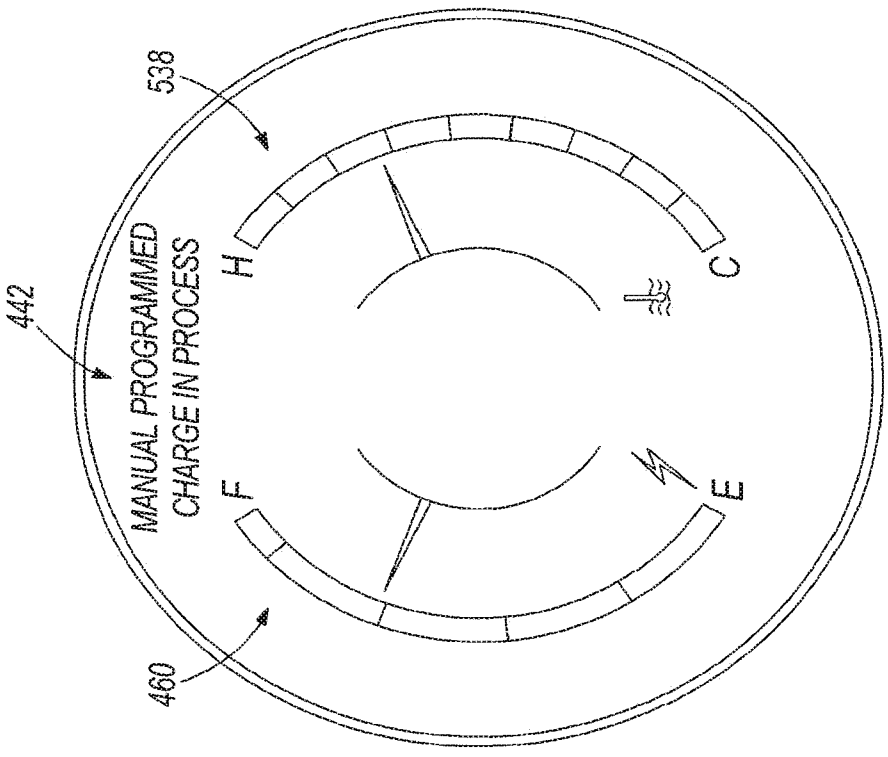

442
MANUAL PROGRAMMED
CHARGE IN PROCESS
538
H
C
F
E
460

FIG. 13

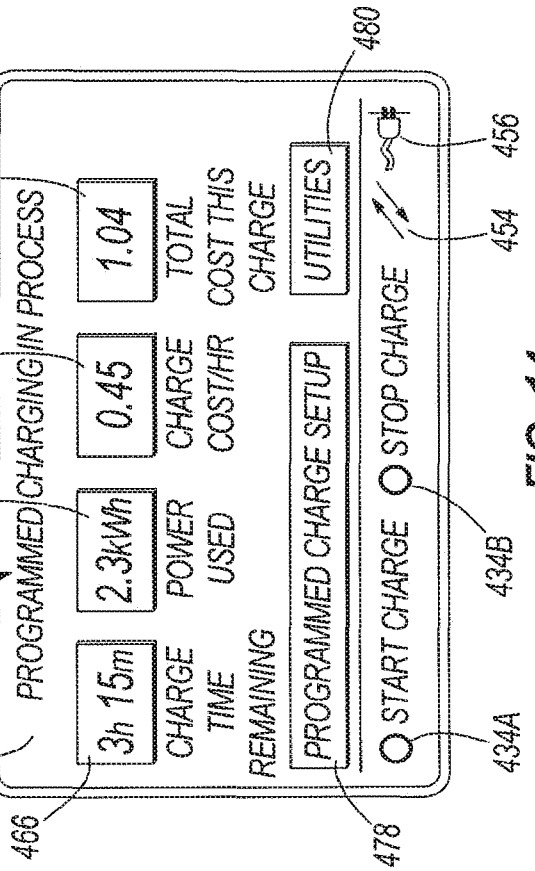

480
472
470
468
442
432
466
PROGRAMMED CHARGING IN PROCESS
3h 15m
CHARGE TIME REMAINING
2.3kWh
POWER USED
0.45
CHARGE COST/HR
1.04
TOTAL COST THIS CHARGE
PROGRAMMED CHARGE SETUP
UTILITIES
START CHARGE
STOP CHARGE
478
434A
434B
454
456

FIG. 14

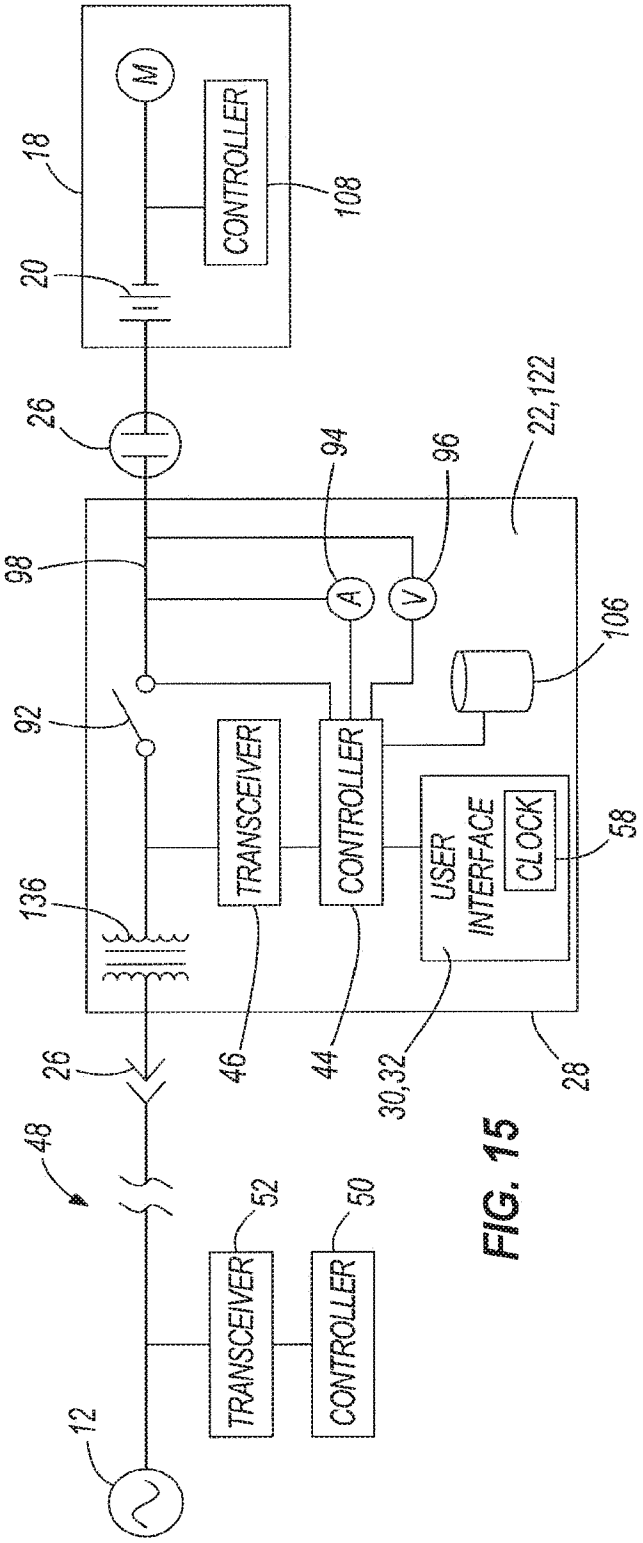

M
CONTROLLER
18
108
20
26
94
96
22,122
98
A
V
106
92
TRANSCEIVER
CONTROLLER
USER INTERFACE
CLOCK
58
136
46
44
30,32
28
26
48
52
50
TRANSCEIVER
CONTROLLER
12

FIG. 15

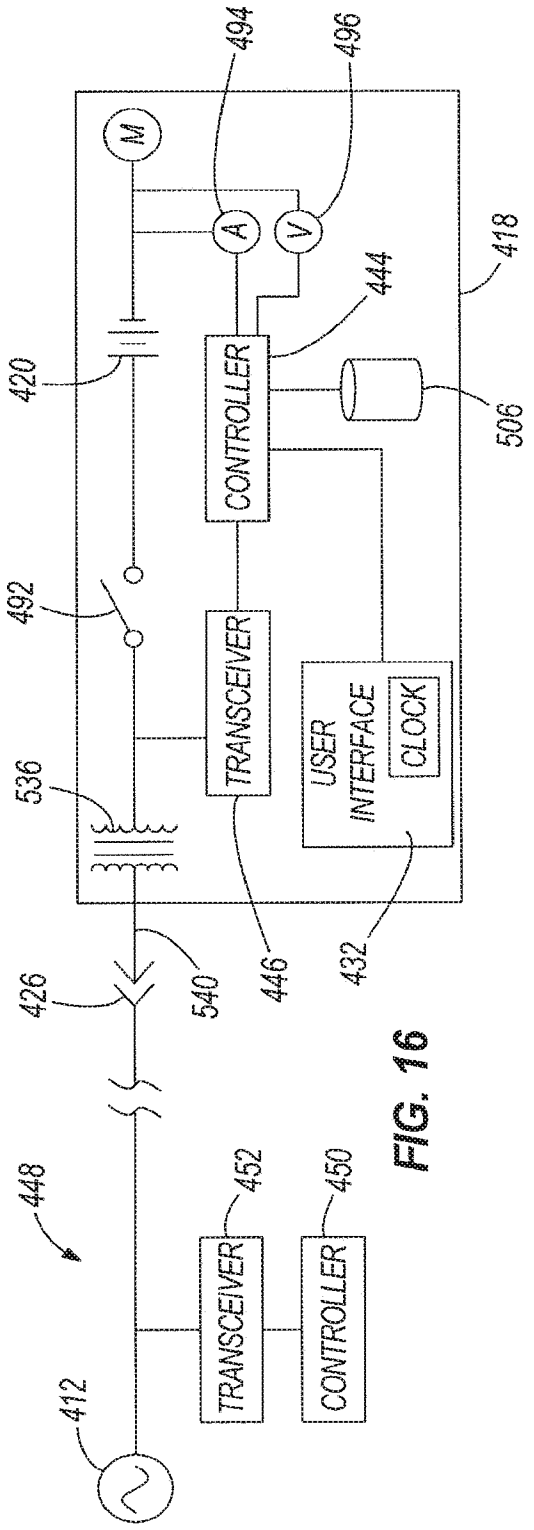

M
494
496
A
V
418
444
420
CONTROLLER
506
492
TRANSCEIVER
USER INTERFACE
CLOCK
536
426
540
446
432
448
452
450
TRANSCEIVER
CONTROLLER
412

FIG. 16

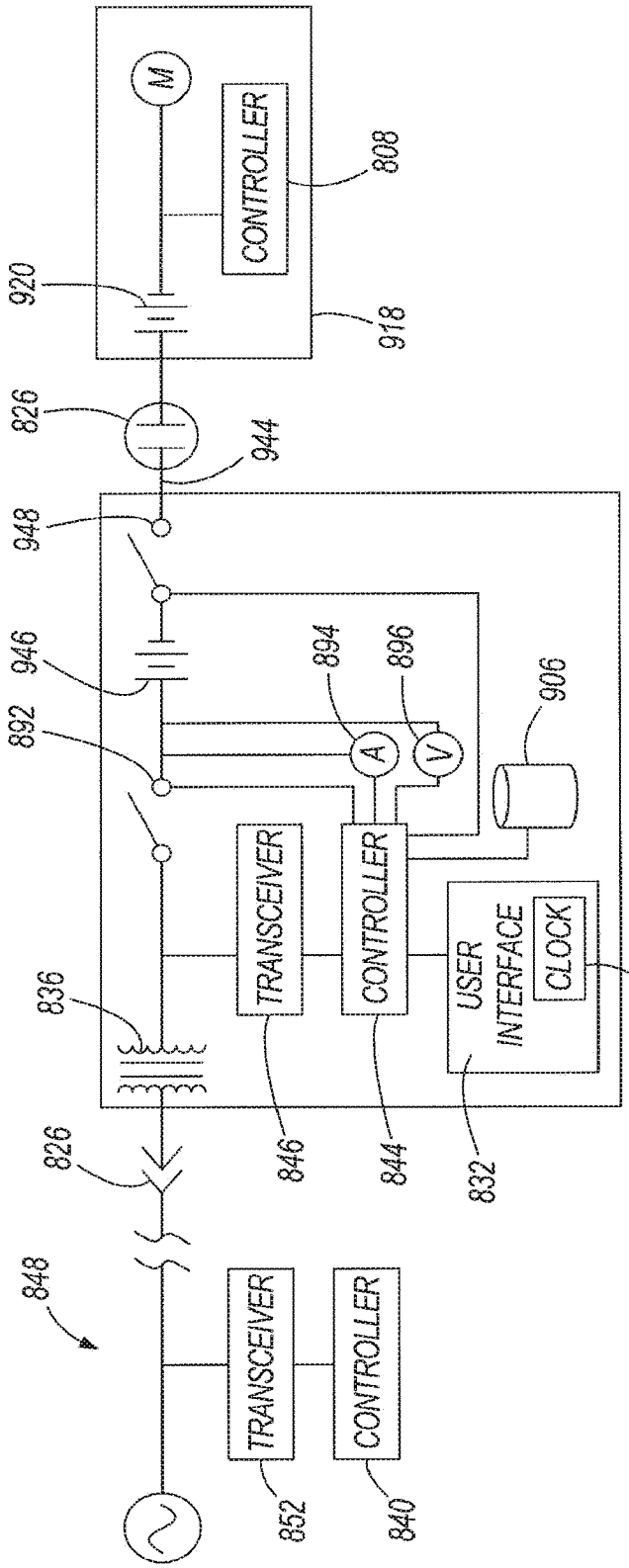

M
CONTROLLER
808
920
918
826
944
948
946
894
896
906
892
A
V
TRANSCEIVER
CONTROLLER
USER INTERFACE
CLOCK
836
858
826
846
844
832
848
TRANSCEIVER
CONTROLLER
852
840

FIG. 17

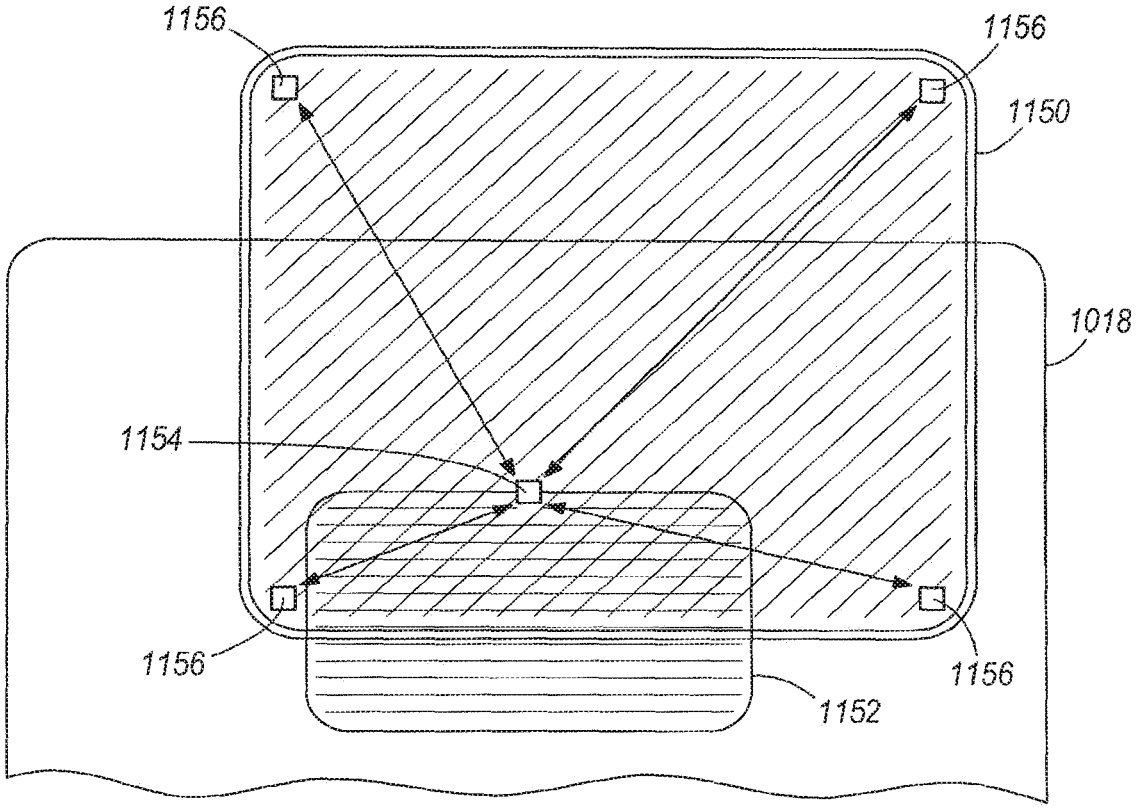

1156
1156
1150
1018
1154
1156
1156
1152

FIG. 18

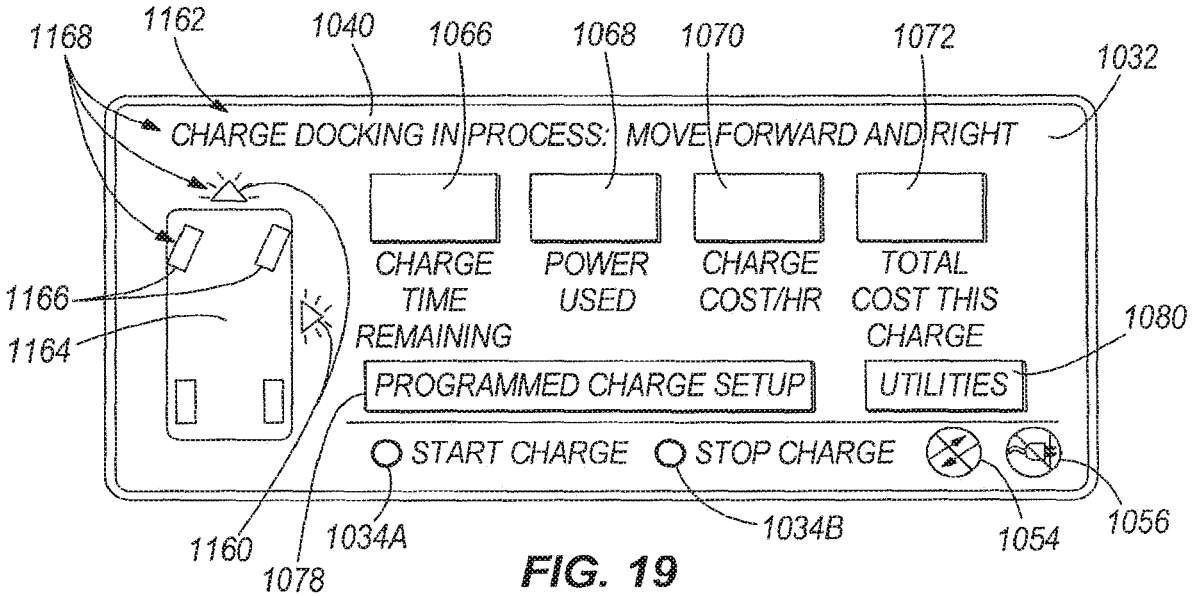

1168
1162
1040
1066
1068
1070
1072
1032
CHARGE DOCKING IN PROCESS: MOVE FORWARD AND RIGHT
1166
1164
CHARGE TIME REMAINING
POWER USED
CHARGE COST/HR
TOTAL COST THIS CHARGE
1080
PROGRAMMED CHARGE SETUP
UTILITIES
START CHARGE
STOP CHARGE
1160
1078
1034A
1034B
1054
1056

FIG. 19

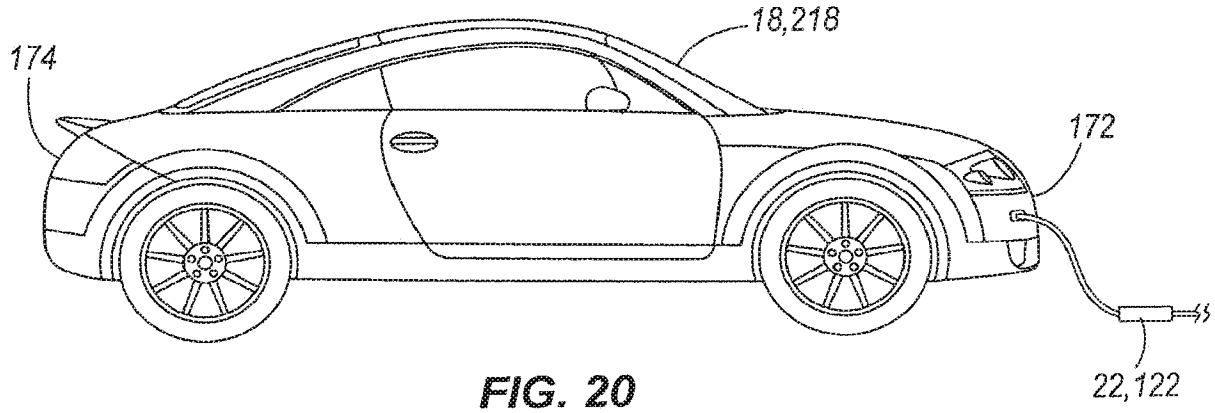


FIG. 20

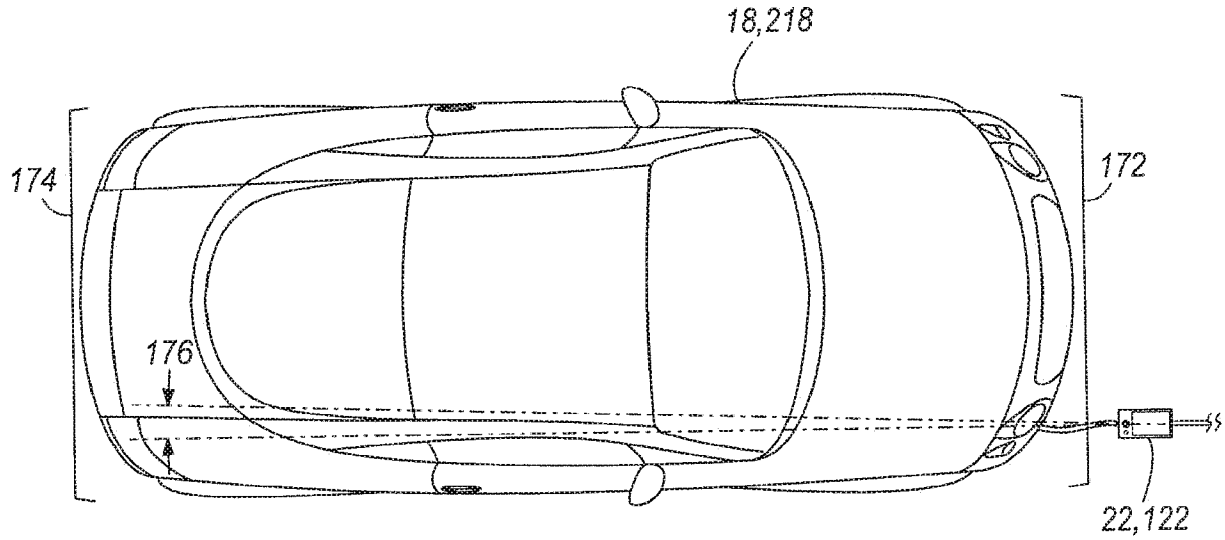


FIG. 21

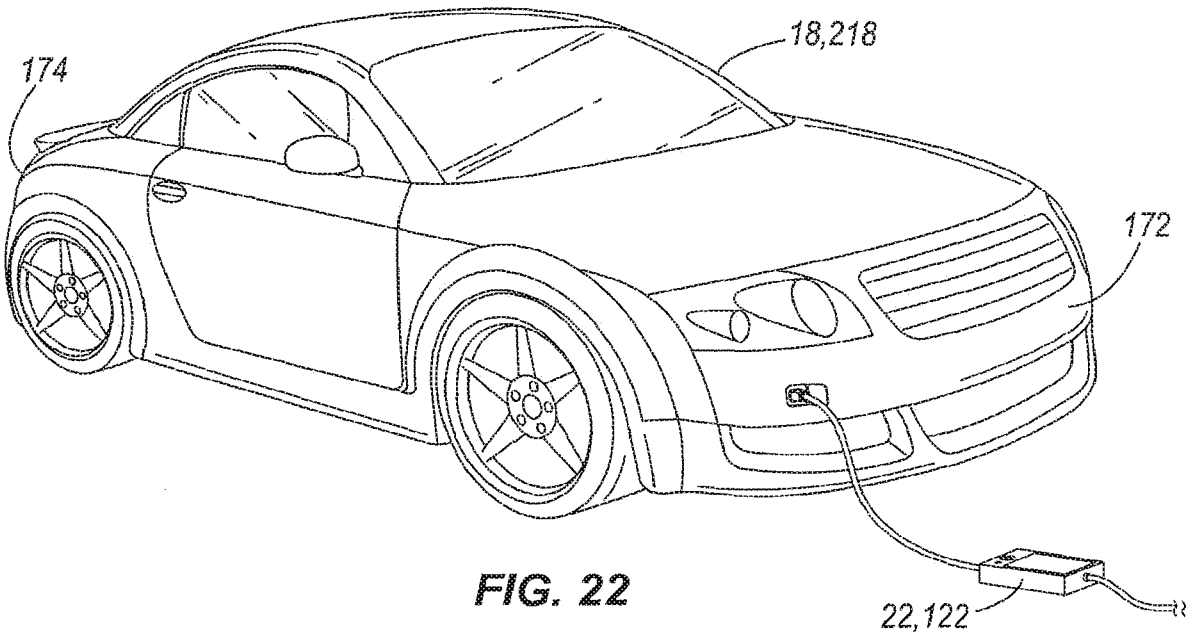


FIG. 22

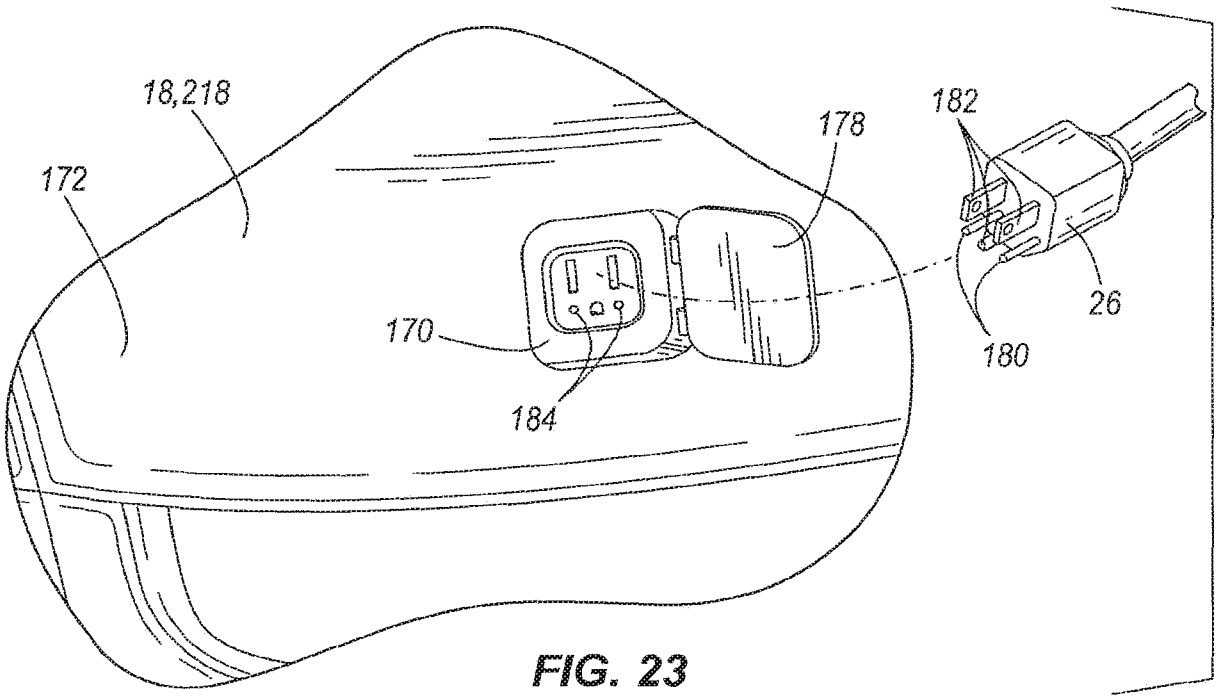


FIG. 23

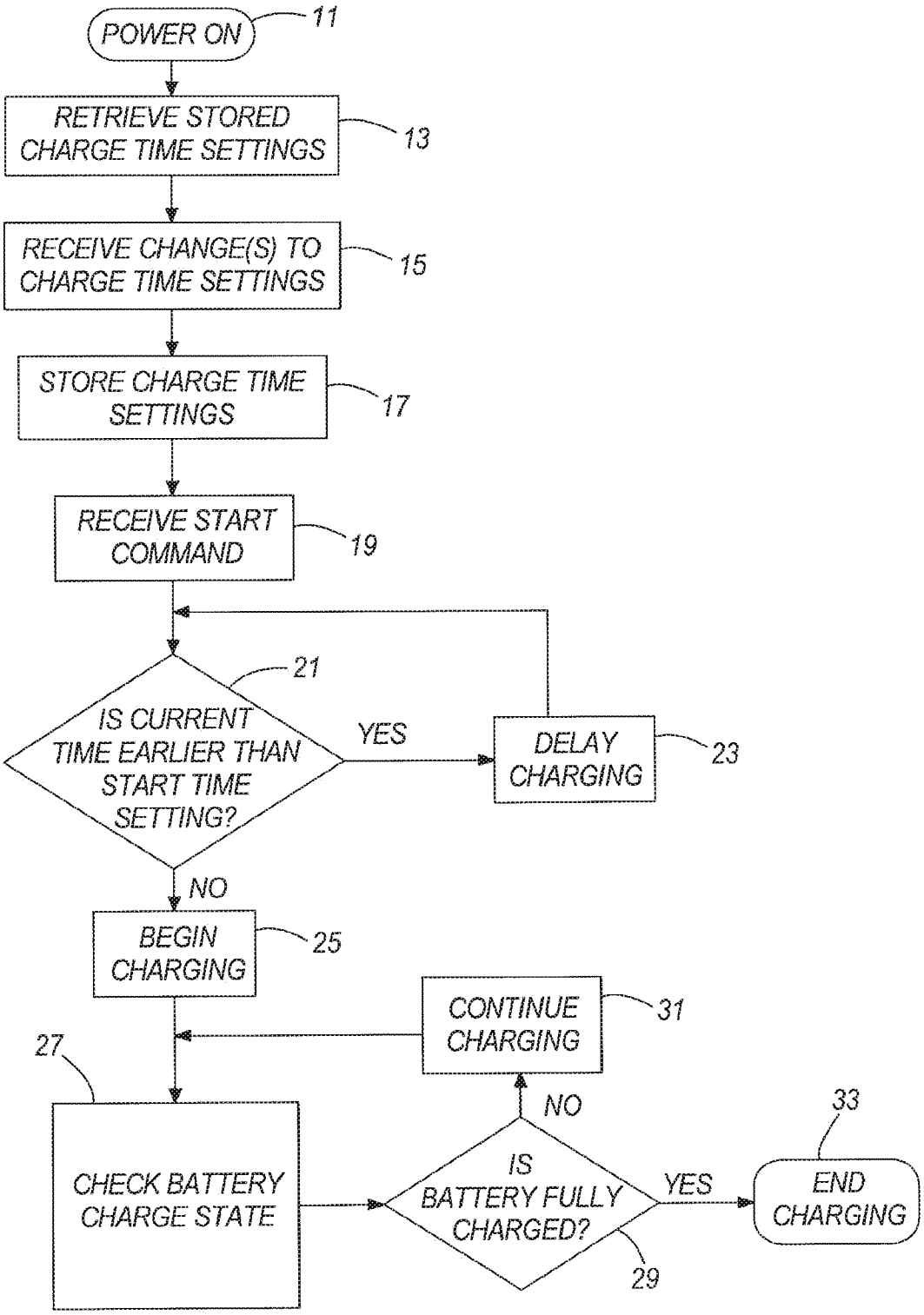

POWER ON
11
RETRIEVE STORED CHARGE TIME SETTINGS
13
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
15
STORE CHARGE TIME SETTINGS
17
RECEIVE START COMMAND
19
21
IS CURRENT TIME EARLIER THAN START TIME SETTING?
YES
DELAY CHARGING
23
NO
BEGIN CHARGING
25
CONTINUE CHARGING
31
27
CHECK BATTERY CHARGE STATE
NO
IS BATTERY FULLY CHARGED?
YES
29
33
END CHARGING

FIG. 24

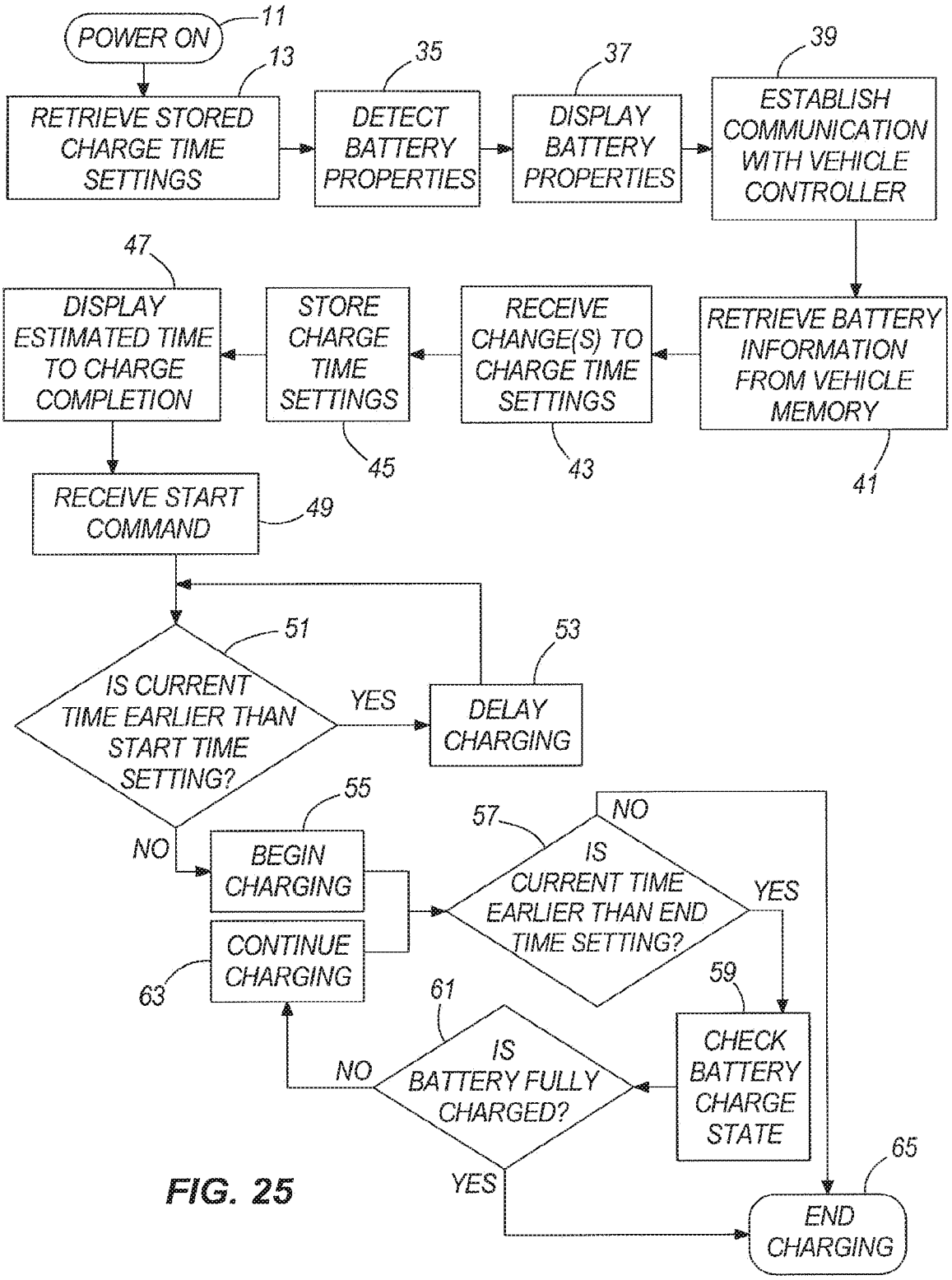

POWER ON
11
RETRIEVE STORED CHARGE TIME SETTINGS
13
DETECT BATTERY PROPERTIES
35
DISPLAY BATTERY PROPERTIES
37
ESTABLISH COMMUNICATION WITH VEHICLE CONTROLLER
39
RETRIEVE BATTERY INFORMATION FROM VEHICLE MEMORY
41
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
43
STORE CHARGE TIME SETTINGS
45
DISPLAY ESTIMATED TIME TO CHARGE COMPLETION
47
RECEIVE START COMMAND
49
IS CURRENT TIME EARLIER THAN START TIME SETTING?
51
YES
DELAY CHARGING
53
NO
BEGIN CHARGING
55
CONTINUE CHARGING
63
IS CURRENT TIME EARLIER THAN END TIME SETTING?
57
NO
YES
CHECK BATTERY CHARGE STATE
59
IS BATTERY FULLY CHARGED?
61
NO
YES
END CHARGING
65

FIG. 25

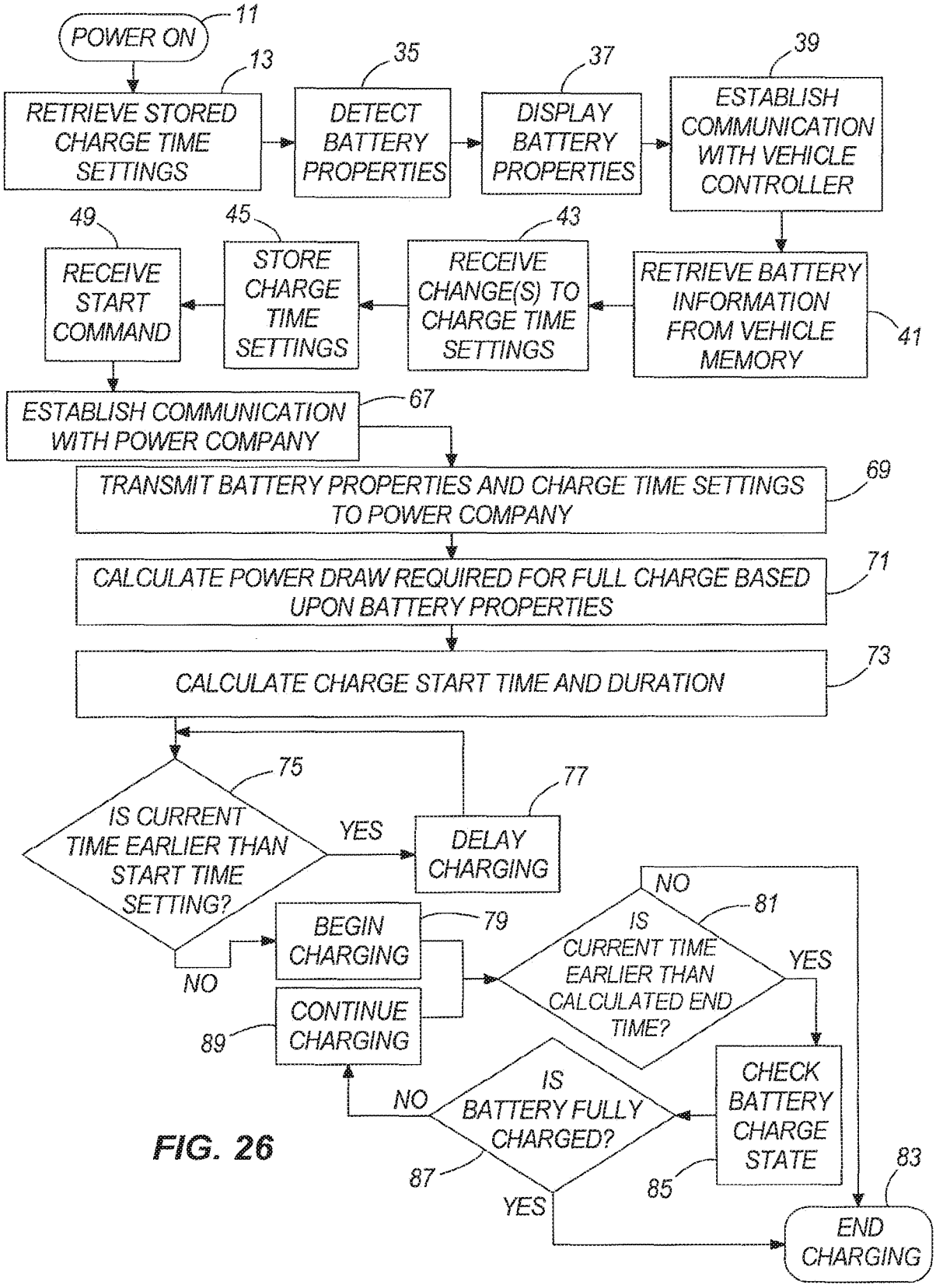

POWER ON
11
RETRIEVE STORED CHARGE TIME SETTINGS
13
DETECT BATTERY PROPERTIES
35
DISPLAY BATTERY PROPERTIES
37
ESTABLISH COMMUNICATION WITH VEHICLE CONTROLLER
39
RETRIEVE BATTERY INFORMATION FROM VEHICLE MEMORY
41
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
43
STORE CHARGE TIME SETTINGS
45
RECEIVE START COMMAND
49
ESTABLISH COMMUNICATION WITH POWER COMPANY
67
TRANSMIT BATTERY PROPERTIES AND CHARGE TIME SETTINGS TO POWER COMPANY
69
CALCULATE POWER DRAW REQUIRED FOR FULL CHARGE BASED UPON BATTERY PROPERTIES
71
CALCULATE CHARGE START TIME AND DURATION
73
IS CURRENT TIME EARLIER THAN START TIME SETTING?
75
YES
DELAY CHARGING
77
NO
BEGIN CHARGING
79
CONTINUE CHARGING
89
IS CURRENT TIME EARLIER THAN CALCULATED END TIME?
81
NO
YES
IS BATTERY FULLY CHARGED?
87
NO
YES
CHECK BATTERY CHARGE STATE
85
END CHARGING
83

FIG. 26

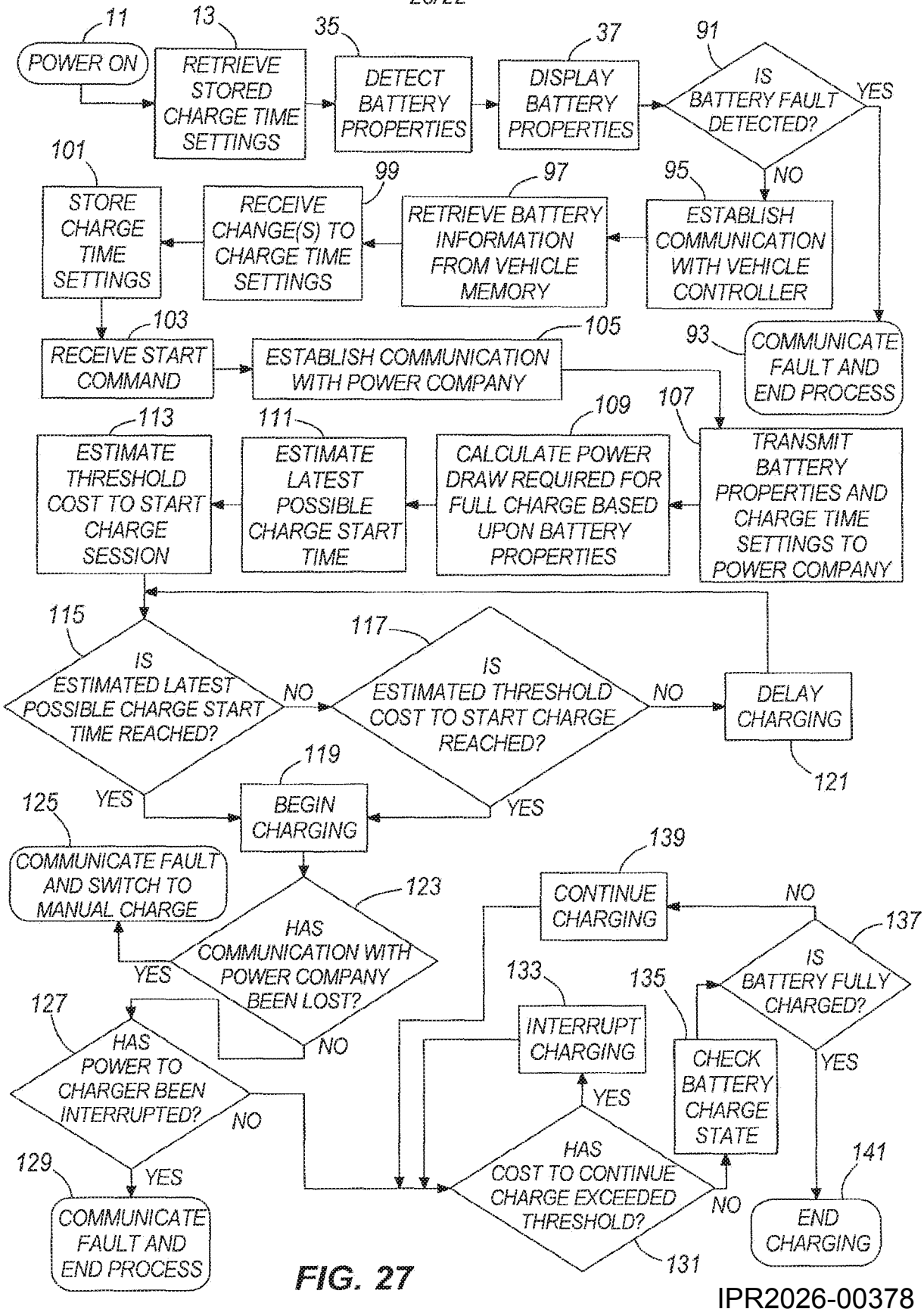

11
POWER ON
13
RETRIEVE STORED CHARGE TIME SETTINGS
35
DETECT BATTERY PROPERTIES
37
DISPLAY BATTERY PROPERTIES
91
IS BATTERY FAULT DETECTED?
YES
NO
95
ESTABLISH COMMUNICATION WITH VEHICLE CONTROLLER
97
RETRIEVE BATTERY INFORMATION FROM VEHICLE MEMORY
99
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
101
STORE CHARGE TIME SETTINGS
93
COMMUNICATE FAULT AND END PROCESS
103
RECEIVE START COMMAND
105
ESTABLISH COMMUNICATION WITH POWER COMPANY
107
TRANSMIT BATTERY PROPERTIES AND CHARGE TIME SETTINGS TO POWER COMPANY
109
CALCULATE POWER DRAW REQUIRED FOR FULL CHARGE BASED UPON BATTERY PROPERTIES
111
ESTIMATE LATEST POSSIBLE CHARGE START TIME
113
ESTIMATE THRESHOLD COST TO START CHARGE SESSION
115
IS ESTIMATED LATEST POSSIBLE CHARGE START TIME REACHED?
NO
YES
117
IS ESTIMATED THRESHOLD COST TO START CHARGE REACHED?
NO
YES
DELAY CHARGING
121
119
BEGIN CHARGING
125
COMMUNICATE FAULT AND SWITCH TO MANUAL CHARGE
123
HAS COMMUNICATION WITH POWER COMPANY BEEN LOST?
YES
NO
127
HAS POWER TO CHARGER BEEN INTERRUPTED?
NO
YES
129
COMMUNICATE FAULT AND END PROCESS
139
CONTINUE CHARGING
NO
137
IS BATTERY FULLY CHARGED?
YES
133
INTERRUPT CHARGING
135
CHECK BATTERY CHARGE STATE
YES
HAS COST TO CONTINUE CHARGE EXCEEDED THRESHOLD?
NO
131
141
END CHARGING

FIG. 27

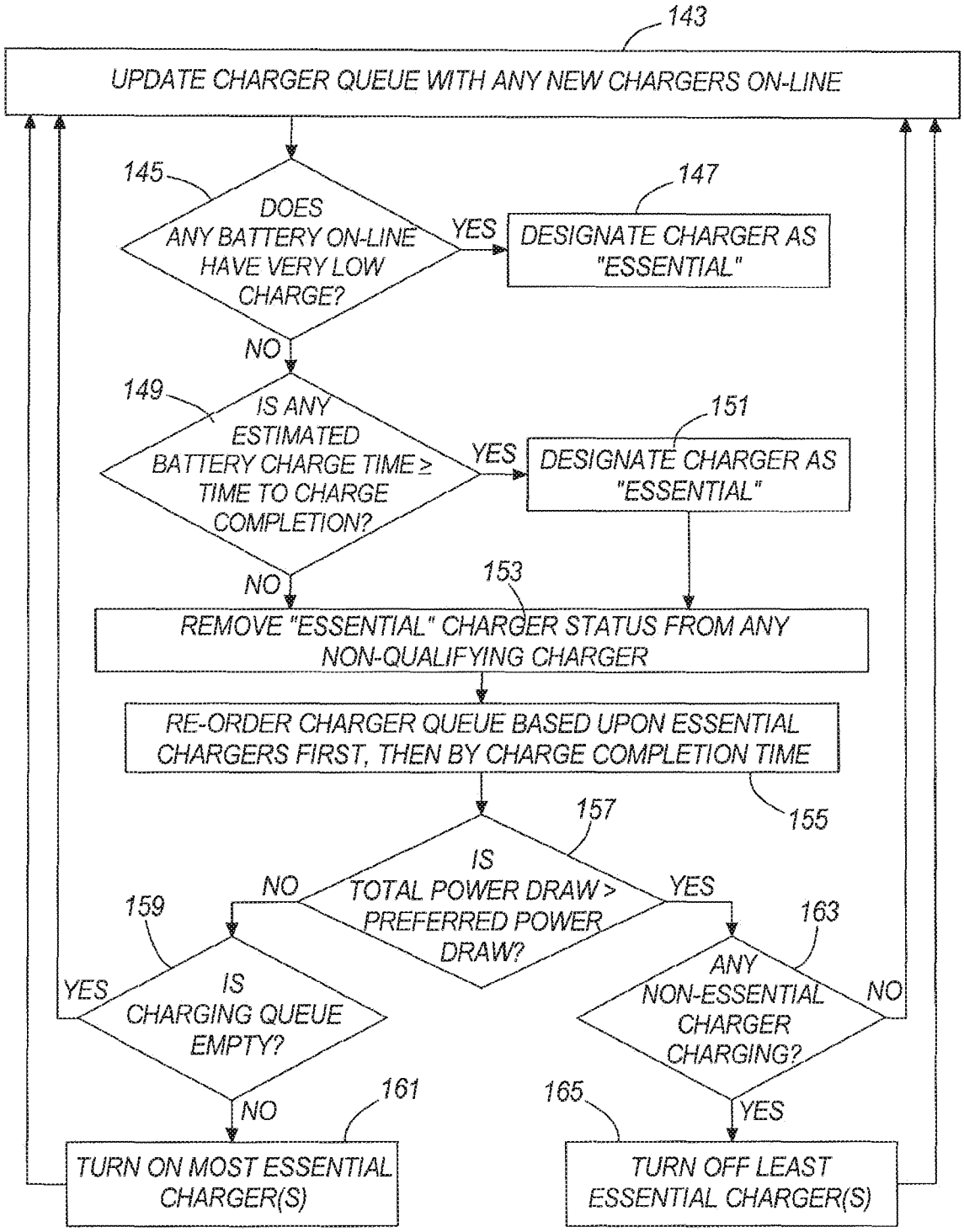

143
UPDATE CHARGER QUEUE WITH ANY NEW CHARGERS ON-LINE
145
DOES ANY BATTERY ON-LINE HAVE VERY LOW CHARGE?
YES
147
DESIGNATE CHARGER AS "ESSENTIAL"
NO
149
IS ANY ESTIMATED BATTERY CHARGE TIME ≥ TIME TO CHARGE COMPLETION?
YES
151
DESIGNATE CHARGER AS "ESSENTIAL"
NO
153
REMOVE "ESSENTIAL" CHARGER STATUS FROM ANY NON-QUALIFYING CHARGER
RE-ORDER CHARGER QUEUE BASED UPON ESSENTIAL CHARGERS FIRST, THEN BY CHARGE COMPLETION TIME
155
157
IS TOTAL POWER DRAW > PREFERRED POWER DRAW?
NO
YES
159
IS CHARGING QUEUE EMPTY?
YES
NO
161
TURN ON MOST ESSENTIAL CHARGER(S)
163
ANY NON-ESSENTIAL CHARGER CHARGING?
NO
YES
165
TURN OFF LEAST ESSENTIAL CHARGER(S)

FIG. 28

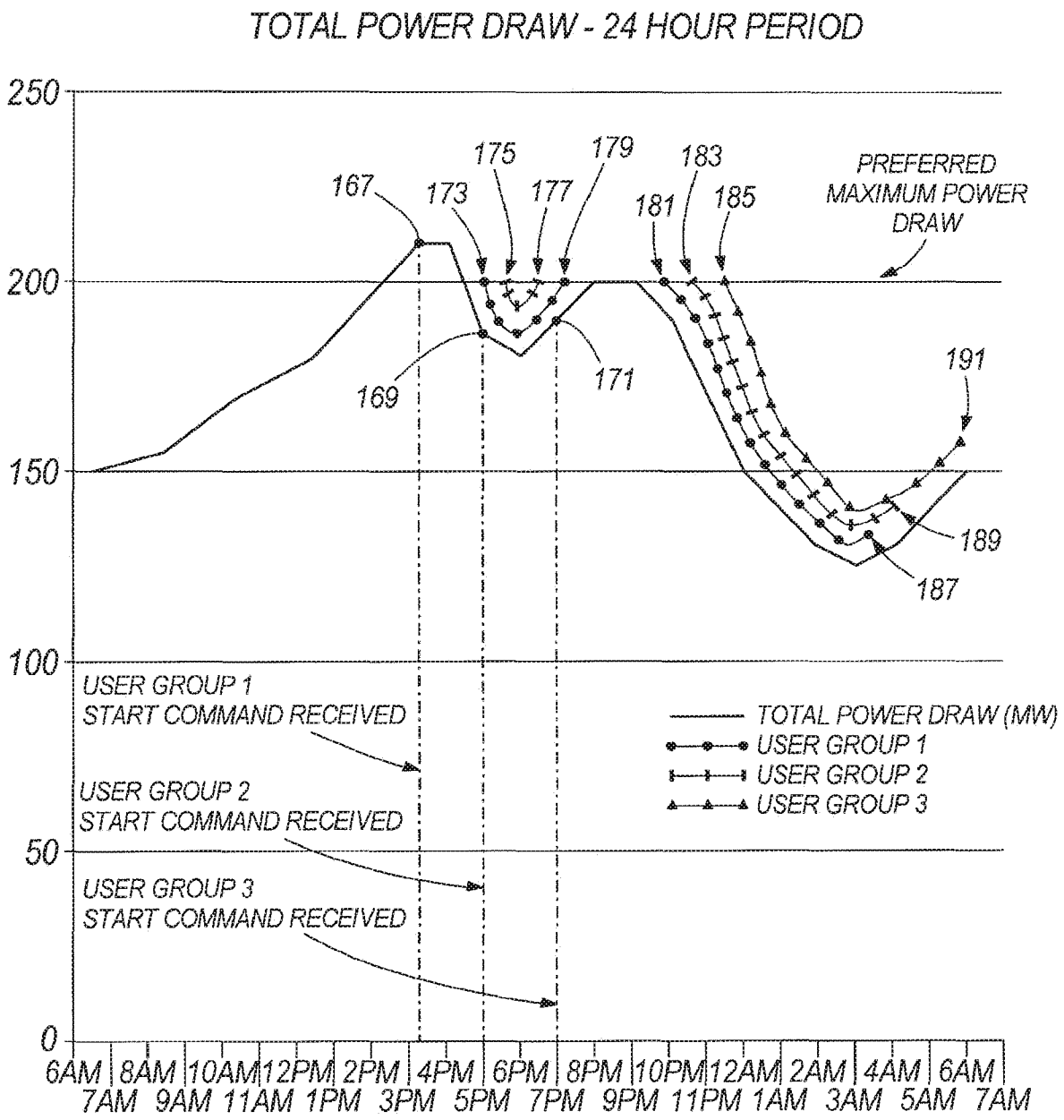

TOTAL POWER DRAW - 24 HOUR PERIOD
250
200
150
100
50
0
167
173
175
177
179
181
183
185
PREFERRED MAXIMUM POWER DRAW
169
171
191
189
187
USER GROUP 1 START COMMAND RECEIVED
USER GROUP 2 START COMMAND RECEIVED
USER GROUP 3 START COMMAND RECEIVED
TOTAL POWER DRAW (MW)
USER GROUP 1
USER GROUP 2
USER GROUP 3
6AM 7AM
8AM 9AM
10AM 11AM
12PM 1PM
2PM 3PM
4PM 5PM
6PM 7PM
8PM 9PM
10PM 11PM
12AM 1AM
2AM 3AM
4AM 5AM
6AM 7AM

FIG. 29

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Christopher	B.	Austin	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
Grafton	WI	US

Mailing Address of Inventor:

Address 1	935 17th Avenue		
Address 2			
City	Grafton	**State/Province**	WI
Postal Code	53024	**Country**	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☒ **An Address is being provided for the correspondence Information of this application.**

Name 1	Christopher B. Austin	**Name 2**	
Address 1	935 17th Avenue		
Address 2			
City	Grafton	**State/Province**	WI
Country	US	**Postal Code**	53024
Phone Number	414.331.0988	**Fax Number**	
Email Address	cbaustin@michaelbest.com	Add Email	Remove Email

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

Application Information:

Title of the Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD		
Attorney Docket Number	013350-9003-US20	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	22	**Suggested Figure for Publication (if any)**	3

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	Customer Number	● US Patent Practitioner	◯ Limited Recognition (37 CFR 11.9)

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	
	Christopher	B.	Austin		Remove
Registration Number	41592				

Additional Representative Information blocks may be generated within this form by selecting the **Add** button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	16/056041	2018-08-06
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/056041	Continuation of	12/737803	2011-02-17
Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/737803	a 371 of international	PCT/US2009/054174	2009-08-18
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2009/054174	Claims benefit of provisional	61/189353	2008-08-18

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Applicant:

Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/christopher b. austin/			Date (YYYY-MM-DD)	2019-01-16
First Name	Christopher	Last Name	Austin	Registration Number	41592

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US20
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD
First Named Inventor/Applicant Name:	Christopher B. Austin
Filer:	Christopher B. Austin/Dorothy Hauser
Attorney Docket Number:	013350-9003-US20

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**785**

Electronic Acknowledgement Receipt

EFS ID:	34854770
Application Number:	16249037
International Application Number:	
Confirmation Number:	4725
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD
First Named Inventor/Applicant Name:	Christopher B. Austin
Correspondence Address:	Christopher B. Austin - 935 17th Avenue - Grafton WI 53024 US 414.331.0988 cbaustin@michaelbest.com
Filer:	Christopher B. Austin/Dorothy Hauser
Filer Authorized By:	Christopher B. Austin
Attorney Docket Number:	013350-9003-US20
Receipt Date:	16-JAN-2019
Filing Date:	
Time Stamp:	12:47:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$785

IPR2026-00378
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RAM confirmation Number	011619INTEFSW12475600
Deposit Account	
Authorized User	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	24995757_013350-9003-US20_As_Filed_Declaration.PDF	3291628 5c279994c94b3d3682a7284e6b7d5c72f7be31cc	no	2
Warnings:					
Information:					
2		24996008_013350-9003-US20_As_Filed_Application.PDF	16003311 f53c1e015aa6ef8706edcc35618f2c29b12b7862	yes	91

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	63
Claims	64	68
Abstract	69	69
Drawings-only black and white line drawings	70	91

Warnings:					
Information:					
3	Application Data Sheet	24996260_013350-9003-US20_As_Filed_ADS.PDF	1256287 476f0aaf840d5f2cd59f2794cad23db615138784	no	9
Warnings:					
Information:					

4	Fee Worksheet (SB06)	fee-info.pdf	35041 0ace1ba20be6147ea83280f21767492d736b7b76	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	20586267

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/249,037	01/16/2019	2859	785	013350-9003-US20	20	3

CONFIRMATION NO. 4725

Christopher B. Austin
935 17th Avenue
Grafton, WI 53024

FILING RECEIPT

OC000000105698004

Date Mailed: 02/07/2019

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Christopher B. Austin, Grafton, WI;

Applicant(s)

Christopher B. Austin, Grafton, WI;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 16/056,041 08/06/2018
which is a CON of 12/737,803 02/17/2011 PAT 10090567
which is a 371 of PCT/US09/54174 08/18/2009
which claims benefit of 61/189,353 08/18/2008

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/06/2019

IPR2026-00378
Tesla EX1002 Page 108

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/249,037**

Projected Publication Date: 05/16/2019

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

Preliminary Class

320

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Tesla EX1002 Page 109

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/249,037

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 50 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 230 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	785		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20

CONFIRMATION NO. 4725

Christopher B. Austin
935 17th Avenue
Grafton, WI 53024

INFORMAL NOTICE

OC000000105698005

Date Mailed: 02/07/2019

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

A new inventor's oath or declaration that identifies this application (e.g., by Application Number and filing date) is required. The inventor's oath or declaration does not comply with 37 CFR 1.63 in that it:

- does not state that the above-identified application was made or authorized to be made by the person executing the oath or declaration.

  Christopher B. Austin

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/lvongxay/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20

CONFIRMATION NO. 4725

Christopher B. Austin
935 17th Avenue
Grafton, WI 53024

PUBLICATION NOTICE



Title:VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

Publication No.US-2019-0148787-A1
Publication Date:05/16/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

7590 12/03/2020

Christopher B. Austin
935 17th Avenue
Grafton, WI 53024

EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

MAIL DATE	DELIVERY MODE
12/03/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 16/249,037	Applicant(s) Austin, Christopher B.	
	Examiner NATHANIEL R PELTON	Art Unit 2859	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on applicatin filed on 01/16/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-20 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☐ Claim(s) _____ is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☑ Claim(s) 1-20 are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Election/Restrictions

REQUIREMENT FOR UNITY OF INVENTION

As provided in 37 CFR 1.475(a), a national stage application shall relate to one invention only or to a group of inventions so linked as to form a single general inventive concept ("requirement of unity of invention"). Where a group of inventions is claimed in a national stage application, the requirement of unity of invention shall be fulfilled only when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features. The expression "special technical features" shall mean those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

The determination whether a group of inventions is so linked as to form a single general inventive concept shall be made without regard to whether the inventions are claimed in separate claims or as alternatives within a single claim. See 37 CFR 1.475(e).

When Claims Are Directed to Multiple Categories of Inventions:

As provided in 37 CFR 1.475 (b), a national stage application containing claims to different categories of invention will be considered to have unity of invention if the claims are drawn only to one of the following combinations of categories:

(1) A product and a process specially adapted for the manufacture of said product; or

(2) A product and a process of use of said product; or

(3) A product, a process specially adapted for the manufacture of the said product, and a use of the said product; or

(4) A process and an apparatus or means specifically designed for carrying out the said process; or

(5) A product, a process specially adapted for the manufacture of the said product, and an apparatus or means specifically designed for carrying out the said process.

Otherwise, unity of invention might not be present. See 37 CFR 1.475 (c).

Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-7, drawn to A method of charging a battery of a vehicle wherein a supply of power to the charger is interrupted and based on the interruption a signal is generated and transmitted to a portable controller to alert the user of the interruption of power supply (i.e. e-mail/text).

Group II, claim(s) 8-20, drawn to A method of charging a battery of a vehicle wherein wireless communication is established with a remote controller and controller of the charger where the charger controller receives information from the remote controller data (i.e. cost of power/battery information) which is then used by the controller for controlling the supply of power to the battery.

The groups of inventions listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Groups I-II lack unity of invention because the groups do not share the same or corresponding technical feature. The special technical feature of the Group I invention, a method of charging a battery of a vehicle wherein a supply of power to the charger is interrupted and based on the interruption a signal is generated and transmitted to a portable controller to alert the user of the interruption of

power supply (i.e. e-mail/text), as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention, a method of charging a battery of a vehicle wherein wireless communication is established with a remote controller and controller of the charger where the charger controller receives information from the remote controller data (i.e. cost of power/battery information) which is then used by the controller for controlling the supply of power to the battery, as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of a vehicle charger for charging a battery of a vehicle, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 6,963,186 to Hobbs, see abstract.

Since none of the special technical features of the Groups I and II inventions are found in more than one of the inventions, unity of invention is lacking.

Furthermore the special technical features require searches in different subclasses utilizing different search strategies where a single reference that teaches both different inventive concepts is not likely to be found.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHANIEL R PELTON whose telephone number is (571)270-1761. The examiner can normally be reached on M-F 9am to 5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricardo Isla can be reached on 571-272-5056. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/02/2020								
	1	÷								
	2	÷								
	3	÷								
	4	÷								
	5	÷								
	6	÷								
	7	÷								
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	20	÷								

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Group Art Unit 2859

In re

Patent Application of

Christopher B. Austin

Application No. 16/249,037

Confirmation No. 4725

Filed: January 16, 2019

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD"

Atty. Docket No. 013350-9003-US20

RESPONSE TO RESTRICTION REQUIREMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

This communication is filed in response to the Restriction Requirement mailed December 3, 2020, and is filed within the two-month shortened statutory period set for reply. Entry of the following amendments and consideration of the accompanying remarks are respectfully requested. Please also charge Deposit Account No. 13-3080 with any necessary fee in connection with this communication. Please also amend the present application as follows:

Amendments to the Claims:	Pages 2-6
Remarks:	Page 7

Amendments to the Claims:

Please amend the claims as indicated in the marked-up version of the listing of claims presented below. This listing of claims replaces all prior versions and listings of claims in the present application.

1-7. (Canceled)

8. (Original) A system for charging a battery of a vehicle, the system comprising:

a battery charger having

an electrical power cord releasably attachable to at least one of the vehicle and a source of power;

at least one of a group consisting of a transmitter and a receiver;

a controller electrically coupled to the electrical power cord and to the at least one of the group consisting of the transmitter and the receiver, the controller responsive to detection of a predetermined threshold level of charge of the battery having been reached by sending at least one signal indicative of the threshold level of charge of the battery via the at least one of the group consisting of the transmitter and the receiver;

a portable controller remote from the vehicle and battery charger, the portable controller adapted for wireless communication with the controller of the battery charger via the at least one of the group consisting of the transmitter and the receiver of the battery charger;

wherein the portable controller generates a notification to a user indicating the threshold level of charge of the battery following and as the result of the at least one signal indicative of the threshold level of charge of the battery.

9. (Original) The system of claim 8, wherein the notification is an indicator on a display viewable by the user.

10. (Original) The system of claim 9, wherein the display is electrically coupled to the controller of the battery charger.

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11. (Original) The system of claim 8, wherein the notification is at least one of a group consisting of a text and an e-mail automatically generated to the user.

12. (Original) The system of claim 8, wherein the portable controller is adapted to send signals to the controller of the battery charger to start and stop charging of the battery.

13. (Original) The system of claim 8, wherein the threshold level of charge of the battery is a full charge of the battery.

14. (Original) The system of claim 8, wherein the threshold level of charge of the battery is a level of charge lower than a full charge of the battery.

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Tesla EX1002 Page 123

15. (Original) A method of charging a battery of a vehicle, the method comprising:

connecting an electrical power cord of a vehicular battery charger to at least one of the vehicle and a source of power;

establishing wireless communication between a controller of the vehicular battery charger and a portable controller of a user remote from the vehicle and the vehicular battery charger;

supplying power to the battery of the vehicle via the vehicular battery charger;

detecting a predetermined level of charge of the battery after supplying an amount of power to the battery;

generating a signal responsive to detecting the predetermined level of charge of the battery;

transmitting the signal wirelessly to the portable controller; and

alerting the user that the predetermined level of charge of the battery has been reached responsive to transmitting the signal wirelessly to the portable controller.

16. (Original) The method of claim 15, wherein the signal includes data indicative of the level of charge of the battery.

17. (Original) The method of claim 15, wherein transmitting the wireless signal comprises transmitting the wireless signal from the controller of the vehicular battery charger.

18. (Original) The method of claim 15, wherein alerting the user comprises alerting the user via at least one of a group consisting of an e-mail and a text.

19. (Original) The method of claim 15, wherein the predetermined level of charge is a fully-charged level of the battery.

20. (Original) The method of claim 15, wherein the predetermined level of charge is less than a fully charged level of the battery.

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21. (New) A system for charging a battery of a vehicle and for wireless communication with a phone having a controller, the system comprising:

a battery charger having

an electrical power cord releasably attachable to at least one of the vehicle and a source of power;

at least one of a group consisting of a transmitter and a receiver;

a battery charger controller electrically coupled to the electrical power cord and to the at least one of the group consisting of the transmitter and the receiver, the battery charger controller configured to wirelessly communicate with the controller of the phone by sending signals via the at least one of the group consisting of the transmitter and the receiver, and to control supply of power to the battery in the course of a charging session as the level of charge of the battery is increased, the battery charger controller responsive to detection of a threshold level of charge of the battery being reached during the charging session by sending a signal indicative of the level of charge being reached via the at least one of the group consisting of the transmitter and the receiver to the controller of the phone.

.

22. (New) The system of claim 21, wherein the signal indicative of the level of charge being reached is at least one of a group consisting of a text and an e-mail automatically generated to the user.

23. (New) The system of claim 21, wherein the battery charger controller is further responsive to signals from the phone to start and stop charging of the battery.

24. (New) The system of claim 21, wherein the threshold level of charge of the battery is a full charge of the battery.

25. (New) The system of claim 21, wherein the threshold level of charge of the battery is a level of charge lower than a full charge of the battery.

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26. (New) The system of claim 21, wherein the battery charger is releasably attachable to the vehicle and the source of power, and is portable as a single unit.

27. (New) The system of claim 21, wherein the battery charger controller is further responsive to detection of interruption of power to the battery by sending another signal indicative of the interruption via the at least one of the group consisting of the transmitter and the receiver to the controller of the phone.

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REMARKS

By this Amendment, claims 1-7 are canceled without prejudice, and new claims 21-27 are added, leaving claims 8-20 unchanged.

RESTRICTION

In the Office action, the Examiner asserts that the application includes the following inventions:

Invention I: claims 1-7; and
Invention II: claims 8-20.

Applicant hereby elects Invention II (claims 8-20) for prosecution, without traverse. New claims 21-27 are hereby added. The Applicant submits that new claims 21-27 are appropriately included in the claims under examination.

CONCLUSION

In view of the foregoing, Applicant respectfully requests entry of the present amendment and examination of the application on the merits.

The undersigned is available for telephone consultation at the Examiner's convenience.

Respectfully submitted,

/Christopher B. Austin/

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414-225-8266 Direct
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414-277-0656 Facsimile

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Tesla EX1002 Page 127

Electronic Acknowledgement Receipt

EFS ID:	41575080
Application Number:	16249037
International Application Number:	
Confirmation Number:	4725
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD
First Named Inventor/Applicant Name:	Christopher B. Austin
Correspondence Address:	Christopher B. Austin - 935 17th Avenue - Grafton WI 53024 US 414.331.0988 cbaustin@michaelbest.com
Filer:	Christopher B. Austin/Dorothy Hauser
Filer Authorized By:	Christopher B. Austin
Attorney Docket Number:	013350-9003-US20
Receipt Date:	07-JAN-2021
Filing Date:	16-JAN-2019
Time Stamp:	13:45:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		013350-9003-US20_As_Filed_Response.pdf	104991 3a65f2957ce83e1c5acf75399cd0ab7f6204f6a1	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response to Election / Restriction Filed	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	7

Warnings:	
Information:	
Total Files Size (in bytes):	104991

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/249,037	Filing Date 01/16/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	01/07/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/SHARON D HARRIS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PLUS Search Results for S/N 16249037, Searched Fri Mar 12 15:38:27 EST 2021

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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PLUS Search Results for S/N 16249037, Searched Fri Mar 12 15:39:31 EST 2021

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

7590 03/15/2021

Christopher B. Austin
935 17th Avenue
Grafton, WI 53024

EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

MAIL DATE	DELIVERY MODE
03/15/2021	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 16/249,037	Applicant(s) Austin, Christopher B.	
	Examiner NATHANIEL R PELTON	Art Unit 2859	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on response to restriction filed on 01/07/2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 8-27 is/are pending in the application.

5a) Of the above claim(s) 27 is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 8-27 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☑ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 01/16/2019 is/are: a)☐ accepted or b)☑ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Election/Restrictions

Claims 1-7 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group I, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 01/07/2021.

Also note that newly submitted claim 27 is directed to the non-elected invention of Group I. Since applicant has selected Group II to receive an action on the merits, Group II and not Group I has been elected for prosecution on the merits which does not include claim 27. Accordingly, claim 27 is withdrawn from consideration as being directed to a non-elected invention.

Response to Amendment

Acknowledgement is made of the amendment filed on 01/07/2021 in which claims 1-7 were canceled and claims 21-27 added. Therefore, claims 8-27 are pending for examination below.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The Examiner recommends that applicant incorporate the inventive concept found in the independent claims, for example, the claims reflect the concept of sending a signal/notifying a user when a detection of charge in a battery reaches a threshold.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "phone" and "to the controller of the phone" in claim 21 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 10 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

For example, claim 8 sets forth that the controller that generates a notification to a user as a result of the at least one signal is portable and remote controller from the battery charger. Claim 9 sets forth that notification is an indicator on a display (of the portable and remote controller). Then finally claim 10 now states that display (of the portable controller) is coupled to the battery charger which is in direct conflict with the requirements of claim 1. Therefore the claim is rendered unclear.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, 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 negatived by the manner in which the invention was made.

Claims 8-10, 13-17, 19-21, and 24-25 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] in view of Sugano [US 2011/0266996].

With respect to claims 8, 9, 13, 15, 16, 17, 19, 21, and 24, Pryor discloses a system for charging a battery of a vehicle [**Fig. 1**], the system comprising: a battery charger having an electrical power cord releasably attachable to at least one of the vehicle and a source of power [**102**]; at least one of a group consisting of a transmitter and a receiver [**126**]; a controller electrically coupled to the electrical power cord and to the at least one of the group consisting of the transmitter and the receiver [**110 and/or 116**], the controller responsive to detection of a predetermined threshold level of charge of the battery

having been reached [**par. 0022**] by sending at least one signal indicative of the level of charge of the battery via the at least one of the group consisting of the transmitter and the receiver [**par. 0025**], and to control supply of power to the battery in the course of a charging session as the level of charge to the battery is increased [**implicit function of a battery charger; see also Fig. 4**]; a portable controller remote from the vehicle and battery charger [**164**], the portable controller adapted for wireless communication with the controller of the battery charger via the at least one of the group consisting of the transmitter and the receiver of the battery charger [**par. 0024**]. However, Pryor fails to disclose the controller being a portable controller that generates a notification to a user indicating the threshold level of charge of the battery following and as the result of the at least one signal indicative of the threshold level of charge of the battery.

Sugano teaches a battery charging process wherein a controller is a portable controller that generates a notification to a user indicating the threshold level of charge of the battery following and as the result of the at least one signal indicative of the threshold level of charge of the battery [**par. 0095; cell phone of a user receives alerts that the battery has been fully charged, i.e. a viewable notification on the phone**].

Therefore it would have been obvious to a person having ordinary skill in the art before the invention was made to further modify Pryor such that the signal was additionally responsive to a predetermined threshold (i.e. charge complete) for the benefit of allowing the user and/or network to know that the vehicle is fully charged and thereby allowing the network to facilitate power transfer operations and for allowing the user to know the vehicle is ready for use.

With respect to claim 10, Pryor further discloses another display is electrically coupled to the controller of the battery charger [**user interface 120**].

With respect to claims 14, 20, and 25, Pryor further discloses wherein the threshold level of charge of the battery is a level of charge less than a full charge of the battery that is sent to a remote controller [**par. 0025; current charge level that is transferred encompasses charge level from depleted (i.e. 0%) up to fully charged (i.e. 100%)**].

Claims 11-12, 18, and 22-23 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Sugano [US 2011/0266996] as applied above, and further in view of Straubel [US 2009/0139781].

With respect to claims 11, 18, and 22, Pryor as modified above teaches automatic generation to a user as described above but fails to explicitly disclose the signal is a text or e-mail.

Straubel teaches a vehicle recharging system with user communication interfaces to communicate with remote devices/users regarding vehicle charging information wherein the signal is at least one of a group consisting of a text and an e-mail sent to for example, a phone or PDA [**par. 0318, 0320, 0325; see also Fig. 47-48**].

Therefore it would have been obvious to a person having ordinary skill in the art before the invention was made to further modify Pryor such that the signal is a text or email send to the mobile device of the user for the benefit of allowing the signal to be sent in a format that is common and routine in the industry and a widely accepted mode of communication.

With respect to claims 12 and 23, Straubel further teaches wherein a portable controller is adapted to send signals to the controller of the battery charger to start and stop charging of the battery [**par. 0320**] and also a query into the current SOC (i.e. claims 14/20/25 less than a full charge scenario).

Therefore it would have been obvious to a person having ordinary skill in the art before the invention was made to further modify Pryor to allow user control of the charging process from the

remote device for the benefit of allowing the user easier access/control (i.e. from a remote location) of the recharging operation thereby facilitating a better experience tailored to the user's settings/needs.

Claim 26 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Sugano [US 2011/0266996] as applied above, and further in view of Wang [US 2008/0054845].

With respect to claim 26, Pryor discloses the battery charger is releasably attachable to the source of power [**Fig. 1/2**] but fails to disclose the cord/charger being releasable from the vehicle and portable as a single unit.

First, as an initial matter it would have been obvious to one having ordinary skill in the art to make the charger portable/separable, since it has been held that making an old device portable or movable without producing any new and unexpected result involves only routine skill and constructing a formerly integral structure in various element also involves only routine skill in the art. The benefit to such a modification would be to all for a portable charging cable thereby allowing a universal type of plug/charger to be connected with any type of vehicle.

However, for completeness and additional clarity, Wang teaches a battery charger that is releasably attachable to a vehicle and a source of power, and is portable as a single unit [**Fig. 1**].

Therefore it would have been obvious to a person having ordinary skill in the art before the invention was made to further modify Pryor to such that the charging plug included battery charger circuitry as claimed for the benefit of providing a battery charger that is convenient to a user while also being more user friendly, more pleasing, and improving the reading of the gauges in a useful way as explicitly stated by Wang [**par. 0009**].

Claim 27 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Sugano [US 2011/0266996] as applied above, and further in view of Morgal et al. [US 2010/0228405].

With respect to claim 27, Pryor and Sugano as applied above disclose sending wireless signals relating to the battery charging operation via the transmitter/receiver but fail to disclose explicitly a signal relating to an interruption of the power supply.

Morgal teaches further sending a wireless signal responsive to the detection of interruption of power to a battery charger [**par. 0173, 0182, 0219-0220**].

Therefore it would have been obvious to a person having ordinary skill in the art before the invention was made to further modify Pryor to include the signal relating to interruption of power for the benefit of allow quick notification to a user regarding the status of the charging operation no matter the location of the user.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHANIEL R PELTON whose telephone number is (571)270-1761. The examiner can normally be reached on M-F 9am to 5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricardo Isla can be reached on 571-272-5056. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Notice of References Cited	Application/Control No. 16/249,037	Applicant(s)/Patent Under Reexamination Austin, Christopher B.	
	Examiner NATHANIEL R PELTON	Art Unit 2859	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20080007202-A1	01-2008	Pryor; Bryan K.	B60L53/14	320/104
*	B	US-20110266996-A1	11-2011	Sugano; Tomio	B60L53/31	320/104
*	C	US-20080054845-A1	03-2008	Wang; Jeen-Shuh	H02J7/0042	320/111
*	D	US-20100228405-A1	09-2010	Morgal; Richard	B60L53/68	701/2
*	E	US-20090313174-A1	12-2009	Hafner; James Lee	B60L53/65	705/80
*	F	US-20090139781-A1	06-2009	Straubel; Jeffrey Brian	B60L50/64	180/65.1
*	G	US-6963186-B2	11-2005	Hobbs; Raymond	B60L3/0046	320/128
	H					
	I					
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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/02/2020	03/12/2021							
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	2	÷	-							
	3	÷	-							
	4	÷	-							
	5	÷	-							
	6	÷	-							
	7	÷	-							
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	25		✓							
	26		✓							
	27		N							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

CPC - Searched*		
Symbol	Date	Examiner
H01M 10/44	03/12/2021	nrp
B60L 53/68,126,14,305,18,38,63	03/12/2021	nrp
G01R 31/371	03/12/2021	nrp
H02J 7/0042,0047	03/12/2021	nrp

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
320	109	03/12/2021	nrp

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
performed inventor and assignee searches	03/12/2021	nrp
requested PLUS search on spec and claims	03/12/2021	nrp
text searched for key concepts	03/12/2021	nrp

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

IPR2026-00378
Tesla EX1002 Page 145

Bibliographic Data

Application No: 16/249,037

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /NATHANIEL R PELTON/ Examiner's Signature | Initials

Title: VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/16/2019	320	2859	013350-9003-US20
RULE			

APPLICANTS

INVENTORS

Christopher B. Austin, Grafton, WI, UNITED STATES

CONTINUING DATA

This application is a CON of 16056041 08/06/2018ABN

16056041 is a CON of 12737803 02/17/2011 PAT 10090567

12737803 is a 371 of PCT/US09/54174 08/18/2009

PCT/US09/54174 has PRO of 61189353 08/18/2008

FOREIGN APPLICATIONS

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02/06/2019

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$785

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	"US 20110175569"	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2013/07/14 21:18
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S3	1,050	320/109.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/14 21:18
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S46	1	"US 20110175569"	US-PGPUB; USPAT; USOCR	OR	OFF	2016/08/09 16:11
S47	29,042	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:17
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S49	16	S48 and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:22
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S51	1	"5548200".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2016/08/09 16:23
S52	1	"20090243549".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/08/09 16:32
S53	10	S48 and (overrid$3 with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:35
S54	51	"320".clas. and (overrid$3 with (below or lower or less)) and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:39
S55	2	"20020079868".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 17:33
S56	38,844	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21

S57	9,252	S56 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21
S58	363	S57 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21
S59	3	"8772970".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/15 13:19
S60	1	"8772970".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/15 13:20
S61	3	"6963186".pn. or "20090243549".pn. or "5548200".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/16 09:33
S62	1	"20020079868".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/16 09:48
S63	38,868	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/16 10:53
S64	9,253	S63 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/16 10:53
S65	10	S64 and (overrid$3 with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/04/16 10:53

			DERWENT; IBM_TDB			
S66	41,747	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:39
S67	9,450	S66 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:39
S68	0	S67 and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (start$4 or initiat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:42
S69	8	("320".clas. or h02j7/$$.cpc. or b60l11/$$.cpc.) and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (start$4 or initiat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:43
S70	83	S67 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:59
S71	2	"20040164711".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 11:53
S72	1	"20040164711".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:53

S73	171	"320".clas. and (decrypt$3)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:56
S74	5	"320".clas. and (decrypt$3 with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:57
S75	1	"20100076825".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:00
S76	2,222	(decrypt$3 with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:04
S77	1,513	S76 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:04
S78	1,216	((decrypt$3 near5 key) with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:05
S79	856	S78 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:05
S80	82	((decrypt$3 near5 key) with (manufacturer or supplier) with server)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:07
S81	47	S80 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:07
S82	242	((decrypt$3 near5 key) with (manufacturer or supplier) with request$3)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:13
S83	131	S82 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:13
S84	11,740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S85	2,157	S84 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S86	293	S85 and (tim$3 near5 (end$3 or complet$4 or finish$3))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S87	50,398	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2018/10/02 13:43

			DERWENT; IBM_TDB			
S88	9,772	S87 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/02 13:43
S89	372	S88 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/02 13:43
S90	1,291	((decrypt$3 near5 key) with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 17:10
S91	2,233	dunn.xa.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S92	1,675	S91 and @ad<"20080101"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S93	1,401	S91 and @ad<"20040101"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S95	2,033	320/109.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/03 17:09
S96	53,838	h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/088.cpc. or h01m10/44.cpc. or b60l11/1824.cpc. or 320/109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/03 17:09
S97	1,324	(S95 or S96) and (vehicle with (charg$5 or recharg$5) with control$4 with transmit$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/03 17:09
S98	11,740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44

S99	2,157	S98 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44
S100	293	S99 and (tim$3 near5 (end$3 or complet$4 or finish$3))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44
S101	2	"20110175569".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/13 14:00
S102	1	"20110175569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:00
S103	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:48
S104	11,629	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:49
S105	4,808	h01m10/44.cpc. or g01r31/3689.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:50
S106	3,622	(S104 or S105) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:50
S107	194	S106 and (((charg$5 or recharg$5 or re$1charg$5) near5 (cable or cord or plug)) with (vehicle or car or auto or automobile))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:55
S108	40,433	(b60l11/1816 or b60l11/182 or b60l11/1824 or b60l11/1829 or b60l11/1844 or b60l2230/12 or b60l2230/16 or b60l2230/40).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/13 15:36
S109	876	S108 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 15:36
S110	2	"20180375175".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/06/16 15:26

			DERWENT; IBM_TDB			
S111	103,122	h01m10/44.cpc. or 320/109 or b60l53/12,68,14,305,18,30,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/17 14:03
S112	5,602	S111 and ((coil or core or inductiv$3) near5 (position$3 or align$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/17 14:05
S113	262	S112 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/06/17 14:05
S114	6	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$).did.	US-PGPUB	OR	OFF	2020/09/14 08:56
S115	2	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB	OR	OFF	2020/09/14 08:58
S116	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/14 08:58
S117	31,994	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:02
S118	7,985	S117 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:02
S119	39,132	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:03

S120	3,591	S119 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:03
S121	103	(S118 or S120) and ((control$4 or display$3) with (onboard or inside or dash) with (vehicle or car or auto or automobile))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:06
S122	18	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:32
S123	6	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/14 09:32
S124	93	(S118 or S120) and ((delay$4 near3 (tim$3 or period)) with (charg$5 or recharg$5))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:33
S125	27	(S118 or S120) and ((input$4 or user) with (time near2 day))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:54
S126	2	"20180375175".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 10:33
S127	192	(US-16056043-$ | US-3603860-$ | US-3624723-$ | US-3673379-$ | US-3740896-$ | US-3870855-$ | US-3898547-$ | US-3900784-$ | US-	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2020/09/14 12:25

		3911284-$ | US-4012681-$ | US-4146825-$ | US-4218644-$ | US-4229687-$ | US-4252217-$ | US-4258305-$ | US-4282475-$ | US-4286911-$ | US-4355275-$ | US-4454926-$ | US-4508090-$ | US-4819139-$ | US-4829223-$ | US-4983904-$ | US-5194799-$ | US-5220268-$ | US-5229703-$ | US-5283470-$ | US-5285963-$ | US-5289103-$ | US-5323099-$ | US-5337237-$ | US-5349535-$ | US-5351283-$ | US-5359308-$ | US-5418437-$ | US-5421427-$ | US-5422822-$ | US-5434494-$ | US-5437939-$ | US-5441123-$ | US-5452983-$ | US-5454767-$ | US-5506489-$ | US-5524726-$ | US-5528234-$ | US-5539296-$ | US-5556284-$ | US-5577920-$ | US-5581171-$ | US-5596258-$ | US-5602459-$ | US-5623194-$ | US-5645279-$ | US-5646507-$ | US-5647450-$ | US-5656916-$ | US-5659240-$ | US-5668460-$ | US-5686812-$ | US-5703464-$ | US-5713426-$ | US-5730237-$ | US-5736831-$ | US-5760569-$ | US-5778329-$ | US-5816643-$ | US-5844384-$ | US-5853058-$ | US-5881559-$ | US-5890555-$ | US-5896022-$ | US-5903134-$ | US-5910714-$ | US-5921708-$ | US-5926004-$ | US-5937831-$ | US-5951229-$ | US-5952813-$ | US-5966285-$ | US-5967115-$ | US-5977744-$ | US-6021862-$ | US-6037746-$ | US-6087805-$ | US-6087806-$ | US-6104160-$ | US-6114833-$ | US-6154005-$ | US-6160374-$ | US-6184656-$ | US-6220538-$ | US-6232743-$ | US-6243644-$ | US-6267190-$ | US-6316908-$ | US-6320358-$ | US-6345772-$ | US-6357244-$ | US-6362594-$ | US-6426606-$ | US-RE36225-$).DID.	JPO; DERWENT; IBM_TDB			
S128	194	(US-16056043-$ | US-4245640-$ | US-4320333-$ | US-4380725-$ | US-4389608-$ | US-4402524-$ | US-4430569-$ | US-4446680-$ | US-4449049-$ | US-4468605-$ | US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/09/14 12:25

		4591778-$ | US-4602204-$ | US-4616169-$ | US-4774449-$ | US-4873160-$ | US-4956563-$ | US-4990099-$ | US-5194799-$ | US-5204611-$ | US-5206577-$ | US-5219034-$ | US-5229703-$ | US-5237257-$ | US-5287052-$ | US-5350993-$ | US-5371456-$ | US-5397991-$ | US-5402056-$ | US-5408170-$ | US-5422558-$ | US-5422560-$ | US-5444352-$ | US-5446364-$ | US-5455637-$ | US-5455638-$ | US-5465038-$ | US-5469043-$ | US-5506646-$ | US-5510694-$ | US-5528148-$ | US-5536979-$ | US-5537023-$ | US-5548200-$ | US-5557190-$ | US-5565756-$ | US-5583416-$ | US-5589757-$ | US-5600225-$ | US-5602459-$ | US-5605769-$ | US-5606851-$ | US-5610499-$ | US-5619845-$ | US-5631536-$ | US-5633574-$ | US-5642031-$ | US-5644210-$ | US-5656920-$ | US-5668462-$ | US-5670861-$ | US-5670863-$ | US-5672952-$ | US-5701069-$ | US-5703471-$ | US-5710502-$ | US-5710506-$ | US-5739673-$ | US-5773962-$ | US-5776119-$ | US-5783927-$ | US-5793185-$ | US-5801512-$ | US-5801515-$ | US-5811958-$ | US-5812382-$ | US-5835185-$ | US-5847912-$ | US-5850134-$ | US-5867008-$ | US-5895440-$ | US-5900720-$ | US-5903764-$ | US-5963012-$ | US-6016047-$ | US-6018227-$ | US-6043625-$ | US-6060185-$ | US-6060865-$ | US-6066938-$ | US-6075341-$ | US-6118250-$ | US-6118254-$ | US-6133766-$ | US-6160376-$ | US-6160378-$ | US-6163086-$ | US-6184650-$ | US-6184660-$ | US-7876068-$ | US-RE36225-$).DID.	DERWENT; IBM_TDB			
S129	1	"20190148794".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:25
S130	11,666	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:36

S131	20,499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:37
S132	4,231	(S130 or S131) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:38
S133	4	"20080007202".pn. or "7243746".pn. or "5548200".pn. or "20080103370".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:03
S134	10	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did.	US-PGPUB	OR	OFF	2020/09/29 10:07
S135	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:08
S136	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$).did.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:08
S137	1	"6983186".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:09
S138	1	"6963186".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:10
S139	13	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:10
S140	1	"20080052145".pn.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:15

S141	14	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:17
S142	410	S132 and ((cost or price) near5 (power or energy))	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:40
S143	236	S132 and ((display$3 or indicat$3 or led) near5 (connect$3 or coupl$3) near5 (power or energy or cable or plug))	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:32
S144	1	"20080103370".pn.	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:45
S145	1,551	(((data or information) near5 (progress)) with (indicator))	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:49
S146	437	S145 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 11:50
S147	1	"20190148785".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 14:42
S148	15	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 14:49
S149	11,666	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S150	20,499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S151	4,231	(S149 or S150) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S152	4	S151 and ((controller or display) near3 (on or within or built$1in) with (cord or cable or plug))	US-PGPUB; USPAT	OR	OFF	2020/09/29 15:58

S153	1,716	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	US-PGPUB; USPAT	OR	OFF	2020/09/29 16:06
S154	219	S153 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 16:07
S155	1	"20070164704".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 08:48
S156	1	"10090567".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 08:57
S157	2,049	((charg$5 or recharg$5) adj4 (cable or plug)) with (display or transmit$4 or reciev$3)	US-PGPUB; USPAT	OR	OFF	2020/09/30 09:03
S158	2,290	((charg$5 or recharg$5) adj4 (cable or plug or cord)) with (display or transmit$4 or reciev$3)	US-PGPUB; USPAT	OR	OFF	2020/09/30 09:03
S159	328	S158 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/09/30 09:03
S160	2	"20160294427".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2020/09/30 14:27
S161	1	"20160294427".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 14:27
S162	1	"20200185933".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 09:48
S163	3	"20120130556".pn. or "20140088781".pn. or "20170110894".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:06
S164	1	"20160380440".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:15
S165	1	"20200238847".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:33
S166	2	"20180191176".pn. or "20160141896".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:00
S167	1	"20200278936".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:30

S168	1	"20050029867".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:37
S169	1	"20190270391".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:41
S170	2	"20110050173".pn. or "9352635".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/05 09:02
S171	1	"20190148792".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/05 09:25
S172	133	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 09:00
S173	32,481	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S174	7,999	S173 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S175	39,828	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S176	3,602	S175 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S177	444	(S174 or S176) and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/11/30 09:10

			DERWENT; IBM_TDB			
S178	17,859	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 10:45
S179	2,346	S178 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 10:45
S180	450	S179 and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/30 10:45
S182	2	"20180257495".pn. or "20180138731".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/01 11:40
S183	1	"20140055088".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/02 10:13
S184	3	"20150054460".pn. or "20180229616".pn. or "20120153874".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/02 10:53
S185	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	US-PGPUB; USPAT	OR	OFF	2020/12/02 11:12
S186	4	"20180257495".pn. or "20180138731".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/02 11:24
S187	139	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2021/03/11 14:31
S188	33,922	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT;	OR	OFF	2021/03/11 16:00

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S189	8,013	S188 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
S190	41,855	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
S191	3,631	S190 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
S192	445	(S189 or S191) and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/03/11 16:00
S193	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	US-PGPUB; USPAT	OR	OFF	2021/03/11 16:01
S194	1	"20090139781".pn.	US-PGPUB; USPAT	OR	OFF	2021/03/12 08:21
S195	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-	US-PGPUB; USPAT	OR	OFF	2021/03/12 13:20

		$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.				
S196	9	S195 and interrupt$3	US-PGPUB; USPAT	OR	OFF	2021/03/12 13:20
S197	33,922	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S198	8,013	S197 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S199	41,855	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S200	3,631	S199 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S201	283	(S198 or S200) and ((signal$3 or communicat$3 or send$3) with ((interrupt$3 or stop$4 or halt$3 or fault$3) near3 (power or energy or charg$3 or recharg$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/03/12 13:29
S202	1,792	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:19

S203	0	S202 and g01r31/371	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:19
S204	5	S202 and g01r31/371.cpc.	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:23
S205	2,017	((charg$5 or recharg$5) near3 (cable or plug)) with (send$3 or transmit$4)	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:23
S206	4	S205 and g01r31/371.cpc.	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:26

3/12/2021 2:28:10 PM
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Group Art Unit 2859

In re

Patent Application of

Christopher B. Austin

Application No. 16/249,037

Confirmation No. 4725

Filed: January 16, 2019

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD"

Atty. Docket No. 013350-9003-US20

RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

This communication is filed in response to the non-final Office Action mailed March 15, 2021. Entry of the following amendments and consideration of the accompanying remarks are respectfully requested. Please also charge Deposit Account No. 13-3080 with any necessary fee in connection with this communication. Please also amend the present application as follows:

Amendments to the Drawings begin on page 2 of this paper;

Amendments to the Specification begin on page 3 of this paper;

Amendments to the Claims are reflected in the listing of the claims, which begins on page 4 of this paper; and

Remarks begin on page 10 of this paper.

AMENDMENTS TO THE DRAWINGS

Please replace the drawing sheet containing FIGS. 15 and 16 of the present application with the enclosed replacement sheet including an amended version of FIG. 15 and the original version of FIG. 16.

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AMENDMENTS TO THE SPECIFICATION

Please amend the title of the present application as follows (shown in mark-up):

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION

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AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated in the marked-up version of the listing of claims presented below. This listing of claims replaces all prior versions and listings of claims in the present application.

1-7. (Canceled)

8. (Currently Amended) A system for charging a battery of a vehicle, the system comprising:

a battery charger having:

an electrical power cord releasably attachable to at least one of the vehicle and a source of power;

~~at least one of a group consisting of~~ a transmitter ~~and a receiver~~;

a controller electrically coupled to the electrical power cord and to the ~~at least one of the group consisting of the~~ transmitter ~~and the receiver~~, the controller configured to:

receive, via a user-manipulatable control, data indicative of a predetermined threshold level of charge by which the controller sends an alert, the predetermined threshold level of charge being less than a full charge of the battery,

compare, during charging of the battery with the battery charger, a level of charge of the battery to the predetermined threshold level of charge, and

responsive to the level of charge of the battery reaching the ~~detection of a~~ predetermined threshold level of charge of the battery ~~having been reached~~, send, before the charging of the battery is complete, ~~by sending~~ the at least one signal as the alert via the transmitter, the at least one signal indicative of the predetermined threshold level of charge of the battery ~~via the at least one of the group consisting of the transmitter and the receiver~~; and

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a portable controller remote from the vehicle and battery charger, the portable controller configured to wirelessly communicate ~~adapted for wireless communication~~ with the controller of the battery charger via the ~~at least one of the group consisting of the~~ transmitter ~~and the receiver of the battery charger~~;

wherein the portable controller generates a notification to a user indicating the predetermined threshold level of charge of the battery following and as the result of receiving the at least one signal indicative of the predetermined threshold level of charge of the battery.

9. (Original) The system of claim 8, wherein the notification is an indicator on a display viewable by the user.

10. (Currently Amended) The system of claim 9, wherein the display is electrically coupled to the portable controller ~~of the battery charger~~.

11. (Original) The system of claim 8, wherein the notification is at least one of a group consisting of a text and an e-mail automatically generated to the user.

12. (Currently Amended) The system of claim 8, wherein the portable controller is configured ~~adapted~~ to send signals to the controller of the battery charger to start and stop charging of the battery.

13. (Canceled) ~~The system of claim 8, wherein the threshold level of charge of the battery is a full charge of the battery.~~

14. (Canceled) ~~The system of claim 8, wherein the threshold level of charge of the battery is a level of charge lower than a full charge of the battery.~~

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15. (Currently Amended) A method of charging a battery of a vehicle, the method comprising:

~~connecting an electrical power cord of a vehicular battery charger to at least one of the vehicle and a source of power;~~

establishing wireless communication between a controller of the vehicular battery charger and a portable controller of a user remote from the vehicle and the vehicular battery charger;

receiving, via a user-manipulatable control, data indicative of a predetermined threshold level of charge by which the controller sends an alert, the predetermined threshold level of charge being less than a full charge of the battery;

supplying power to the battery of the vehicle via the vehicular battery charger;

comparing, during charging of the battery with the vehicular battery charger, a level of charge of the battery to the predetermined threshold level of charge; and

~~detecting a predetermined level of charge of the battery after supplying an amount of power to the battery;~~

generating and wirelessly transmitting, during the charging of the battery and before the charging of the battery is complete, a signal to the portable controller responsive to detecting the level of charge of the battery reaching the predetermined level of charge of the battery~~;~~

~~transmitting the signal wirelessly to the portable controller; and~~

~~alerting the user that the predetermined level of charge of the battery has been reached responsive to transmitting the signal wirelessly to the portable controller~~.

16. (Original) The method of claim 15, wherein the signal includes data indicative of the level of charge of the battery.

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17. (Currently Amended) The method of claim 15, wherein wirelessly transmitting the ~~wireless~~ signal comprises wirelessly transmitting the ~~wireless~~ signal from the controller of the vehicular battery charger.

18. (Original) The method of claim 15, wherein alerting the user comprises alerting the user via at least one of a group consisting of an e-mail and a text.

19. (Canceled) ~~The method of claim 15, wherein the predetermined level of charge is a fully-charged level of the battery.~~

20. (Canceled) ~~The method of claim 15, wherein the predetermined level of charge is less than a fully-charged level of the battery.~~

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21. (Currently Amended) A system for charging a battery of a vehicle and for wireless communication with a phone having a controller, the system comprising:

a battery charger having:

an electrical power cord releasably attachable to at least one of the vehicle and a source of power;

~~at least one of a group consisting of~~ a transmitter ~~and a receiver~~;

a battery charger controller electrically coupled to the electrical power cord and to the ~~at least one of the group consisting of the~~ transmitter ~~and the receiver~~, the battery charger controller configured to:

wirelessly communicate with the controller of the phone by sending signals via the ~~at least one of the group consisting of the~~ transmitter ~~and the receiver~~, ~~and to~~

control supply of power to the battery in the course of a charging session as the level of charge of the battery is increased,

receive, via a user-manipulatable control, data indicative of a predetermined threshold level of charge by which the battery charger controller sends an alert, the predetermined threshold level of charge being less than a full charge of the battery;

compare, during charging of the battery with the vehicular battery charger, a level of charge of the battery to the predetermined threshold level of charge; and

~~the battery charger controller~~ responsive to detection of the level of charge of the battery reaching the predetermined[[a]] threshold level of charge ~~of the battery being reached~~ during the charging session and before charging of the battery is complete, send ~~by sending~~ a signal indicative of the level of charge

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being reached via the ~~at least one of the group consisting of the~~ transmitter ~~and the receiver~~ to the controller of the phone as the alert.

22. (Previously Presented) The system of claim 21, wherein the signal indicative of the level of charge being reached is at least one of a group consisting of a text and an e-mail automatically generated to the user.

23. (Previously Presented) The system of claim 21, wherein the battery charger controller is further responsive to signals from the phone to start and stop charging of the battery.

24. (Canceled) ~~The system of claim 21, wherein the threshold level of charge of the battery is a full charge of the battery.~~

25. (Canceled) ~~The system of claim 21, wherein the threshold level of charge of the battery is a level of charge lower than a full charge of the battery.~~

26. (Previously Presented) The system of claim 21, wherein the battery charger is releasably attachable to the vehicle and the source of power, and is portable as a single unit.

27. (Withdrawn) The system of claim 21, wherein the battery charger controller is further responsive to detection of interruption of power to the battery by sending another signal indicative of the interruption via the at least one of the group consisting of the transmitter and the receiver to the controller of the phone.

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REMARKS

Prior to the filing of this Response, Claims 8-26 were pending with Claims 1-7 being previously canceled and Claim 27 being withdrawn by the Examiner in the Office action dated March 15, 2021 (the "Office Action"). In the present response, Applicant has amended Claims 8, 10, 12, 15, 17, and 21 and canceled Claims 13, 14, 19, 20, 24, and 25. Thus, Claims 8-12, 15-18, 21-23, and 26 remain pending. Applicant respectfully requests reconsideration of the pending claims based on the amendments and arguments contained herein.

I. Specification Objection

In the Office Action, the Examiner objects to the specification because the Examiner asserts that a more descriptive title is needed. Applicant has amended the title in the present application as requested by the Examiner (see page 2 of this paper). Thus, this objection should be withdrawn.

II. Drawing Objection

In the Office Action, the Examiner objects to drawings as failing to show the "phone" or "to the controller of the phone" as recited in Claim 21.

The present response includes an amended version of FIG. 15 including the addition of an "OTHER CONTROLLER." Support for this addition can be found in at least Paragraph [0062] of the present application (reproduced below, emphasis added):

> [0062] With reference now to FIG. 15, in some embodiments, the vehicle charging cord 22 has a controller 44 located within the housing 28 and at least partially controlling operations of the vehicle charging cord 22. The controller 44 in the illustrated embodiment of FIGS. 2, 5-11 and 15 is a programmable processor of any suitable type, but in some embodiments can take other forms such as non-programmable processor, a system of discrete logic elements, and any combination thereof. The illustrated vehicle charging cord 22 also has a transceiver 46 coupled to the controller 44, ***enabling the controller 44 to communicate with another controller. The other controller can be one or more processors of a personal computer, phone, PDA, or other processor-based device associated with a user of the vehicle charging cord 22***, one or more processors of a server or other computer associated with a power utility providing power to the vehicle charging cord 22,

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> and the like). In the illustrated embodiment of FIGS. 2, 5-11 and 15, the other controller is a remote computer of a power utility 48, and is indicated at 50. The controller 50 of the power utility 48 is coupled to a power utility transceiver 52 to enable the power utility 48 to communicate with the controller 44 of the vehicle charging cord 22.

In addition, Paragraph [0068] of the present application (reproduced below, emphasis added) describes how the controller 44 of the vehicle charging cord 22 can communicate with a user's computer (i.e., the "other computer" as described in Paragraph [0062]) in addition to communicating with the controller 50 of the power utility 48 via any combination of wired or wireless communication.

> [0068] ***In some embodiments, the controller 44 of the vehicle charging cord 22 communicates with a user's computer rather than, or in addition to, communicating with the controller 50 of the power utility 48. This communication can be any combination of wired or wireless communication.*** For example, a residence-based, office-based, or other facility-based PLC system can be used to communicate between the controller 44 of the charging cord 22 and a user's computer (via the electrical system of the residence, office, or other facility). In other embodiments, the vehicle charging cord 22 can have a wireless processor adapted for communication with a user's computer. Such communication can be through any suitable wireless personal area network (WPAN) (using, for example, ZigBee™, Bluetooth™, or any other WPAN wireless technology), wireless local area network (WLAN), and the like. Like the PLC communication described above, communication between the controller 50 of the power utility 48 and the user's computer can be established automatically upon plugging in the first end 24 of the vehicle charging cord 22, when the vehicle charging cord 22 is turned on, or when a user enters an appropriate command to establish this communication (described in greater detail below).

Thus, with this amendment to FIG. 15, the figures illustrate an "other controller," which, as described in the present application (see, e.g., Paragraph [0062]), can be included in a "phone." Accordingly, FIG. 15, as amended, clearly shows "the controller of the phone" as recited in Claim 21. Also, as FIG. 15 already illustrates that the controller 44 communicates with a transceiver 46 and given the communication described in the present application via the transceiver 46 between the controller 44 and other controllers (including the "other controller"), FIG. 15, as amended, clearly shows communication "to the controller of the phone" as recited in Claim 21.

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Accordingly, Applicant requests that this objection be withdrawn. Applicant also requests that the Examiner contact the below attorney of record should Examiner believe that this drawing objection has not been properly addressed in the present response.

III. Claim Rejections – 35 U.S.C. § 112

In the Office Action, the Examiner rejects Claim 10 under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicant has amended Claim 10 in the present response to address this rejection. Accordingly, this rejection should be withdrawn.

IV. Claim Rejections – 35 U.S.C. § 103

a. Claims 8-10, 13-17, 19-21, and 24-25

In the Office Action, the Examiner rejects Claims 8-10, 13-17, 19-21, and 24-25 under 35 U.S.C. § 103 as being unpatentable over U.S. Published Application No. 2008/0007202 ("Pryor") in view of U.S. Published Application No. 2011/0266996 ("Sugano").

Without conceding the appropriateness of the current rejection of Claim 8, to advance prosecution Applicant has amended Claim 8 in the present response to recite:

> 8. A system for charging a battery of a vehicle, the system comprising:
>
> a battery charger having:
>
> an electrical power cord releasably attachable to at least one of the vehicle and a source of power;
>
> a transmitter;
>
> a controller electrically coupled to the electrical power cord and to the transmitter, the controller configured to:
>
> receive, via a user-manipulatable control, data indicative of a predetermined threshold level of charge by which the controller sends an alert, the predetermined threshold level of charge being less than a full charge of the battery,

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compare, during charging of the battery with the battery charger, a level of charge of the battery to the predetermined threshold level of charge, and

responsive to the level of charge of the battery reaching the predetermined threshold level of charge of the battery, send, before the charging of the battery is complete, the at least one signal as the alert via the transmitter, the at least one signal indicative of the predetermined threshold level of charge of the battery; and

a portable controller remote from the vehicle and battery charger, the portable controller configured to wirelessly communicate with the controller of the battery charger via the transmitter;

wherein the portable controller generates a notification to a user indicating the predetermined threshold level of charge of the battery following and as the result of receiving the at least one signal indicative of the predetermined threshold level of charge of the battery.

Support for the amendments to Claim 8 can be found throughout the application, such as, for example, in Paragraphs [0099] and [0105]. Pryor and Sugano fail to teach or suggest allowing a user to input any data indicative of a threshold level of charge that is used by a battery charger controller to control when a signal is sent to portable controller (e.g., a user's phone) that triggers generation of a notification to a user. As acknowledged by the Examiner, Pryor fails to teach or suggest a portable controller that generates a notification to a user indicating a threshold level of charge (*Office Action*, p. 5). The Examiner, however, asserts that Sugano solves this deficiency of Pryor.

Sugano discloses a charge completion alarm 75 that notifies a driver when a power storing means has been "fully charged" (see, e.g., Paragraph [0095]). Sugano, however, makes no mention whatsoever of receiving any type of data indicative of a threshold level of charge from a user, or using such a user-input information to control when the charge completion alarm 75 is triggered. Rather, the charge completion alarm 75 in Sugano is statically configured to only generate an alarm when a full charge has been reached.

Furthermore, as explicitly recited in amended Claim 8, the predetermined threshold level of charge is ***less than a full charge***, and the signal (which triggers the notification) is ***sent before charging is complete***. Accordingly, this claim language in Claim 8 is contrary to the notification

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disclosed in Sugano, which is generated when a battery is fully charged and, hence, charging is complete.

Applicant further notes that even assuming for the sake of argument that Pryor discloses allowing a user to specify a defined charge as a charge completion setup, this user input only triggers when charging stops, and fails to teach or suggest triggering any type of alert or notification to the user during charging as explicitly recited in amended Claim 8.

Accordingly, for at least the above reasons, Pryor and Sugano, taken individually or in combination, fail to teach or suggest the subject matter of Claim 8. Thus, Claim 8 and the claims that depend from Claim 8 are allowable. Independent Claims 15 and 21, as amended, recite similar subject matter as Claim 8. Therefore, Claims 15 and 21 and the claims that depend from these are also allowable for at least the reasons as Claim 8.

b. Claims 11-12, 18, and 22-23

In the Office Action, the Examiner also rejects Claims 11-12, 18, and 22-23 under 35 U.S.C. § 103 as being unpatentable over Pryor and Sugano and further in view of U.S. Published Application No. 2009/0139781 ("Straubel").

Claims 11-12 depend from Claim 8, Claim 18 depends from Claim 15, and Claims 22-23 depend from Claim 21. Thus, Claims 11-12, 18, and 22-23 are allowable for at least the reasons set forth above with respect to Claim 8. In addition, Straubel fails to solve the deficiencies of Pryor and Sugano set forth above. Although Straubel discloses that a user can query a vehicle for battery information, or the user can be informed when the battery reaches a full charge (see, e.g., Paragraph [0320]), Straubel makes no mention whatsoever of allowing a user to input data indicative of a predetermined threshold charge level that is used by the controller to control when a signal is transmitted to a portable controller as recited in the independent claims.

Accordingly, Claims 11-12, 18, and 22-23 are allowable for at least these reasons.

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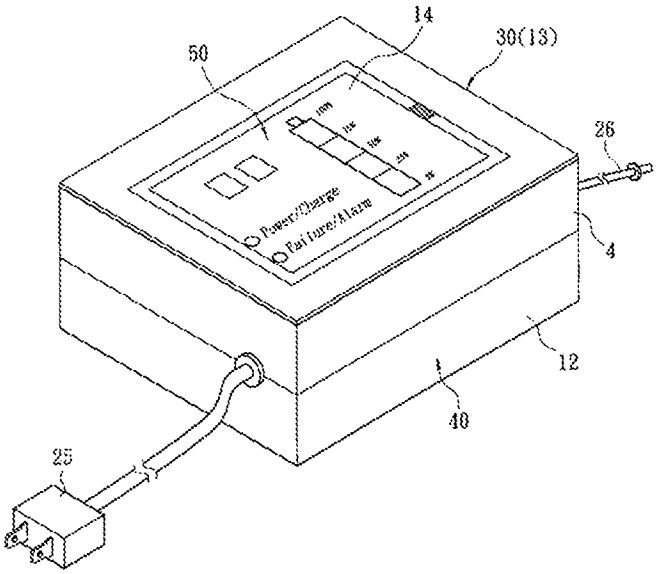
c. Claim 26

In the Office Action, the Examiner also rejects Claim 26 under 35 U.S.C. § 103 as being unpatentable over Pryor and Sugano and further in view of U.S. Published Application No. 2008/0054845 ("Wang").

Claim 26 depends from Claim 21 and, therefore, is allowable for at least the reasons set forth above. In addition, Wang fails to solve the deficiencies of Pryor and Sugano set forth above. In fact, Wang makes no mention whatsoever of receiving any type of input from a user regarding data representative of a threshold level of charge, and makes no mention whatsoever of transmitting signals to any type of portable controller for any purpose, let alone to notify a user when the user-selected threshold level of charge has been reached.

Furthermore, Wang fails to teach or suggest the subject matter of Claim 26. Claim 26 recites, "wherein the battery charger is releasably attachable to the vehicle and the source of power, and is portable as a single unit." In rejecting Claim 26, the Examiner asserts that FIG. 1 of Wang "teaches a battery charger that is releasably attachable to a vehicle and a source of power, and a portable as a single unit" (*Office Action*, p. 7). As illustrated in FIG. 1 of Wang (reproduced below), even if the power input cord 25 of the battery charger 40 is illustrated as including a plug for an outlet, this at most implies that the battery charger 40 is releasably attachable to a source of power. However, Claim 26 explicitly states that the battery charger is releasably attachable to ***a vehicle*** and is portable as a single unit. Wang makes no mention whatsoever of how the charge output cord 26 is connected to a battery or an object including a battery, and fails to show any type of plug or other "releasably attachable" element associated with this cord 26. Accordingly, contrary to the Examiner's assertion, the battery charger 40 illustrated in FIG. 1 of Wang is not releasably attachable to a battery nor is the battery charger 40 portable as a single unit.

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Accordingly, Claim 26 is allowable for at least the above additional reasons.

d. Claim 27

In the Office Action, the Examiner also rejects Claim 27 under 35 U.S.C. § 103 as being unpatentable over Pryor and Sugano and further in view of U.S. Published Application No. 2010/0228405 ("Morgal"). Claim 27 appears to have been withdrawn by the Examiner in the Office Action, so argument regarding claim 27 is deferred until (and if) claim 27 is again rejoined for examination with the other claims of this application. Clarification of this rejection from the Examiner is therefore welcome.

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V. Conclusion

In light of the above, Applicant believes that the application is in condition for allowance and respectfully requests that the Examiner issue a timely Notice of Allowance. Applicant also requests that the Examiner telephone the attorneys of record in the event a telephone discussion would be helpful in advancing the prosecution of the present application.

Respectfully submitted,

/molly s. lawson/

Molly S. Lawson
Reg. No. 58,890

MICHAEL BEST & FRIEDRICH LLP
790 N. Water Street, Suite 2500
Milwaukee, WI 53202
414-225-8266 Direct
414-271-6560 Main
414-277-0656 Facsimile

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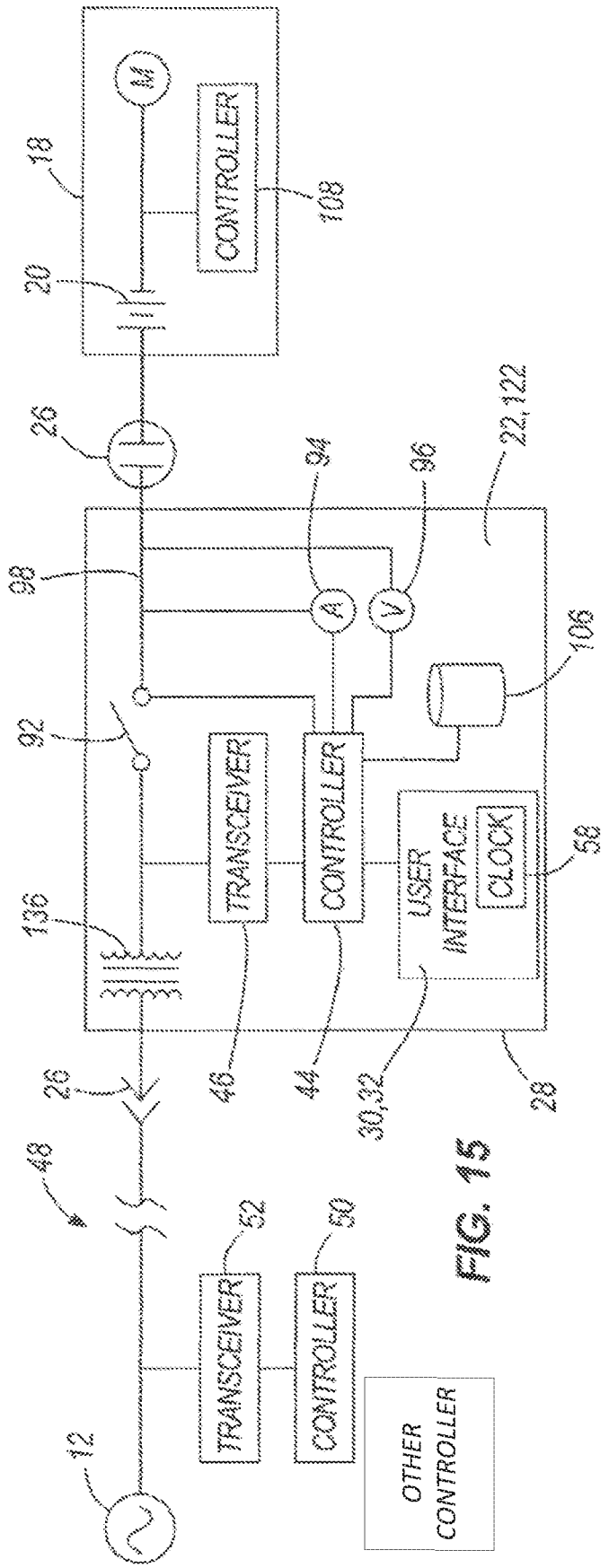

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USER INTERFACE
CLOCK
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30,32
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OTHER CONTROLLER
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FIG. 15

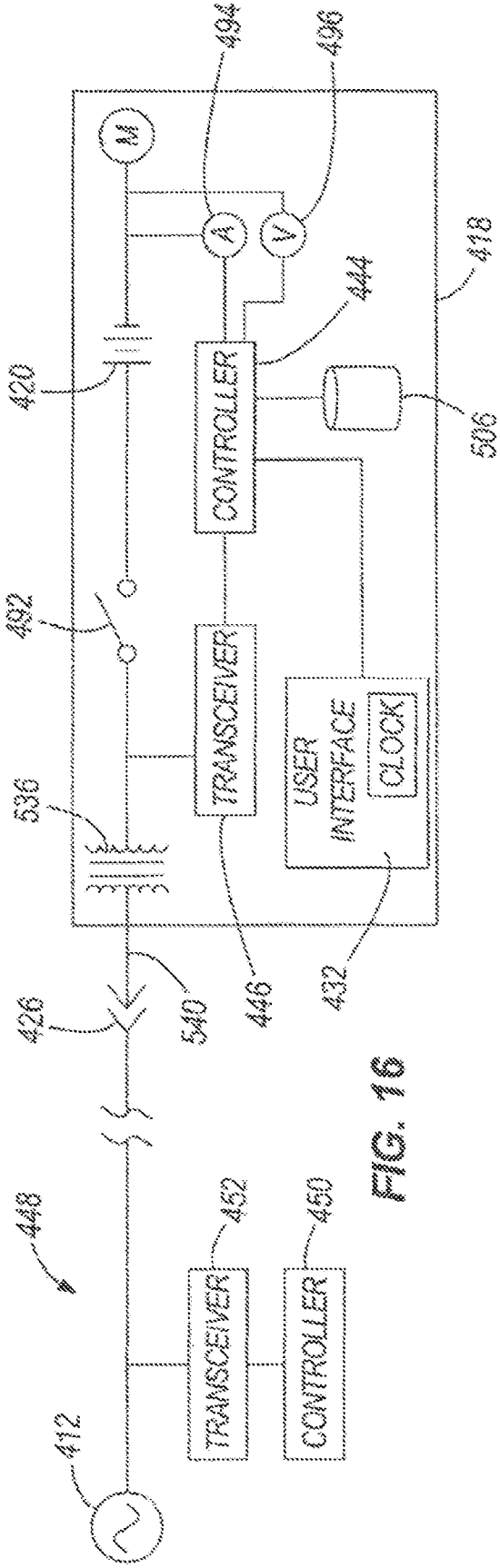

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FIG. 16

Electronic Acknowledgement Receipt

EFS ID:	42996236
Application Number:	16249037
International Application Number:	
Confirmation Number:	4725
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD
First Named Inventor/Applicant Name:	Christopher B. Austin
Correspondence Address:	Christopher B. Austin - 935 17th Avenue - Grafton WI 53024 US 414.331.0988 cbaustin@michaelbest.com
Filer:	Molly S. Lawson/Dorothy Hauser
Filer Authorized By:	Molly S. Lawson
Attorney Docket Number:	013350-9003-US20
Receipt Date:	15-JUN-2021
Filing Date:	16-JAN-2019
Time Stamp:	19:23:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		013350-9003-US20_As_Filed_Response.pdf	620678 ee24b5762816c928b5f1ee32eb5750320c969979	yes	18

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Drawings-only black and white line drawings	2	2
Specification	3	3
Claims	4	9
Applicant Arguments/Remarks Made in an Amendment	10	17
Drawings-only black and white line drawings	18	18

Warnings:	
Information:	
Total Files Size (in bytes):	620678

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 07/19/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

EXAMINER
PELTON, NATHANIEL R

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 07/19/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

TITLE OF INVENTION: VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	10/19/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7590 07/19/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

TITLE OF INVENTION: VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	10/19/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
PELTON, NATHANIEL R	2859	320-109000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

7590 07/19/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

EXAMINER	
PELTON, NATHANIEL R	
ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 07/19/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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Notice Requiring Inventor's Oath or Declaration	Application No. 16/249,037	Applicant(s) Christopher B. Austin	
	Examiner PELTON, NATHANIEL R	Art Unit 2859	

This notice is an attachment to the Notice of Allowability (PTOL-37), or the Notice of Allowability For A Design Application (PTOL-37D).

An inventor's oath or declaration in compliance with 37 CFR 1.63 or 1.64 executed by or with respect to each inventor has not yet been submitted.

An oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each inventor (for any inventor for which a compliant oath, declaration, or substitute statement has not yet been submitted) MUST be filed no later than the date on which the issue fee is paid. See 35 U.S.C. 115(f). Failure to timely comply will result in ABANDONMENT of this application.

A properly executed inventor's oath to declaration has not been received for the following inventor(s):

If applicant previously filed one or more oaths, declarations, or substitute statements, applicant may have received an informational notice regarding deficiencies therein.

The following deficiencies are noted:

INFORMAL ACTION PROBLEMS

A new inventor's oath or declaration that identifies this application (e.g., by Application Number and filing date) is required. The inventor's oath or declaration does not comply with 37 CFR 1.63 in that it:

- does not state that the above-identified application was made or authorized to be made by the person executing the oath or declaration: **Christopher B. Austin**.

Questions relating to this Notice should be directed to the Application Assistance Unit at 571-272-4200.

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Tesla EX1002 Page 194

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IPR2026-00378
Tesla EX1002 Page 195

Notice of Allowability	Application No. 16/249,037	Applicant(s) Austin, Christopher B.	
	Examiner NATHANIEL R PELTON	Art Unit 2859	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to amendment filed on 06/15/2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. 20210713.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☑ Other see detailed action.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Continuation of 3. The allowed claim(s) is/are: 8-12,15-18,21-23 and 26-27

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Specification

Acknowledgment is made of the amendment to the title of the invention, as the new title is reflective of the claimed material the previous objection has been withdrawn.

Response to Amendment

Acknowledgment is made of the amendment filed on 06/15/2021 in which claims 8, 10, 12, 15, 17, and 21 were amended, claims 13-14, 19-20, and 24-25 canceled, with claim 27 previously withdrawn (note as the base claim is now allowed as detailed below claim 27 is rejoined). Therefore claims 8-12, 15-18, 21-23 and 26-27 are pending for examination below.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Molly Lawson on 07/14/2021.

The claim set filed on 06/15/2021 is amended as follows:

In claim 8, line 17, replace "the at least one signal" with –at least one signal--.

Allowable Subject Matter

Claims 8-12, 15-18, 21-23, and 26-27 are allowed.

The following is an examiner's statement of reasons for allowance:

With respect to claims 8, 15, and 21, the prior art of record does not suggest or disclose the claimed combination of elements or steps as recited, most particularly the claimed, "receive, via a user-manipulatable control, data indicative of a predetermined threshold level of charge by which the controller sends an alert, the predetermined threshold level of charge being less than a full charge of the battery, compare, during charging of the battery with the battery charger, a level of charge of the battery to the predetermined threshold level of charge, and responsive to the level of charge of the battery reaching the predetermined threshold level of charge of the battery, send, before the charging of the battery is complete, at least one signal as the alert via the transmitter, the at least one signal indicative of the predetermined threshold level of charge of the battery; and a portable controller remote from the vehicle and battery charger, the portable controller configured to wirelessly communicate with the controller of the battery charger via the transmitter; wherein the portable controller generates a notification to a user indicating the predetermined threshold level of charge of the battery following and as the result of receiving the at least one signal indicative of the predetermined threshold level of charge of the battery."

Claims 9-12, 16-18, 22-23, and 26-27 depend from the claim above and are allowed for the same reasons.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHANIEL R PELTON whose telephone number is (571)270-1761. The examiner can normally be reached on M-F 9am to 5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricardo Isla can be reached on 571-272-5056. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Examiner-Initiated Interview Summary	**Application No.** 16/249,037	**Applicant(s)** Austin, Christopher B.		
	Examiner NATHANIEL R PELTON	**Art Unit** 2859	**AIA (First Inventor to File) Status** No	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
NATHANIEL R PELTON	Primary Examiner	Telephonic
MOLLY LAWSON	Attorney	

Date of Interview: 14 July 2021

Issues Discussed:

35 U.S.C. 112

Examiner pointed out a 112 antecedent basis issue with claim 8. Applicant approved the proposed change via Examiner's amendment. The detailed action details the proposed change.

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

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Tesla EX1002 Page 201

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M 10/44	03/12/2021	nrp
B60L 53/68,126,14,305,18,38,63	03/12/2021	nrp
G01R 31/371	03/12/2021	nrp
H02J 7/0042,0047	03/12/2021	nrp
H01M 10/44	07/14/2021	nrp
B60L 53/68,126,14,305,18,38,63	07/14/2021	nrp
G01R 31/371	07/14/2021	nrp
H02J 7/0042,0047	07/14/2021	nrp

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
320	109	03/12/2021	nrp
320	109	07/14/2021	nrp

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

Search Notes		
Search Notes	**Date**	**Examiner**
performed inventor and assignee searches	03/12/2021	nrp
requested PLUS search on spec and claims	03/12/2021	nrp
text searched for key concepts	03/12/2021	nrp
updated East search (see attached)	07/14/2021	nrp

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	((charg$5 or recharg$5)(batter$3 or cell or accumulator or storage)(cord or plug or connector)(vehicle or car or auto or automobile)(data or information)(level or limit or threshold or percentage)(voltage or soc or (state adj2 charge))).clm.	07/14/2021	nrp

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

CPC						
Symbol					**Type**	**Version**
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B60L	/	53	/	18	I	2019-02-01
B60L	/	53	/	305	I	2019-02-01
B60L	/	53	/	68	I	2019-02-01
B60L	/	53	/	126	I	2019-02-01
G01R	/	31	/	371	A	2019-01-01
H02J	/	7	/	0042	A	2013-01-01
H02J	/	7	/	0047	A	2013-01-01
Y02T	/	90	/	14	A	2013-01-01
Y02T	/	90	/	16	A	2013-01-01
Y04S	/	10	/	126	A	2013-01-01
Y02E	/	60	/	00	A	2013-01-01
Y02T	/	10	/	70	A	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	14	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	13 July 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office

Part of Paper No.: 20210713

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H01M	/	10	/	44	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
320	109

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	14	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	13 July 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office

Part of Paper No.: 20210713

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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-	2	4	11	-	20										
-	3	5	12	10	21										
-	4	-	13	11	22										
-	5	-	14	12	23										
-	6	6	15	-	24										
-	7	7	16	-	25										
1	8	8	17	13	26										
2	9	9	18	14	27										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	14	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	13 July 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	NATHANIEL R PELTON	2859

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
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EAST Search History

EAST Search History (Prior Art)

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S41	6,455	(g01r19/0084.cpc. or h04b5/0037.cpc. or h04b5/0081.cpc.) and @ad<"20120321"	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2016/04/27 20:26

			JPO; DERWENT; IBM_TDB			
S42	33	S41 and ((first and second) near5 regulat$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/27 20:26
S43	127	S41 and ((first and second) near5 (regulat$3 or convert$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/27 20:27
S44	265	S39 and ((first and second) near5 (regulat$3 or convert$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/27 20:27
S45	368	S43 or S44	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/27 20:27
S46	1	"US 20110175569"	US-PGPUB; USPAT; USOCR	OR	OFF	2016/08/09 16:11
S47	29,042	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:17
S48	8,357	S47 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:19

S49	16	S48 and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:22
S50	5	"5548200".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:23
S51	1	"5548200".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2016/08/09 16:23
S52	1	"20090243549".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/08/09 16:32
S53	10	S48 and (overrid$3 with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:35
S54	51	"320".clas. and (overrid$3 with (below or lower or less)) and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:39
S55	2	"20020079868".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 17:33
S56	38,844	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21

S57	9,252	S56 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21
S58	363	S57 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21
S59	3	"8772970".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/15 13:19
S60	1	"8772970".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/15 13:20
S61	3	"6963186".pn. or "20090243549".pn. or "5548200".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/16 09:33
S62	1	"20020079868".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/16 09:48
S63	38,868	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/16 10:53
S64	9,253	S63 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/16 10:53
S65	10	S64 and (overrid$3 with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/04/16 10:53

			DERWENT; IBM_TDB			
S66	41,747	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:39
S67	9,450	S66 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:39
S68	0	S67 and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (start$4 or initiat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:42
S69	8	("320".clas. or h02j7/$$.cpc. or b60l11/$$.cpc.) and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (start$4 or initiat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:43
S70	83	S67 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:59
S71	2	"20040164711".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 11:53
S72	1	"20040164711".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:53

S73	171	"320".clas. and (decrypt$3)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:56
S74	5	"320".clas. and (decrypt$3 with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:57
S75	1	"20100076825".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:00
S76	2,222	(decrypt$3 with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:04
S77	1,513	S76 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:04
S78	1,216	((decrypt$3 near5 key) with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:05
S79	856	S78 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:05
S80	82	((decrypt$3 near5 key) with (manufacturer or supplier) with server)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:07
S81	47	S80 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:07
S82	242	((decrypt$3 near5 key) with (manufacturer or supplier) with request$3)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:13
S83	131	S82 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:13
S84	11,740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S85	2,157	S84 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S86	293	S85 and (tim$3 near5 (end$3 or complet$4 or finish$3))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S87	50,398	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2018/10/02 13:43

			DERWENT; IBM_TDB			
S88	9,772	S87 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/02 13:43
S89	372	S88 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/02 13:43
S90	1,291	((decrypt$3 near5 key) with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 17:10
S91	2,233	dunn.xa.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S92	1,675	S91 and @ad<"20080101"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S93	1,401	S91 and @ad<"20040101"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S95	2,033	320/109.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/03 17:09
S96	53,838	h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/088.cpc. or h01m10/44.cpc. or b60l11/1824.cpc. or 320/109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/03 17:09
S97	1,324	(S95 or S96) and (vehicle with (charg$5 or recharg$5) with control$4 with transmit$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/03 17:09
S98	11,740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44

S99	2,157	S98 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44
S100	293	S99 and (tim$3 near5 (end$3 or complet$4 or finish$3))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44
S101	2	"20110175569".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/13 14:00
S102	1	"20110175569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:00
S103	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:48
S104	11,629	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:49
S105	4,808	h01m10/44.cpc. or g01r31/3689.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:50
S106	3,622	(S104 or S105) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:50
S107	194	S106 and (((charg$5 or recharg$5 or re$1charg$5) near5 (cable or cord or plug)) with (vehicle or car or auto or automobile))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:55
S108	40,433	(b60l11/1816 or b60l11/182 or b60l11/1824 or b60l11/1829 or b60l11/1844 or b60l2230/12 or b60l2230/16 or b60l2230/40).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/13 15:36
S109	876	S108 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 15:36
S110	2	"20180375175".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/06/16 15:26

			DERWENT; IBM_TDB			
S111	103,122	h01m10/44.cpc. or 320/109 or b60l53/12,68,14,305,18,30,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/17 14:03
S112	5,602	S111 and ((coil or core or inductiv$3) near5 (position$3 or align$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/17 14:05
S113	262	S112 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/06/17 14:05
S114	6	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$).did.	US-PGPUB	OR	OFF	2020/09/14 08:56
S115	2	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB	OR	OFF	2020/09/14 08:58
S116	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/14 08:58
S117	31,994	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:02
S118	7,985	S117 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:02
S119	39,132	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:03

S120	3,591	S119 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:03
S121	103	(S118 or S120) and ((control$4 or display$3) with (onboard or inside or dash) with (vehicle or car or auto or automobile))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:06
S122	18	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:32
S123	6	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/14 09:32
S124	93	(S118 or S120) and ((delay$4 near3 (tim$3 or period)) with (charg$5 or recharg$5))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:33
S125	27	(S118 or S120) and ((input$4 or user) with (time near2 day))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:54
S126	2	"20180375175".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 10:33
S127	192	(US-16056043-$ | US-3603860-$ | US-3624723-$ | US-3673379-$ | US-3740896-$ | US-3870855-$ | US-3898547-$ | US-3900784-$ | US-	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2020/09/14 12:25

		3911284-$ | US-4012681-$ | US-4146825-$ | US-4218644-$ | US-4229687-$ | US-4252217-$ | US-4258305-$ | US-4282475-$ | US-4286911-$ | US-4355275-$ | US-4454926-$ | US-4508090-$ | US-4819139-$ | US-4829223-$ | US-4983904-$ | US-5194799-$ | US-5220268-$ | US-5229703-$ | US-5283470-$ | US-5285963-$ | US-5289103-$ | US-5323099-$ | US-5337237-$ | US-5349535-$ | US-5351283-$ | US-5359308-$ | US-5418437-$ | US-5421427-$ | US-5422822-$ | US-5434494-$ | US-5437939-$ | US-5441123-$ | US-5452983-$ | US-5454767-$ | US-5506489-$ | US-5524726-$ | US-5528234-$ | US-5539296-$ | US-5556284-$ | US-5577920-$ | US-5581171-$ | US-5596258-$ | US-5602459-$ | US-5623194-$ | US-5645279-$ | US-5646507-$ | US-5647450-$ | US-5656916-$ | US-5659240-$ | US-5668460-$ | US-5686812-$ | US-5703464-$ | US-5713426-$ | US-5730237-$ | US-5736831-$ | US-5760569-$ | US-5778329-$ | US-5816643-$ | US-5844384-$ | US-5853058-$ | US-5881559-$ | US-5890555-$ | US-5896022-$ | US-5903134-$ | US-5910714-$ | US-5921708-$ | US-5926004-$ | US-5937831-$ | US-5951229-$ | US-5952813-$ | US-5966285-$ | US-5967115-$ | US-5977744-$ | US-6021862-$ | US-6037746-$ | US-6087805-$ | US-6087806-$ | US-6104160-$ | US-6114833-$ | US-6154005-$ | US-6160374-$ | US-6184656-$ | US-6220538-$ | US-6232743-$ | US-6243644-$ | US-6267190-$ | US-6316908-$ | US-6320358-$ | US-6345772-$ | US-6357244-$ | US-6362594-$ | US-6426606-$ | US-RE36225-$).DID.	JPO; DERWENT; IBM_TDB			
S128	194	(US-16056043-$ | US-4245640-$ | US-4320333-$ | US-4380725-$ | US-4389608-$ | US-4402524-$ | US-4430569-$ | US-4446680-$ | US-4449049-$ | US-4468605-$ | US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/09/14 12:25

		4591778-$ | US-4602204-$ | US-4616169-$ | US-4774449-$ | US-4873160-$ | US-4956563-$ | US-4990099-$ | US-5194799-$ | US-5204611-$ | US-5206577-$ | US-5219034-$ | US-5229703-$ | US-5237257-$ | US-5287052-$ | US-5350993-$ | US-5371456-$ | US-5397991-$ | US-5402056-$ | US-5408170-$ | US-5422558-$ | US-5422560-$ | US-5444352-$ | US-5446364-$ | US-5455637-$ | US-5455638-$ | US-5465038-$ | US-5469043-$ | US-5506646-$ | US-5510694-$ | US-5528148-$ | US-5536979-$ | US-5537023-$ | US-5548200-$ | US-5557190-$ | US-5565756-$ | US-5583416-$ | US-5589757-$ | US-5600225-$ | US-5602459-$ | US-5605769-$ | US-5606851-$ | US-5610499-$ | US-5619845-$ | US-5631536-$ | US-5633574-$ | US-5642031-$ | US-5644210-$ | US-5656920-$ | US-5668462-$ | US-5670861-$ | US-5670863-$ | US-5672952-$ | US-5701069-$ | US-5703471-$ | US-5710502-$ | US-5710506-$ | US-5739673-$ | US-5773962-$ | US-5776119-$ | US-5783927-$ | US-5793185-$ | US-5801512-$ | US-5801515-$ | US-5811958-$ | US-5812382-$ | US-5835185-$ | US-5847912-$ | US-5850134-$ | US-5867008-$ | US-5895440-$ | US-5900720-$ | US-5903764-$ | US-5963012-$ | US-6016047-$ | US-6018227-$ | US-6043625-$ | US-6060185-$ | US-6060865-$ | US-6066938-$ | US-6075341-$ | US-6118250-$ | US-6118254-$ | US-6133766-$ | US-6160376-$ | US-6160378-$ | US-6163086-$ | US-6184650-$ | US-6184660-$ | US-7876068-$ | US-RE36225-$).DID.	DERWENT; IBM_TDB			
S129	1	"20190148794".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:25
S130	11,666	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:36

S131	20,499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:37
S132	4,231	(S130 or S131) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:38
S133	4	"20080007202".pn. or "7243746".pn. or "5548200".pn. or "20080103370".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:03
S134	10	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did.	US-PGPUB	OR	OFF	2020/09/29 10:07
S135	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:08
S136	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$).did.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:08
S137	1	"6983186".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:09
S138	1	"6963186".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:10
S139	13	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:10
S140	1	"20080052145".pn.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:15

S141	14	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:17
S142	410	S132 and ((cost or price) near5 (power or energy))	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:40
S143	236	S132 and ((display$3 or indicat$3 or led) near5 (connect$3 or coupl$3) near5 (power or energy or cable or plug))	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:32
S144	1	"20080103370".pn.	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:45
S145	1,551	(((data or information) near5 (progress)) with (indicator))	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:49
S146	437	S145 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 11:50
S147	1	"20190148785".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 14:42
S148	15	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 14:49
S149	11,666	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S150	20,499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S151	4,231	(S149 or S150) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S152	4	S151 and ((controller or display) near3 (on or within or built$1in) with (cord or cable or plug))	US-PGPUB; USPAT	OR	OFF	2020/09/29 15:58

S153	1,716	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	US-PGPUB; USPAT	OR	OFF	2020/09/29 16:06
S154	219	S153 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 16:07
S155	1	"20070164704".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 08:48
S156	1	"10090567".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 08:57
S157	2,049	((charg$5 or recharg$5) adj4 (cable or plug)) with (display or transmit$4 or reciev$3)	US-PGPUB; USPAT	OR	OFF	2020/09/30 09:03
S158	2,290	((charg$5 or recharg$5) adj4 (cable or plug or cord)) with (display or transmit$4 or reciev$3)	US-PGPUB; USPAT	OR	OFF	2020/09/30 09:03
S159	328	S158 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/09/30 09:03
S160	2	"20160294427".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2020/09/30 14:27
S161	1	"20160294427".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 14:27
S162	1	"20200185933".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 09:48
S163	3	"20120130556".pn. or "20140088781".pn. or "20170110894".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:06
S164	1	"20160380440".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:15
S165	1	"20200238847".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:33
S166	2	"20180191176".pn. or "20160141896".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:00
S167	1	"20200278936".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:30

S168	1	"20050029867".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:37
S169	1	"20190270391".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:41
S170	2	"20110050173".pn. or "9352635".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/05 09:02
S171	1	"20190148792".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/05 09:25
S172	133	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 09:00
S173	32,481	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S174	7,999	S173 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S175	39,828	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S176	3,602	S175 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S177	444	(S174 or S176) and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/11/30 09:10

			DERWENT; IBM_TDB			
S178	17,859	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 10:45
S179	2,346	S178 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 10:45
S180	450	S179 and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/30 10:45
S182	2	"20180257495".pn. or "20180138731".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/01 11:40
S183	1	"20140055088".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/02 10:13
S184	3	"20150054460".pn. or "20180229616".pn. or "20120153874".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/02 10:53
S185	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	US-PGPUB; USPAT	OR	OFF	2020/12/02 11:12
S186	4	"20180257495".pn. or "20180138731".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/02 11:24
S187	139	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2021/03/11 14:31
S188	33,922	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT;	OR	OFF	2021/03/11 16:00

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S189	8,013	S188 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
S190	41,855	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
S191	3,631	S190 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
S192	445	(S189 or S191) and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/03/11 16:00
S193	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	US-PGPUB; USPAT	OR	OFF	2021/03/11 16:01
S194	1	"20090139781".pn.	US-PGPUB; USPAT	OR	OFF	2021/03/12 08:21
S195	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-	US-PGPUB; USPAT	OR	OFF	2021/03/12 13:20

		$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.				
S196	9	S195 and interrupt$3	US-PGPUB; USPAT	OR	OFF	2021/03/12 13:20
S197	33,922	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S198	8,013	S197 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S199	41,855	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S200	3,631	S199 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S201	283	(S198 or S200) and ((signal$3 or communicat$3 or send$3) with ((interrupt$3 or stop$4 or halt$3 or fault$3) near3 (power or energy or charg$3 or recharg$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/03/12 13:29
S202	1,792	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:19

S203	0	S202 and g01r31/371	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:19
S204	5	S202 and g01r31/371.cpc.	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:23
S205	2,017	((charg$5 or recharg$5) near3 (cable or plug)) with (send$3 or transmit$4)	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:23
S206	4	S205 and g01r31/371.cpc.	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:26
S207	4	"20200244075".pn. or "20070188134".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2021/03/15 11:59
S208	4	"20160344070".pn. or "20140055092".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2021/03/15 13:37
S209	2	"20160344070".pn. or "20140055092".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2021/03/15 13:37
S210	2	"20150326031".pn. or "20180048162".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2021/03/15 14:20
S211	1	"9260025".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2021/03/16 08:02
S212	34,769	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35
S213	8,015	S212 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35
S214	43,109	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35

S215	3,644	S214 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35
S216	115	(S213 or S215) and ((indicat$3 or send$3 or notify$3 or transmit$4) with ((level or threshold or limit) near (soc or (state adj2 charge) or voltage)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 13:35
S217	6,462	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((indicat$3 or send$3 or notify$3 or transmit$4) with ((level or threshold or limit) near (soc or (state adj2 charge) or voltage)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 14:11
S218	1,360	S217 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2021/07/13 14:12
S219	7	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((send$3 or notify$3 or transmit$4) with ((percentage or percent) near (soc or (state adj2 charge) or voltage)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 16:16
S220	49	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((send$3 or notify$3 or transmit$4) with ((percentage or percent) near (soc or (state adj2 charge) or voltage or charge)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 16:17
S221	59,036	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((send$3 or notify$3 or transmit$4 or communicat$3) with ((soc or (state adj2 charge) or voltage or charge)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/14 08:36
S222	6,159	S221 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2021/07/14 08:36

S223	2,620	S222 and ((level or threshold or limit) near (soc or (state adj2 charge) or voltage))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/14 08:37

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S224	295	((charg$5 or recharg$5)(batter$3 or cell or accumulator or storage)(cord or plug or connector)(vehicle or car or auto or automobile)(data or information)(level or limit or threshold or percentage)(voltage or soc or (state adj2 charge))).clm.	US-PGPUB; USPAT	AND	ON	2021/07/14 15:40

7/14/2021 3:53:00 PM
C:\Users\npelton\Documents\EAST\Workspaces\16249037.wsp

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/249,037	01/16/2019	2859	785	013350-9003-US20	20	3

CONFIRMATION NO. 4725

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

CORRECTED FILING RECEIPT

OC000000127153040

Date Mailed: 07/22/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Christopher B. Austin, Grafton, WI;

Applicant(s)

Christopher B. Austin, Grafton, WI;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 16/056,041 08/06/2018 ABN
which is a CON of 12/737,803 02/17/2011 PAT 10090567
which is a 371 of PCT/US09/54174 08/18/2009
which claims benefit of 61/189,353 08/18/2008

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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If Required, Foreign Filing License Granted: 02/06/2019
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/249,037**
Projected Publication Date: Not Applicable
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION

Preliminary Class

320

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Group Art Unit 2859

In re

Patent Application of

Christopher B. Austin

Application No. 16/249,037

Confirmation No. 4725

Filed: January 16, 2019

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD"

Atty. Docket No. 013350-9003-US20

RESPONSE TO NOTICE REQUIRING INVENTOR'S OATH OR DECLARATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

This communication is in response to the Notice Requiring Inventor's Oath or Declaration. This Notice accompanied the Notice of Allowance mailed July 19, 2021.

Submitted herewith is the properly executed Declaration.

No fees are believed due with this communication. However, if fees are owed regarding this communication, please charge or credit any overpayments to Deposit Account No. 13-3080.

Respectfully submitted,

/christopher b. austin/

Christopher B. Austin
Reg. No. 41,592

MICHAEL BEST & FRIEDRICH LLP
790 N. Water Street, Suite 2500
Milwaukee, Wisconsin 53202
Phone: 414-271-6560
Fax: 414-277-0656

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 16/249,037 filed on January 16, 2019.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I have reviewed and understand the contents of the above identified application, including the claims.

I acknowledge the duty to disclose to the United States Patent & Trademark Office all information known to me to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Christopher B. Austin Date (Optional): 8/23/21

Signature: Christopher Austin

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

Electronic Acknowledgement Receipt

EFS ID:	43685587
Application Number:	16249037
International Application Number:	
Confirmation Number:	4725
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Correspondence Address:	CHRISTOPHER B. AUSTIN - 935 17TH AVENUE - GRAFTON WI 53024 US 414.331.0988 cbaustin@michaelbest.com
Filer:	Christopher B. Austin/Dorothy Hauser
Filer Authorized By:	Christopher B. Austin
Attorney Docket Number:	013350-9003-US20
Receipt Date:	03-SEP-2021
Filing Date:	16-JAN-2019
Time Stamp:	16:20:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

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1	Post Allowance Communication - Incoming	013350-9003-US20_As_Filed_Response.pdf	81647 7bc0ba11530d6610914971b9c9519171bdc96f04	no	1
Warnings:					
Information:					
2	Oath or Declaration filed	013350-9003-US20_As_Filed_Declaration.pdf	79281 854f288b3c89ee89c26553892fdd71ff98e26f1d	no	1
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	16249037	Filing Date	2019-01-16	Docket Number (if applicable)	013350-9003-US20	Art Unit	2859
First Named Inventor	Christopher B. Austin			Examiner Name	Nathaniel R. Pelton		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☐ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 133080

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

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Signature of Registered U.S. Patent Practitioner			
Signature	/christopher b. austin/	Date (YYYY-MM-DD)	2021-09-29
Name	Christopher B. Austin	Registration Number	41592

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2008 年3 月6 日 (06.03.2008)

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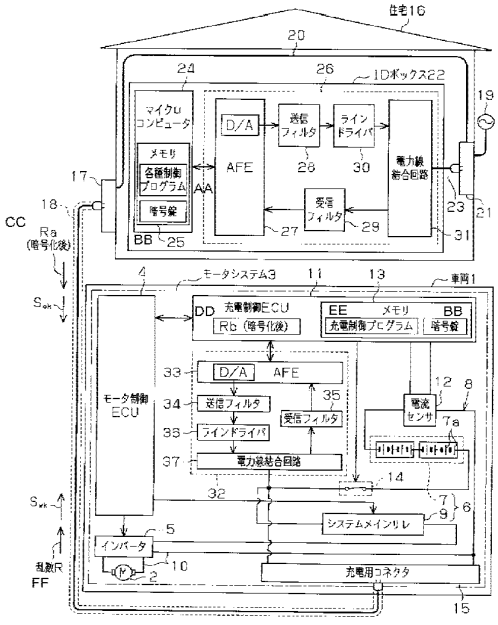
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/続葉有/

(54) **Title:** CHARGING SYSTEM

(54) **発明の名称:** 充電システム



16 DWELLING HOUSE
24 MICROCOMPUTER
25 MEMORY
AA VARIOUS CONTROL PROGRAMS
BB CIPHER LOCK
28 TRANSMISSION FILTER
29 RECEPTION FILTER
30 LINE DRIVER
22 ID BOX
31 POWER LINE COUPLING CIRCUIT
CC Ra (AFTER ENCRYPTION)
3 MOTOR SYSTEM
1 VEHICLE
4 MOTOR CONTROL ECU
11 CHARGE CONTROL ECU
DD Rb (AFTER ENCRYPTION)
13 MEMORY
EE CHARGE CONTROL PROGRAM
34 TRANSMISSION FILTER
36 LINE DRIVER
35 RECEPTION FILTER
37 POWER LINE COUPLING CIRCUIT
12 CURRENT SENSOR
9 SYSTEM MAIN RELAY
5 INVERTER
FF RANDOM NUMBER R
15 CONNECTOR FOR CHARGING

(57) Abstract: Provided is a charging system by which theft of an object to be charged is sufficiently prevented. An object (1) to be charged includes a rechargeable battery (6). The rechargeable battery (6) of the object (1) is connected to a power supply (19) of a dwelling house through power lines (20, 18). An authentication control apparatus (22) performs authentication of the object (1) by communicating with the object (1) through the power lines (20, 18), and only when the object is authenticated, charging from the power supply (19) of the dwelling house to the rechargeable battery (6) is permitted.

(57) 要約: 充電対象の盗難予防性を充分に高くすることができる充電システム。充電対象（１）は、蓄電池（６）を含む。充電対象（１）の蓄電池（６）は、住宅の電源（１９）と電力線（２０，１８）を通じて接続される。認証管理機器（２２）は、電力線（２０，１８）を通じて充電対象（１）と通信することにより充電対象（１）の認証を行い、該認証が成立したときにのみ住宅の電源（１９）から蓄電池（６）への充電を許可するように構成されている。

WO 2008/026390 A1

Hiroaki) [JP/JP]; 〒4800195 愛知県丹羽郡大口町豊田三丁目２６０番地 株式会社 東海理化電機製作所 内 Aichi (JP). **山本 圭司 (YAMAMOTO, Keiji)** [JP/JP]; 〒4718571 愛知県豊田市トヨタ町１番地 トヨタ自動車 株式会社 内 Aichi (JP). **坂本 昌之 (YURIMOTO, Masayuki)** [JP/JP]; 〒4718571 愛知県豊田市トヨタ町１番地 トヨタ自動車 株式会社 内 Aichi (JP). **塩谷 純 (SHIONOYA, Jun)** [JP/JP]; 〒4718571 愛知県豊田市トヨタ町１番地 トヨタ自動車 株式会社 内 Aichi (JP).

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(81) 指定国 (表示のない限り、全ての種類の国内保護が可能)**:** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能)**:** ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), **ユーラシア** (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), **ヨーロッパ** (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— **国際調査報告書**

明 細 書

充電システム

技術分野

[0001] 本発明は、住宅の電源を充電対象に供給することにより充電対象の蓄電池に充電を行う充電システムに関する。

背景技術

[0002] 近年、エンジンのみで動くエンジン自動車以外の車種として、エンジン及びモータの両方を駆動源として動くハイブリッド車や、モータで動く電気自動車の普及が広まりつつある。この種の電動車両においては、バッテリの電圧が低下した場合、バッテリに充電を行う必要がある。例えば家庭用電源（商用電源：交流100V）で充電を行う場合、充電ケーブル等の外部充電機器の入力を家庭用コンセントに接続するとともに、その出力を車両の充電用コネクタに接続することにより充電を行う。

[0003] ところで、家庭用電源でバッテリに充電を行う場合、外部充電機器を家庭用コンセントに繋げれば、この家庭用コンセントから供給される電力で制限無く電動車両のバッテリに充電ができてしまう。従って、仮に電動車両が盗難に遭った場合を考えると、この盗難車両は外部充電機器を用いて家庭用電源でバッテリに繰り返し充電ができることから、この盗難車両は盗難者によって乗り続けられてしまうことになる。このことは電動車両が盗難に遭う原因の一つにもなっていると思われ、車両盗難の発生件数を減らすための何らかの盗難予防対策が望まれる。

[0004] そこで、電動車両の盗難予防性を高めるために、電動車両のバッテリに充電を行う際において充電行為を認証制にする技術が例えば特許文献1に開示されている。この技術は、車両キーとして用いるICカードの情報を読み取り可能、或いはICカードへ情報を書き込み可能なリードライト装置を用いる。正規利用者は、充電装置で充電を行うに際しては、車両からICカードを抜きとってリードライト装置に挿入し、ICカードによる認証が成立すれば、充電行為が許可されてバッテリへの充電が可能になる。

[0005] ところで、ICカードの認証成立可否により充電行為を制限する技術を用いたとしても、ICカードが盗難にあってしまっては、バッテリへの充電を行えることになり、効果を

発揮しない。特に、この種のICカードは携帯されるものであるため、カード所有者が目を離した隙にICカードが盗難されてしまうなどの状況にも遭い易い。従って、家庭用電源による充電行為を認証制にしたとしても、車両盗難の予防性が充分に確保できない問題があった。

特許文献1:特開平10－262303号公報

発明の開示

[0006] 本発明は、充電対象の盗難予防性を充分に高くすることができる充電システムを提供する。

本発明の第1側面は、住宅の電源を用いた充電システムである。当該充電システムは、蓄電池を含む充電対象と、前記充電対象の蓄電池と前記住宅の電源とを接続可能な電力線と、前記電源に接続可能に構成され、前記電力線の少なくとも一部を通じて前記充電対象の認証を行うための認証管理機器と、を備え、前記充電対象は、前記認証管理機器と前記充電対象とによる前記認証が成立したときに前記電源から前記蓄電池への充電を許可するように構成されている。

[0007] 本発明の第2側面は、住宅の電源を用いた充電システムである。当該充電システムは、蓄電池を含む充電対象と、前記充電対象の蓄電池と前記住宅の電源とを接続可能な電力線と、前記電源に接続可能に構成され、前記電力線と独立して設けられた電気配線を通じて前記充電対象の認証を行うための認証管理機器と、を備え、前記充電対象は、前記認証管理機器と前記充電対象とによる前記認証が成立したときに前記電源から前記蓄電池への充電を許可するように構成されている。

図面の簡単な説明

[0008] [図1]本発明の第1実施形態による充電システムの概略構成を示すブロック図。

[図2]車両の充電接続にコイルを用いた充電システムの概略構成を示す模式図。

[図3]本発明の第2実施形態によるIDボックスの概略構成を示すブロック図。

[図4]データ通信専用の制御線を用いた本発明の第3実施形態による充電システムの概略構成を示すブロック図。

[図5]本発明の第4実施形態によるIDボックス系機器の概略構成を示すブロック図。

[図6]本発明の第5実施形態によるIDボックス系機器のプラグ付き車両キーの概略構

成を示す斜視図。

発明を実施するための最良の形態

[0009] （第1実施形態）

以下、本発明の第1実施形態の充電システムを図1及び図2に従って説明する。

図1に示すように、車両1が電気自動車の場合には、この電気自動車を走行させる際において車両動力源となるモータ2を駆動制御するモータシステム3が車両1に搭載されている。モータシステム3は、システム停止時においてシフトレバーが駐車位置でブレーキペダルが踏まれつつエンジン系のスタートスイッチ（図示略）が操作されると起動する。システム起動時においてシフトレバーが駐車位置で車速が「0」の時にスタートスイッチが操作されるとモータシステム3は停止する。なお、車両1が充電対象に相当する。

[0010] モータシステム3は、車両1の走行制御を司るモータ制御ECU4を含む。モータ制御ECU4には、走行駆動源となるモータ2がインバータ5を介して接続されている。モータ制御ECU4は、アクセル開度、シフトポジション、各種センサからの出力信号を基に運転状態に応じたモータトルクを求め、その算出モータトルクに応じた電流をモータ2に流すことにより、モータ2の駆動を制御する。

[0011] 車両1には、モータ2の電源となるバッテリ6が搭載されている。バッテリ6は、直列接続された複数のセル7aを含む電池モジュール7と、この電池モジュール7の高電圧電源回路8に直列接続されたシステムメインリレー9とを有する。インバータ5は、高電圧大電流を供給可能なパワーケーブル10でモータ2と接続されている。また、インバータ5は、別のパワーケーブル10でバッテリ6と接続されている。システムメインリレー9は、電気配線を通じてモータ制御ECU4に接続され、このモータ制御ECU4からの指令により、高電圧電源回路8の接続又は遮断を行う。なお、バッテリ6が蓄電池に相当する。

[0012] モータ制御ECU4には、バッテリ6の充電監視を行う充電制御ECU11が、例えばCAN(Controller Area Network)通信により接続されている。また、この充電制御ECU11には、高電圧電源回路8に流れる電流量を検出する電流センサ12が接続されている。電流センサ12は、高電圧電源回路8の配線途中に電池モジュール7と直列

に設けられ、高電圧電源回路8に流れる電流値に応じた検出信号を充電制御ECU11に供給する。

[0013] 充電制御ECU11内のROMやEEPROM等から成るメモリ13には、充電監視用の制御プログラムが書き込まれている。充電制御ECU11は、この充電監視用の制御プログラムに従い作動することにより、バッテリ6の充電状態監視(充電中か否か)や充電量監視(バッテリ残量確認)等の処理を行い、その処理結果(充電情報)をモータ制御ECU4に供給する。モータ制御ECU4は、充電制御ECU11から供給される充電情報を基にバッテリ6の充電状態や充電量を把握する。

[0014] 高電圧電源回路8には、高電圧電源回路8の通電のオンオフを切り換える切換スイッチ14が直列接続されている。バッテリ6、電流センサ12及び切換スイッチ14から成る直列回路は、充電用コネクタ15に対して並列に接続されている。切換スイッチ14は、通常の状態においてオン状態に制御される。充電制御ECU11による制御が充電不許可状態下にあるとき切換スイッチ14はオフされる。このとき、バッテリ6を充電することはできない。切換スイッチ14は、電気配線を通じて充電制御ECU11に接続されるとともに、充電制御ECU11からの指令に基づきオンオフ状態が切り換えられる。

[0015] 車両1には、バッテリ6へ充電を行う際の電気導入口となる充電用コネクタ15が設けられている。充電用コネクタ15は、電池モジュール7及び電流センサ12の直列回路に対して直列に接続されている。充電用コネクタ15には、充電ケーブル18の一端が接続可能である。充電ケーブル18の他端は、住宅16の屋外コンセント17に挿し込み可能に形成されている。作業者が充電ケーブル18を充電用コネクタ15及び屋外コンセント17に接続すると、住宅16の家庭用電源19(商用電源:例えば交流100V)から流れ出す電流が充電ケーブル18内の電力線を通じてバッテリ6に流れ込み、バッテリ6が充電される。なお、充電ケーブル18が電力線を構成し、家庭用電源19が電源に相当する。

[0016] 屋外コンセント17は、電流流路として屋内に設けられた屋内電力線20を介して屋内コンセント21に接続されている。屋内コンセント21は家庭用電源19に接続されている。即ち、第1実施形態の充電システムは、屋外コンセント17から延びる屋内電力

線20が屋内コンセント21に直接繋がる直接方式である。また、屋内コンセント21には、バッテリ6へ充電を行うに際して充電制御ECU11との間で暗号を用いた認証を行うためのIDボックス22が接続されている。IDボックス22は、自身1つで独立した部品を成す認証機器であって、自身のケースから外部に飛び出した接続コード23を含む。この接続コード23は屋内コンセント21に挿し込み可能に形成されている。なお、屋内電力線20が電力線（第2電力線、または分岐電力線）を構成する。また、屋内コンセント21がコンセントに相当し、IDボックス22が認証管理機器を構成する。

[0017] IDボックス22は、充電制御ECU11とのデータ通信処理を電力線通信で行うマイクロコンピュータ24を含む。マイクロコンピュータ24内のメモリ25には、充電制限プログラムが記憶されている。マイクロコンピュータ24は、この充電制限プログラムに従って充電制御ECU11とIDボックス22との間で認証を行い、認証が成立したことを条件にバッテリ6への充電を許可する。また、マイクロコンピュータ24のメモリ25には、認証時に用いられる暗号鍵が登録されている。一方、充電制御ECU11のメモリ13にも同様の暗号鍵が登録されている。充電制御ECU11とIDボックス22とが正規のペアを成すものであれば、これら暗号鍵は互いに一致する。

[0018] マイクロコンピュータ24には、電力線通信を行う際に作動する住宅用電力線通信モジュール26が接続されている。この住宅用電力線通信モジュール26には、信号変換器として作動するアナログフロントエンド（AFE）27が設けられ、このアナログフロントエンド27がマイクロコンピュータ24に接続されている。

[0019] アナログフロントエンド27には、マイクロコンピュータ24から充電制御ECU11に送られる各種信号に送信処理を施す送信フィルタ28と、屋内電力線20等の電力線を通じてIDボックス22に取り込まれた各種信号に受信処理を施す受信フィルタ29とが接続されている。例えば、送信フィルタ28は、データをパケット単位で送信するための処理を行う。送信フィルタ28は、必要なデータを統合して単一のデータユニットを生成し、それをパケットに分割することにより伝送速度調整や重複送信制御を行う。受信フィルタ29は、受信した複数のパケットからデータユニットを復元し、そのデータユニットから必要なデータを取り出す処理を行う。

[0020] 送信フィルタ28には、送信フィルタ28の出力信号を差動出力に変換するラインドラ

イバ30が接続されている。受信フィルタ29及びラインドライバ30には、住宅用電力線通信モジュール26内の各種信号線を電力線系配線に結合する電力線結合回路31が接続されている。この電力線結合回路31から延びる接続コード23が屋内コンセント21に接続可能となっている。

[0021] 充電制御ECU11のメモリ13には、IDボックス22に登録されたものと同様の充電制限プログラムが記憶されている。また、車両1には、高電圧電源回路8から分岐され、充電制御ECU11に繋がる経路上に、住宅16に設けられた住宅用電力線通信モジュール26と同様に構成された車両用電力線通信モジュール32が設けられている。なお、車両用電力線通信モジュール32は、住宅用電力線通信モジュール26と同じように、アナログフロントエンド33、送信フィルタ34、受信フィルタ35、ラインドライバ36及び電力線結合回路37を含む。

[0022] 次に、第1実施形態の充電システムの動作を説明する。

まず、車両1のバッテリ6に充電を行うに際しては、充電ケーブル18の一端を充電用コネクタ15に挿し込み、充電ケーブル18の他端を住宅16の屋外コンセント17に接続する。すると、住宅16の家庭用電源19の電流が屋内電力線20及び充電ケーブル18を介して高電圧電源回路8に流れ込み始める。なお、このとき、システムメインリレー9はオフされておりモータシステム3は起動していない。充電制御ECU11は、高電圧電源回路8へ流入する電流を車両用電力線通信モジュール32を通じて検出することにより、バッテリ6への充電操作が開始されたと認識する。

[0023] 充電操作が開始されると、充電制御ECU11は、IDボックス22を起動するためのIDボックス起動信号Swkを、アナログフロントエンド33、送信フィルタ34、ラインドライバ36及び電力線結合回路37を介して、充電ケーブル18(即ち、電力線)に送出する。そして、充電制御ECU11は、充電ケーブル18及び屋内電力線20を用いた電力線通信により、IDボックス起動信号SwkをIDボックス22に送信する。

[0024] IDボックス22は、充電ケーブル18及び屋内電力線20を通じてIDボックス起動信号Swkを受信する。マイクロコンピュータ24は、このIDボックス起動信号Swkを電力線結合回路31、受信フィルタ29及びアナログフロントエンド27を介して取得する。

[0025] マイクロコンピュータ24は、IDボックス起動信号Swkに応答して、IDボックス起動信

号Swkのデータ内容を解読することにより起動を開始する。マイクロコンピュータ24は、初期化等の各種処理を行って起動完了を認識すると、起動完了信号Sokをアナログフロントエンド27、送信フィルタ28、ラインドライバ30及び電力線結合回路31を介して屋内電力線20に送出する。そして、マイクロコンピュータ24は、屋内電力線20及び充電ケーブル18を用いた電力線通信により、起動完了信号Sokを充電制御ECU11に送信する。

[0026] 充電制御ECU11は、この起動完了信号Sokを電力線結合回路37、受信フィルタ35及びアナログフロントエンド33を介して受け取る。そして、充電制御ECU11は、起動完了信号Sokに応答して、暗号化された通信経路を確立し、暗号通信を用いてIDボックス22の認証を行う。この認証として、例えばチャレンジ・レスポンス方式を用いることができる。この場合、充電制御ECU11は所定の乱数Rを生成し、その乱数Rを電力線通信によりIDボックス22に送信する。IDボックス22のマイクロコンピュータ24は、自身が持つ暗号鍵(公開鍵)で、その受信した乱数Rを暗号化することにより暗号化乱数Raを生成する。そして、マイクロコンピュータ24は、この暗号化乱数Raを、電力線通信により充電制御ECU11に返信する。

[0027] 充電制御ECU11は、乱数RをIDボックス22に送信する際に、自身が持つ暗号鍵(公開鍵)で乱数Rを暗号化することにより暗号化乱数Rbを生成する。そして、充電制御ECU11は、IDボックス22から受信した暗号化乱数Raと、自身で生成した暗号化乱数Rbとを比較することによりIDボックス22の認証を行う。

[0028] ここで、充電制御ECU11とIDボックス22とが正規のペアを成すものであれば、両者の暗号鍵が一致する。つまり、暗号化乱数Raと暗号化乱数Rbとが一致する。この場合、充電制御ECU11は、通信先のIDボックス22が正規の通信相手であると判断し、認証成立を認識する。充電制御ECU11は、認証成立を認識すると、切換スイッチ14をオン状態に維持することにより、高電圧電源回路8を閉回路のままに保つ。これにより、住宅16の商用電源の電流がバッテリ6に流れ込み続け、バッテリ6が充電される。

[0029] 一方、充電制御ECU11は、暗号化乱数Ra, Rbの不一致を検知した場合、即ち、認証不成立を認識した場合、オン状態の切換スイッチ14をオフに切り換えることによ

り高電圧電源回路8を開回路にする。これにより、住宅16の商用電源の電流がバッテリ6に流れ込まないため、バッテリ6への充電が行われなくなる。その後、例えば充電ケーブル18が充電用コネクタ15から抜かれる等により高電圧電源回路8に電流が流れ込まなくなると、充電制御ECU11は、この状態を車両用電力線通信モジュール32を通じて検出し、切換スイッチ14をオン状態に戻す。

[0030] ところで、仮に第三者が車両1を盗難した場合、その盗難者は、この盗難車両を乗り続けるには住宅16内に設置されたIDボックス22も同時に盗まないと、その盗難車両のバッテリ6に充電を行うことができない。しかし、このIDボックス22は住宅16内にあるため盗難に困難性を有し、しかもIDボックス22を見つけ難い場所に配置しておけば、盗難困難性は更に顕著になる。よって、車両1とIDボックス22との両方を盗み出すことは難しいと盗難者に思わせられる。従って、盗難者の車両盗難意欲を殺ぐことが可能となり、これは車両1の盗難予防性を高めることに非常に効果が高い。

[0031] なお、車両1のバッテリ6と住宅16の家庭用電源19との充電接続は、充電ケーブル18を用いた有線に限定されない。例えば、図2に示すように、充電接続は、1次コイル38及び2次コイル39を用いて車両1と家庭用電源19とを磁気的に接続する磁気配線でもよい。即ち、屋外コンセント17に接続された1次コイル38を地中に埋設し、車両1に2次コイル39を設ける。この2次コイル39は、2次コイル39に誘起される電流がバッテリ6に流れ込むように同バッテリ6に接続されている。

[0032] バッテリ6を充電するに際しては、ユーザは車両1の2次コイル39が1次コイル38と向き合うように車両1を駐車する。この状態で1次コイル38を屋外コンセント17に接続して1次コイル38に電流を流す。すると、1次コイル38に磁束が発生することから、この磁束が2次コイル39に印加されて、2次コイル39に電流が誘起される。その結果、2次コイル39に流れる電流によってバッテリ6が充電される。この場合、認証時においては、データ通信の際にやり取りされる送受信信号の周波数を、充電電流の周波数よりも充分に高く設定することにより、充電電流周波数よりも充分に高い周波数の電流変動を与えて通信を行う。

[0033] 第1実施形態の充電システムは、以下の利点を有する。

(1)電気自動車等の車両1を継続使用するにはバッテリ6に定期的に充電を行う必

要がある。従って、盗難者が車両1を盗難した場合、この車両1を乗り続けるべくバッテリ6に充電を行うには、住宅16内のIDボックス22も盗み出す必要がある。しかし、住宅16内に設置してあるIDボックス22を盗み出すことは困難性を要することから、盗難者は車両盗難意欲が殺がれることになり、車両盗難予防性が高くなる。また、充電制御ECU11とIDボックス22とを繋ぐ充電ケーブル18及び屋内電力線20をデータ通信経路として用いるので、例えば両者を無線で接続する場合の懸案事項となる電波ノイズ影響等の問題を考えずに済む。よって、充電制御ECU11がIDボックス22と認証を行う際に通信が途中で途絶えるような状況が生じ難く、認証の信頼性も確保することができる。

[0034] (2)充電制御ECU11とIDボックス22とのデータ通信に電力線通信を用いるので、充電ケーブル18と屋内電力線20とが電力系配線及び制御系配線の両方を兼ねることになる。従って、充電制御ECU11及びIDボックス22間で認証を行う際に、そのデータ通信経路となる制御系配線を新たに設ける必要がなく、部品点数が増えずに済む。

[0035] (3)充電制御ECU11とIDボックス22との間の認証に暗号を用いているので、充電行為の許可・不許可を判断する際の認証の信頼性が高くなる。従って、充電制御ECU11とIDボックス22との間で不正に認証が成立されてしまうような状況が生じ難く、無断充電防止に効果が高い。

[0036] (4)車両1のバッテリ6に家庭用電源19を用いて充電を行うに際しては、充電ケーブル18を用いた有線方式が採用されるので、元々ある比較的安価なシステムでバッテリ6へ充電を行うことができる。

[0037] (5)充電システムには、屋外コンセント17から延びる屋内電力線20がIDボックス22を経由せずに屋内コンセント21に直接繋がる直接方式が採用されている。また、IDボックス22は、自身1つで独立した部品を成している。従って、IDボックス22を住宅にセットする際には、IDボックス22から延びる接続コード23を屋内コンセント21に繋ぐというワンアクションの作業だけで済み、取り付け作業が楽である。

[0038] (6)1次コイル38及び2次コイル39による磁気配線でバッテリ6に充電を行うこともできる。この場合には、バッテリ6の充電作業時において車両1を充電系のケーブル

部品で家庭用電源19と接続する必要がなくなり、手間のかからない楽な作業でバッテリ6に充電を行うことができる。

[0039] （第2実施形態）

次に、本発明の第2実施形態の充電システムを図3に従って説明する。なお、第2実施形態は、第1実施形態に記載されたIDボックス22への屋内電力線20の別の接続形式を示すものである。第1実施形態と同様の部分については同一符号を付して詳しい説明を省略する。

[0040] 図3に示すように、第2実施形態の充電システムでは、屋内電力線20がIDボックス22を経由して家庭用電源19に繋がる分割方式が採用されている。第2実施形態のIDボックス22は、第1実施形態のIDボックス22（図1）の構成要素に加えて、入力信号の低周波数成分をカットするローパスフィルタ（LPF）40を含む。ローパスフィルタ40は、IDボックス22内において電力線結合回路31に接続されるとともに、接続コード23を介してIDボックス22外の屋内コンセント21に接続されている。ローパスフィルタ40は、屋内電力線20に重畳した高周波成分を家庭用電源19に出さないようにするものである。

[0041] IDボックス22には、外部の電力線系配線を接続可能なコネクタ41が設けられている。コネクタ41は、IDボックス22内において電力線結合回路31及びローパスフィルタ40の両者に電気的に接続されている。屋内電力線20はIDボックス22のコネクタ41に接続可能である。IDボックス22は屋内コンセント21に接続された接続コード23を通じて家庭用電源19から電力を受けていることから、屋内電力線20をIDボックス22のコネクタ41に繋いだ時には、家庭用電源19の電流が屋内電力線20に流れる状態となる。

[0042] さて、充電制御ECU11は、車両1の充電用コネクタ15に接続された充電ケーブル18を通じてバッテリ6に流入する電流を検出すると、充電ケーブル18及び屋内電力線20を通じた電力線通信によりIDボックス22にIDボックス起動信号Swkを送信する。IDボックス22は、このIDボックス起動信号Swkをコネクタ41を通じて受け取り、それに応答して起動を開始する。なお、起動完了信号Sokの送信や、充電制御ECU11及びIDボックス22間の認証処理は、第1実施形態と同様であるので、これら処理の

説明については省略する。家庭用電源19の電流は、IDボックス22内のローパスフィルタ40を通って屋内電力線20を流れ、その後、充電ケーブル18を通って車両1のバッテリ6に流れ込む。

[0043] 従って、第2実施形態においては充電システムに分割方式が採用されているので、IDボックス22のコネクタ41に充電ケーブル18を直接接続することにより、車両1のバッテリ6に充電することが可能となる。よって、バッテリ6に充電を行う際に仮に近くに屋外コンセント17が無かったとしても、IDボックス22が手元にあれば、それに充電ケーブル18を接続することによりバッテリ6に充電できる。

[0044] 第2実施形態の充電システムは、第1実施形態の(1)～(4)，(6)に記載の利点に加え、以下の利点を有する。

(7)分割方式の充電システムでは、バッテリ6への充電を行う際に近くに屋外コンセント17が無い状況にあったとしても、充電ケーブル18をIDボックス22のコネクタ41に接続すれば、バッテリ6は家庭用電源19と繋がった状態となる。従って、近くに屋外コンセント17が無い充電作業状況下であっても、バッテリ6に充電を行うことができる。

[0045] (第3実施形態)

次に、本発明の第3実施形態の充電システムを図4に従って説明する。なお、第3実施形態は、第1実施形態に記載された充電制御ECU11及びIDボックス22間の通信の別の形態を示すものである。第1実施形態と同様の部分については同一符号を付して詳しい説明を省略する。

[0046] 第3実施形態では充電制御ECU11とIDボックス22との通信形式を、電力線通信に代えてデータ通信専用の制御系配線を用いて行う。IDボックス22には、制御系配線を用いたデータ通信処理を実行するマイクロコンピュータ42が設けられている。マイクロコンピュータ42には、該マイクロコンピュータ42によるデータ通信時に出力データの変調や入力データの復調等の各種処理を施す通信回路43が接続されている。

[0047] IDボックス22の通信回路43には、データ通信経路となる屋内制御線44の一端が接続されている。屋内制御線44の他端は、屋外コンセント17に接続されている。即

ち、IDボックス22は、屋内制御線44を通じて屋外コンセント17に接続されている。第3実施形態の屋外コンセント17は、屋内電力線20を介した電流の受け渡しだけでなく、屋内制御線44によるデータ転送も可能なコンセント部品である。なお、屋内制御線44が電気配線を構成する。

[0048] 充電ケーブル18は、家庭用電源19から流入する電流の流路となる電力線18aと、充電制御ECU11及びIDボックス22間のデータ通信経路となる制御線18bとから成る。充電ケーブル18は1本のケーブル部品であり、例えばカーボン等の被覆材の中に電力線18a及び制御線18bが収納されている。充電ケーブル18が充電用コネクタ15に接続されると、充電ケーブル18内の制御線18bは、充電用コネクタ15と充電制御ECU11とを繋ぐ車両1内の通信線45を介して充電制御ECU11と接続される。なお、電力線18aが電力線を構成し、制御線18bが電気配線を構成する。

[0049] 充電制御ECU11は、充電ケーブル18と充電用コネクタ15との接続通知を、待機状態のIDボックス22から、屋内制御線44、制御線18b及び通信線45を介して受け取る。充電制御ECU11は、このケーブル接続通知に応答して、IDボックス22を起動するためのIDボックス起動信号Swkを、通信線45、制御線18b及び屋内制御線44を通じてIDボックス22に送信する。マイクロコンピュータ24は、充電制御ECU11から送られたIDボックス起動信号Swkを通信回路43を介して受け取り、それに応答してIDボックス22の起動を開始する。

[0050] マイクロコンピュータ42は、IDボックス22の起動完了を認識すると、起動完了信号Sokを、屋内制御線44、制御線18b及び通信線45を通じて充電制御ECU11に送信する。そして、充電制御ECU11は、IDボックス22の認証を、屋内制御線44、制御線18b及び通信線45を用いて行う。このとき、家庭用電源19の電流は、屋内電力線20及び電力線18aを通じ、車両1のバッテリ6に流れ込む。なお、充電制御ECU11は、充電ケーブル18が例えば充電用コネクタ15から抜き取られてケーブル用制御線18bから信号を受け付けなくなると、切換スイッチ14をオン状態に戻す。

[0051] ところで、電力線はもともと高い周波数の電気信号を流すことを想定していない。このため、仮に電力線通信を用いると電力線から漏洩電波が生じ、しかもその電波の周波数が短波帯の電波と重なることがある。その結果、短波ラジオやアマチュア無線

等に悪影響を及ぼす可能性も否めない。しかし、第3実施形態においては、充電制御ECU11及びIDボックス22との間のデータ通信に、データ通信専用の制御線18b，44を用いるので、電力線通信採用時に生じ得る各種問題については考えなくて済む。

[0052] 第3実施形態の充電システムは、第1実施形態の(1)，(3)～(6)に記載の利点に加え、以下の利点を有する。

(8)充電制御ECU11とIDボックス22との間のデータ通信経路に専用の制御線18b，44が用いられる。このため、電力線通信を用いた際に生じ得る漏洩電波の問題を考えずに済み、周囲の短波ラジオやアマチュア無線などに悪影響を及ぼす状況にならずに済む。なお、充電制御ECU11とIDボックス22との間のデータ通信経路に専用の制御線18b，44を用いた場合、これを充電システムの直接方式及び分割方式のどちらにも適用可能である。

[0053] (第4実施形態)

次に、本発明の第4実施形態の充電システムを図5に従って説明する。なお、第4実施形態は、第1実施形態に記載のIDボックス22の別の構造を示すものである。第1実施形態と同様の部分については同一符号を付して詳しい説明を省略する。

[0054] 図5に示すように、第4実施形態のIDボックス系機器は、図1に示すような自身で1つの独立した認証機器を成すIDボックス22に代えて、車両キー46と、車両キー46を差し込み可能な通信ボックス47とを含む。車両キー46には、図1に示すようなマイクロコンピュータ24が組み込まれ、このマイクロコンピュータ24にキー固有の暗号鍵が登録されている。なお、この車両キー46は通常のメカニカルキーの他に、車両1を作動させる時に自身に登録されたIDコードを車両1に無線で発信可能な電子キーであってももちろんよい。車両キー46が電子キーの場合、この無線通信機構をマイクロコンピュータ24に組み込んでもよい。

[0055] 図5に示すように、通信ボックス47には、車両キー46の挿込口となるスロット47aが設けられている。車両キー46がスロット47aに全挿しされた際、マイクロコンピュータ24は通信ボックス47内の住宅用電力線通信モジュール26のアナログフロントエンド27とデータ通信可能に接続される。なお、上記したように、データ通信の形態は有線

或いは無線のいずれでもよい。IDボックス系機器として通信ボックス47を用いた場合、バッテリ6への充電を許可するか否かの認証通信は、車両キー46のマイクロコンピュータ24と充電制御ECU11との間で行われることになる。なお、車両キー46及び通信ボックス47が認証管理機器を構成する。

[0056] 家庭用電源19でバッテリ6に充電を行うに際しては、まず屋外コンセント17に繋いだ充電ケーブル18を車両1の充電用コネクタ15に接続する。続いて、作業者は住宅16内に入り、屋内コンセント21に接続された通信ボックス47のスロット47aに、自身が所有する車両キー46を挿し込む。車両キー46がスロット47aに全挿しされた状態になると、車両キー46内のマイクロコンピュータ24が通信ボックス47の住宅用電力線通信モジュール26と電気接続される。そして、住宅用電力線通信モジュール26が起動を開始する。

[0057] マイクロコンピュータ24は、自身も含めて住宅用電力線通信モジュール26の起動が完了したことを認識すると、起動完了信号Sokを電力線通信(制御線通信も可)で充電制御ECU11に送信する。充電制御ECU11は、この起動完了信号Sokに応答して、車両キー46が正規の相手か否かを確認する。なお、認証処理は第1実施形態と同様であるので、詳細については省略する。

[0058] 第4実施形態の充電システムは、第1実施形態の(1)～(6)の利点に加え、以下の利点を有する。

(9)盗難者が車両1を盗み出してその盗難車両のバッテリ6に充電を行うには、IDボックス22の他に車両キー46も盗み出す必要がある。従って、盗難者は、盗難車両に充電を行うには、IDボックス22及び車両キー46の2部品を盗難しなければならない。このため、盗難困難性を高めることができる。しかも車両キー46は車両所有者が常時持ち歩くことが多いことから、両者を盗み出すことは実際のところ非常に難しい。従って、盗難者の車両盗難意欲を大きく殺ぐことになり、盗難予防性を大きく向上することが可能となる。

[0059] (第5実施形態)

次に、本発明の第5実施形態の充電システムを図6に従って説明する。なお、第5実施形態は、IDボックス系機器の別の構造を示すものである。第1実施形態と同様

の部分については同一符号を付して詳しい説明を省略する。

[0060] 図6に示すように、第5実施形態のIDボックス系機器は、図1に示すIDボックス22や、図5に示すIDボックス系機器（車両キー46及び通信ボックス47）に代えて、プラグ付き車両キー48で構成されている。この車両キー48は、図1のマイクロコンピュータ24及び住宅用電力線通信モジュール26を内蔵するキー本体48aと、キー本体48aから引き出し可能に構成されたプラグ49とを含む。キー本体48aには、車両1とIDコードの無線通信を行う無線通信機構50が内蔵されている。プラグ49は、住宅16の屋内コンセント21に接続可能であって、非使用時においてはキー本体48a内に収納される。なお、プラグ付き車両キー48が認証管理機器を構成する。

[0061] 家庭用電源19でバッテリ6に充電を行うに際しては、まず屋外コンセント17に繋いだ充電ケーブル18を車両1の充電用コネクタ15に接続する。続いて、作業者は住宅16内に入り、自身が所有する車両キー48からプラグ49を抜き出し、これを屋内コンセント21に接続する。

[0062] 車両キー48内のマイクロコンピュータ24は、屋内コンセント21に接続されたプラグ49を介してプラグ付き車両キー48に流入する電流を検出すると、起動を開始する。マイクロコンピュータ24は、起動完了を認識すると、起動完了信号Sokを電力線通信（制御線通信も可）で充電制御ECU11に送信する。充電制御ECU11は、この起動完了信号Sokに応答して、車両キー48が正規の相手か否かを確認する。この認証処理については第1実施形態と同じであるので、詳細な説明は省略する。

[0063] 第5実施形態の充電システムは、第1実施形態の（1）～（6）の利点に加え、以下の利点を有する。

（10）盗難者は車両1を盗んでも、車両所有者が通常持ち歩く車両キー48を同時に盗み出さないとバッテリ6に充電することができない。よって、車両キー48の盗み出しは困難であることから、盗難者の車両盗難意欲を殺ぐことになり、車両1の盗難予防性を確保することが可能となる。また、図1のようなIDボックス22を用いた場合は、それが常に屋内コンセント21に接続されるため、待機電力が必要となる。しかしながら、第5実施形態の場合は使用時のみにおいてプラグ49を屋外コンセント17に接続するので、待機電力を要さず、家庭用電源19の省電力化に効果がある。

[0064] なお、上記各実施形態は以下の態様に変更してもよい。

・ 第1～第5実施形態において、充電許可判定時に行われる認証は、必ずしもチャレンジ・レスポンス方式に限定されない。例えば、充電制御ECU11とIDボックス22との各々に固有のIDコードを持たせ、両者のコードが一致するか否かを判定することによりID照合を行ってもよい。また、ID照合は、充電を行う際に指紋を収集し、これをIDボックス22に登録された指紋データと比較するバイオメトリクス認証でもよい。

[0065] ・ 第1～第5実施形態において、チャレンジ・レスポンス方式のような暗号を用いた認証を行う場合、この時に用いる暗号鍵は公開鍵に限定されず、秘密鍵でもよい。

・ 第1～第5実施形態において、充電制御ECU11及びIDボックス22の間のデータ通信に暗号通信を用いてもよい。この場合の暗号としては、例えばDES(Data Encryption Standard)、AES(Advanced Encryption Standard)、RC(Rivest Code)などの秘密鍵暗号や、Diffie－Hellman方式、RSA、ElGamal方式などの公開鍵暗号や、秘密鍵及び公開鍵を組み合わせたハイブリッド暗号が挙げられる。

[0066] ・ 第1～第5実施形態において、IDボックス系機器は、必ずしも家庭用電源19に接続すると自動で内部に電流が流れ込む構造に限定されない。例えば、IDボックス系機器の機器本体に電源スイッチを設け、家庭用電源19に接続された状態で電源スイッチがオン操作されたときに、家庭用電源19の電力が機器本体内に流れ込む構造でもよい。

[0067] ・ 第3実施形態では、電力線18aと制御線18bとは必ずしも1本のケーブル(18)として構成されることに限定されず、これらは別々の配線であってもよい。

・ 第1～第5実施形態において、車両1は必ずしも電気自動車に限らず、モータとエンジンとの両方を走行駆動源とするハイブリッド車でもよい。また、充電対象としては、バッテリ6を駆動源に動く装置や機器であれば、車両に限定されない。

請求の範囲

[1] 住宅の電源を用いた充電システムであって、

蓄電池を含む充電対象と、

前記充電対象の蓄電池と前記住宅の電源とを接続可能な電力線と、

前記電源に接続可能に構成され、前記電力線の少なくとも一部を通じて前記充電対象の認証を行うための認証管理機器と、を備え、

前記充電対象は、前記認証管理機器と前記充電対象とによる前記認証が成立したときに前記電源から前記蓄電池への充電を許可するように構成されていることを特徴とする充電システム。

[2] 住宅の電源を用いた充電システムであって、

蓄電池を含む充電対象と、

前記充電対象の蓄電池と前記住宅の電源とを接続可能な電力線と、

前記電源に接続可能に構成され、前記電力線と独立して設けられた電気配線を通じて前記充電対象の認証を行うための認証管理機器と、を備え、

前記充電対象は、前記認証管理機器と前記充電対象とによる前記認証が成立したときに前記電源から前記蓄電池への充電を許可するように構成されていることを特徴とする充電システム。

[3] 前記認証管理機器は、前記電力線の少なくとも一部をデータ通信経路として用いて前記充電対象と電力線通信を行うことにより前記認証を行うことを特徴とする請求項1に記載の充電システム。

[4] 前記認証管理機器は、前記充電対象と暗号による通信を行って前記認証を行うことを特徴とする請求項1～3のいずれか一項に記載の充電システム。

[5] 前記電力線は、前記蓄電池及び前記電源に直接接続されることを特徴とする請求項1～4のうちいずれか一項に記載の充電システム。

[6] 前記電力線を通じて前記電源と接続可能な1次コイルと、

前記蓄電池に接続された2次コイルと、をさらに備え、

前記蓄電池は、前記1次コイルと前記2次コイルとを通じて前記電源に磁気的に接続されることを特徴とする請求項1～4のうちいずれか一項に記載の充電システム。

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[7] 前記電力線は、

前記蓄電池に接続可能な第1電力線と、

前記住宅に設けられ、前記電源に接続されたコンセントから延出され、前記第1電力線と接続可能な第2電力線と、を含み、

前記認証管理機器は、前記コンセントに接続可能に構成され、前記第1電力線及び前記第2電力線を使用して前記充電対象と前記認証を行うことを特徴とする請求項1～6のうちいずれか一項に記載の充電システム。

[8] 前記電力線は、

前記蓄電池に接続可能な第1電力線と、

前記第1電力線と前記認証管理機器とを接続可能な分岐電力線と、を含み、

前記認証管理機器は、前記住宅に設けられ、前記電源に接続されたコンセントに前記分岐電力線を自身を通じて接続可能に構成され、前記第1電力線及び前記分岐電力線を使用して前記充電対象と前記認証を行うことを特徴とする請求項1～6のうちいずれか一項に記載の充電システム。

[9] 前記認証管理機器は、固有の識別子を有し、前記識別子を用いて前記充電対象との前記認証を実行可能な単一のIDボックスとして構成されることを特徴とする請求項1～8のうちいずれか一項に記載の充電システム。

[10] 前記IDボックスは、車両キーであることを特徴とする請求項9に記載の充電システム。

[11] 前記認証管理機器は、

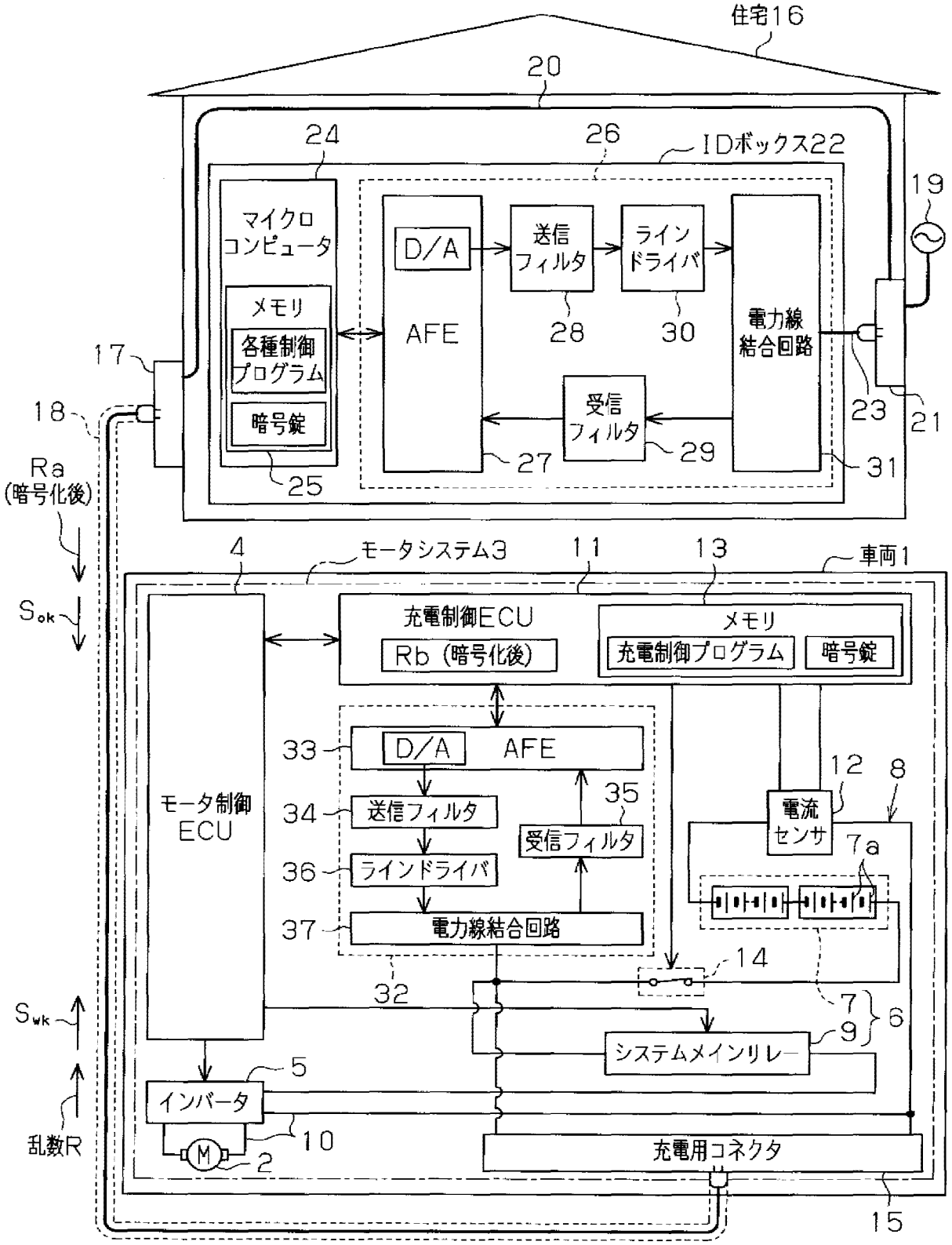
固有の識別子を有する通信端末と、

前記通信端末を着脱可能であり、前記通信端末から前記識別子を受け取り、前記識別子を用いて前記充電対象との前記認証を実行可能な機器本体と、

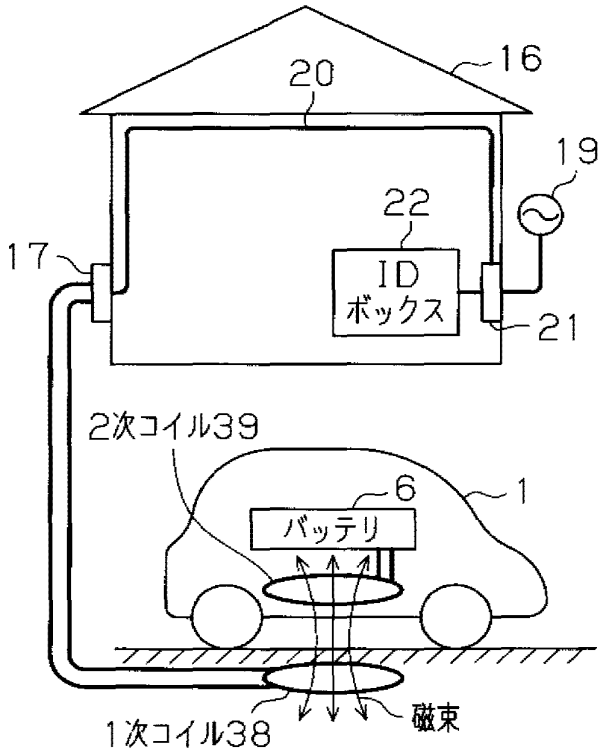
を含むことを特徴とする請求項1～8のうちいずれか一項に記載の充電システム。

[12] 前記充電対象は、前記認証管理機器と協働して前記認証を行い、該認証結果に基づいて前記電源から前記蓄電池への充電を制御する充電制御部を含むことを特徴とする請求項1～11のうちいずれか一項に記載の充電システム。

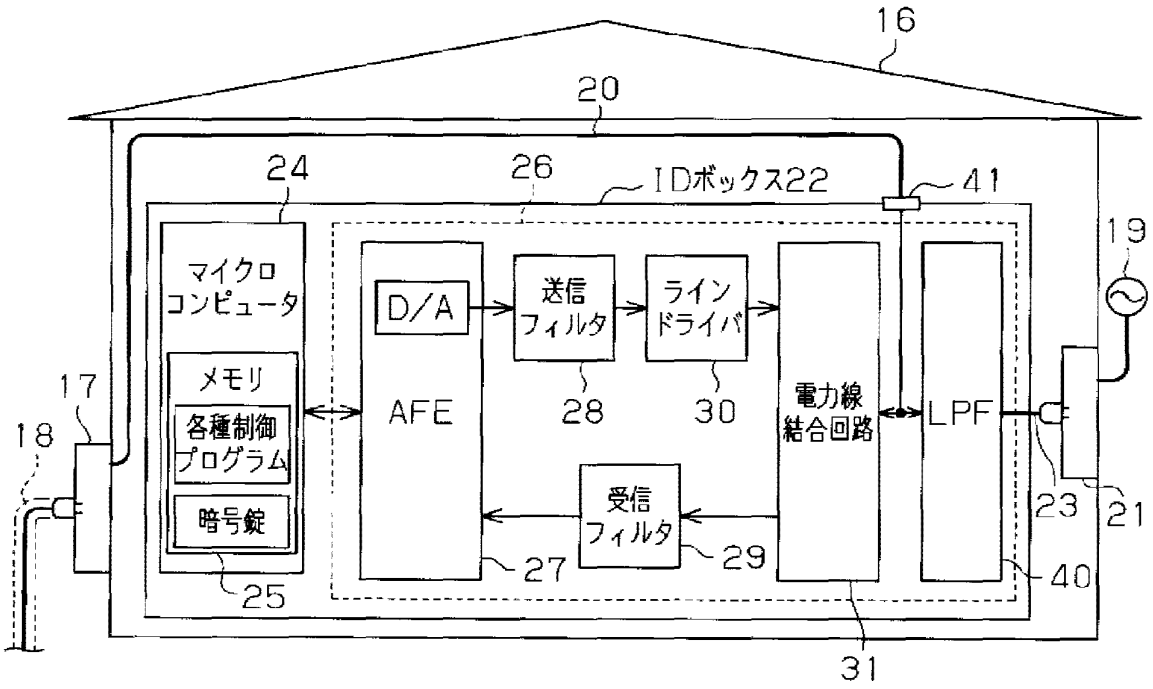
[図1]


住宅16
20
24
26
IDボックス22
19
マイクロコンピュータ
メモリ
各種制御プログラム
暗号錠
D/A
AFE
送信フィルタ
ラインドライバ
電力線結合回路
受信フィルタ
28
30
27
29
31
17
18
23
21
25
Ra
(暗号化後)
Sok
4
モータシステム3
11
13
車両1
充電制御ECU
Rb (暗号化後)
メモリ
充電制御プログラム
暗号錠
33
D/A
AFE
34
送信フィルタ
35
受信フィルタ
36
ラインドライバ
37
電力線結合回路
32
12
8
電流センサ
7a
モータ制御ECU
14
7
6
9
システムメインリレー
Swk
5
インバータ
10
M
2
乱数R
充電用コネクタ
15

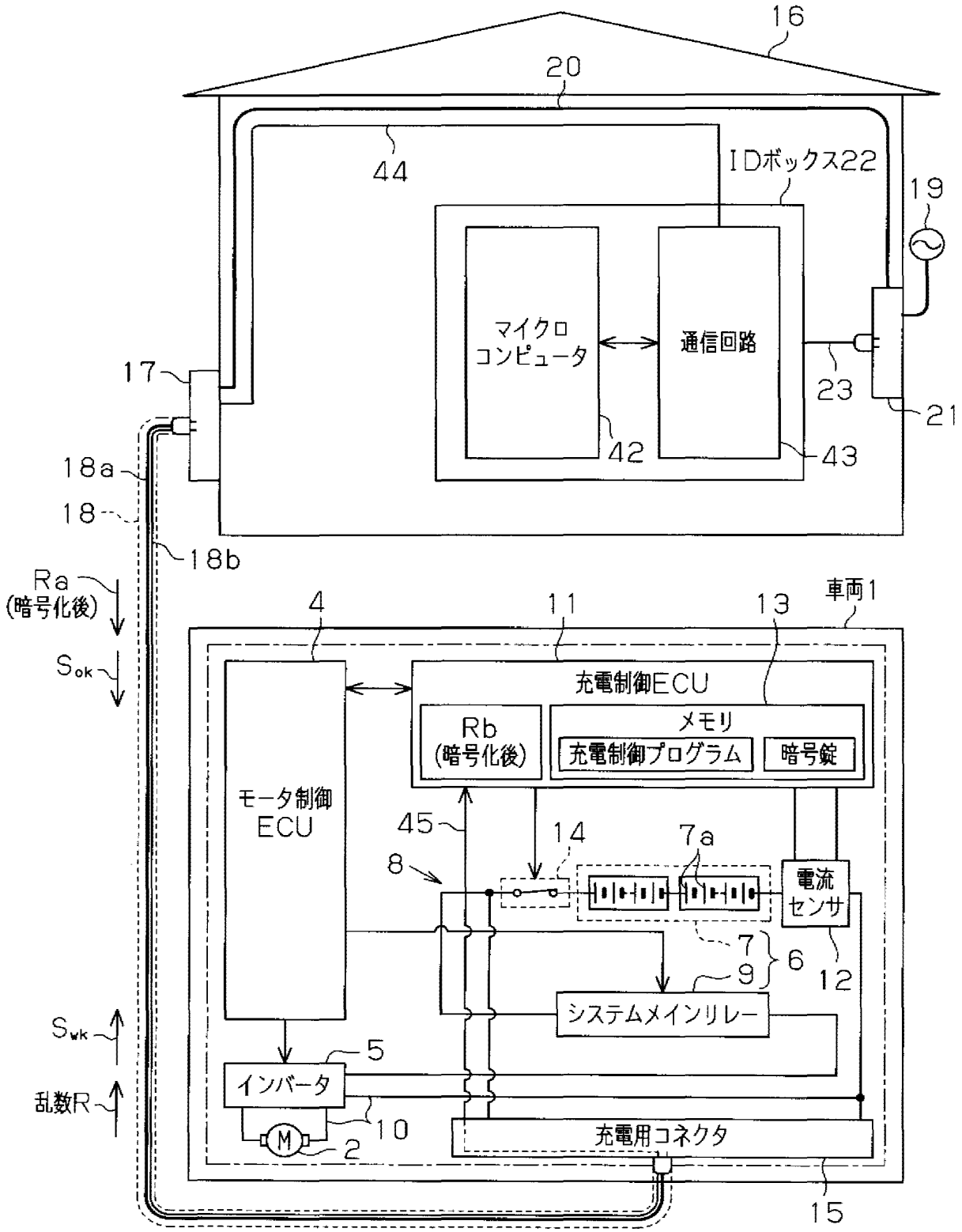
[図2]


20
16
19
22
17
ID
ボックス
21
2次コイル39
6
1
バッテリ
磁束
1次コイル38

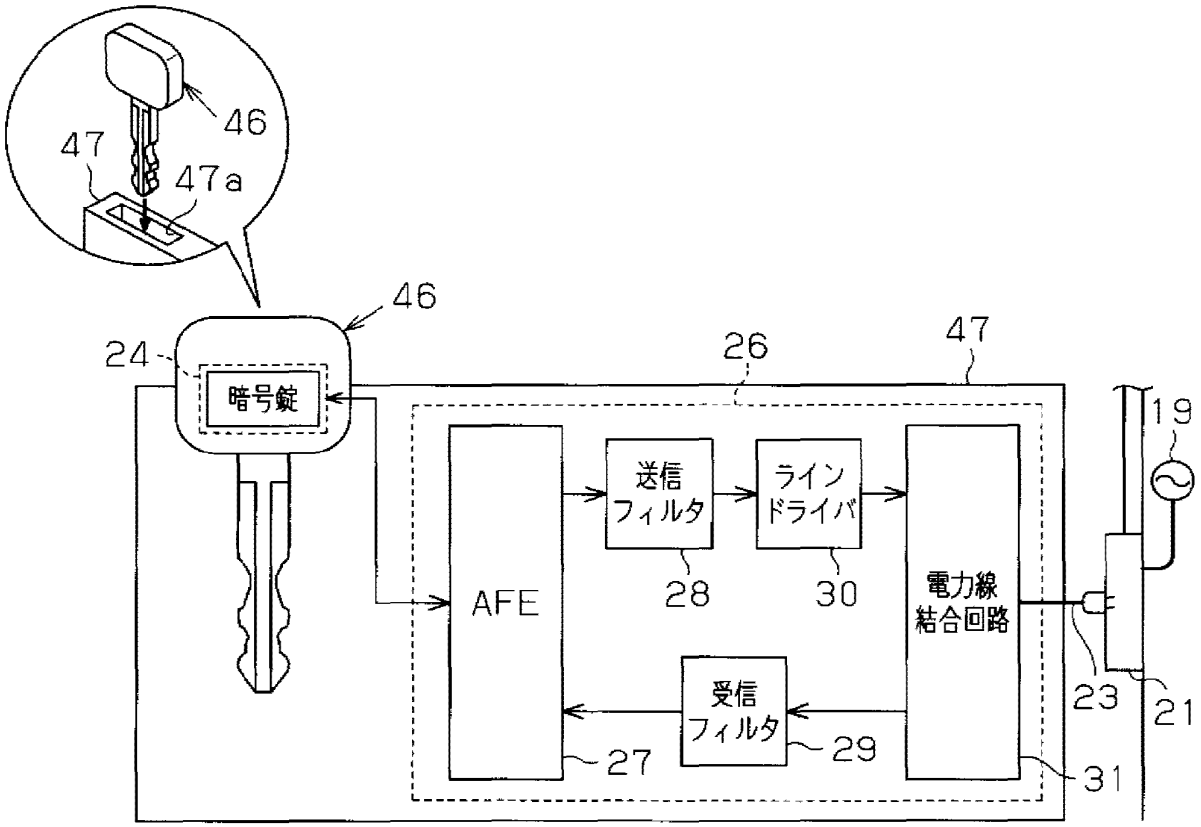
[図3]


16
20
24
26
IDボックス22
41
19
マイクロ
コンピュータ
D/A
送信
フィルタ
ライン
ドライバ
メモリ
各種制御
プログラム
暗号錠
AFE
28
30
電力線
結合回路
LPF
17
18
受信
フィルタ
23
21
25
27
29
40
31

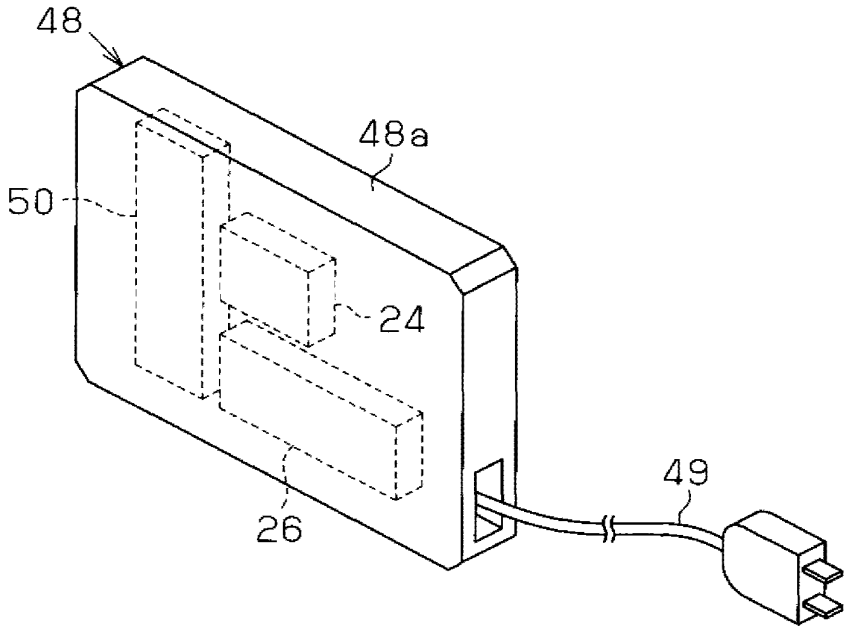
[図4]


16
20
44
IDボックス22
19
マイクロ
コンピュータ
通信回路
17
23
21
42
43
18a
18
18b
Ra
(暗号化後)
車両1
4
11
13
Sok
充電制御ECU
Rb
(暗号化後)
メモリ
充電制御プログラム
暗号錠
モータ制御
ECU
45
14
7a
8
電流
センサ
7
6
9
12
システムメインリレー
Swk
5
乱数R
インバータ
10
M
2
充電用コネクタ
15

[図5]


46
47
47a
46
24
暗号錠
26
47
19
送信
フィルタ
ライン
ドライバ
AFE
28
30
電力線
結合回路
受信
フィルタ
23
21
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31

[図6]


48
48a
50
24
49
26

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/063857

A. CLASSIFICATION OF SUBJECT MATTER
H02J7/00(2006.01)i, *B60L11/18*(2006.01)i, *G08B13/00*(2006.01)i, *H01M10/44*(2006.01)i, *H02J13/00*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02J7/00, B60L11/18, G08B13/00, H01M10/44, H02J13/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2006-164547 A (Sony Corp.), 22 June, 2006 (22.06.06), Par. Nos. [0029] to [0043]; Figs. 1 to 3 & US 2006/0119315 A1 & US 2006/0119316 A1 & EP 1667306 A1	1-12
A	JP 2001-078302 A (Tokyo R & D Co., Ltd.), 23 March, 2001 (23.03.01), Par. Nos. [0004], [0018] to [0083]; Figs. 1 to 3 & WO 2001/017829 A1 & US 6833784 B1 & EP 1223092 A1	1-12

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 September, 2007 (07.09.07)	25 September, 2007 (25.09.07)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/063857

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-050508 A (Kabushiki Kaisha Takayanagi Kenkyusho), 18 February, 2000 (18.02.00), Par. Nos. [0028] to [0035], [0041]; Figs. 1, 13, 14 (Family: none)	1-12
A	JP 2000-517487 A (BTG International Ltd.), 26 December, 2000 (26.12.00), Full text; all drawings & WO 1997/023986 A1	1-12

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国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２００７／０６３８５７

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　H02J7/00(2006.01)i, B60L11/18(2006.01)i, G08B13/00(2006.01)i, H01M10/44(2006.01)i, H02J13/00(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　H02J7/00, B60L11/18, G08B13/00, H01M10/44, H02J13/00

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	１９２２－１９９６年
日本国公開実用新案公報	１９７１－２００７年
日本国実用新案登録公報	１９９６－２００７年
日本国登録実用新案公報	１９９４－２００７年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

Ｃ．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
A	JP ２００６－１６４５４７ A（ソニー株式会社）２００６．０６．２２，段落【００２９】－【００４３】、第１－３図 & US ２００６／０１１９３１５ A1 & US ２００６／０１１９３１６ A1 & EP １６６７３０６ A1	１－１２
A	JP ２００１－０７８３０２ A（株式会社東京アールアンドデー）２００１．０３．２３，段落【０００４】、【００１８】－【００８３】、第１－３図 & WO ２００１／０１７８２９ A1 & US ６８３３７８４ B1 & EP １２２３０９２ A1	１－１２

☑　Ｃ欄の続きにも文献が列挙されている。　　☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー
「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの
「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「Ｏ」口頭による開示、使用、展示等に言及する文献
「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
０７．０９．２００７	２５．０９．２００７

国際調査機関の名称及びあて先	特許庁審査官（権限のある職員）	５Ｔ	３３５７
日本国特許庁（ＩＳＡ／ＪＰ） 郵便番号１００－８９１５ 東京都千代田区霞が関三丁目４番３号	宮本　秀一 電話番号　０３－３５８１－１１０１　内線　３５６８		

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Ｃ（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
A	JP ２０００－０５０５０８ A（株式会社高柳研究所）２０００．０２．１８，段落【００２８】－【００３５】、【００４１】、第１、１３、１４図 （ファミリーなし）	１－１２
A	JP ２０００－５１７４８７ A（ビーティージー・インターナショナル・リミテッド）２０００．１２．２６，全文、全図 & WO １９９７／０２３９８６ A1	１－１２

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(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2006-74868
(P2006-74868A)
(43)公開日　平成18年3月16日(2006.3.16)

(51)Int.Cl.		F I		テーマコード（参考）
B60L 11/18	(2006.01)	B60L 11/18	C	5H115

審査請求 未請求　請求項の数 2　OL　（全 8 頁）

(21)出願番号　特願2004-252786 (P2004-252786)
(22)出願日　平成16年8月31日 (2004.8.31)

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(72)発明者　大出　宏
東京都新宿区西新宿一丁目７番２号　富士重工業株式会社内

Fターム(参考)　5H115 PA01　PC06　PG04　PI16　PO07
PO16　QN03

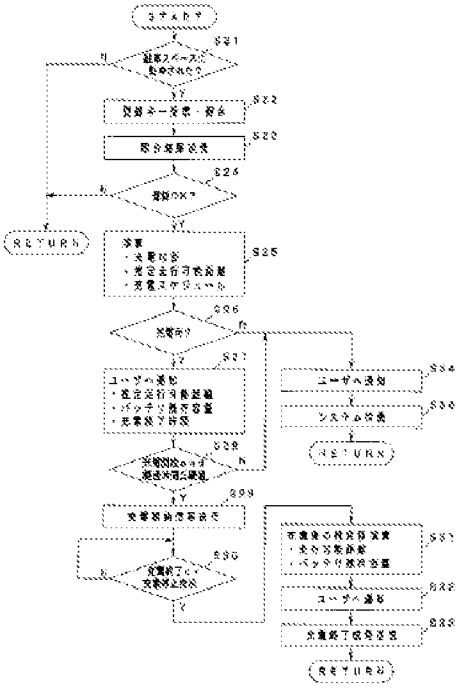
(54)【発明の名称】電気自動車のバッテリ充電システム

(57)【要約】

【課題】電気自動車のバッテリ充電を自動化し、充電操作の煩雑さを解消する。

【解決手段】車両が充電用駐車スペースの規定の位置に駐車して認証がＯＫの場合、充電の可否、推定走行可能距離、充電スケジュール等を演算する（Ｓ２５）。そして、充電可能のとき、推定走行可能距離、バッテリ残存容量、充電終了時間をユーザに通知し（Ｓ２７）、充電開始指示があり且つ充電開始指示までの経過時間が閾値未満の場合、充電開始信号を充電ステーションに送信して充電を開始させる（Ｓ２９）。その後、充電終了或いは充電停止を受信したとき、充電後の走行可能距離やバッテリ残存容量等の推定値を演算してユーザへ通知し（Ｓ３１、Ｓ３２）、充電終了信号を充電ステーションへ送信する（Ｓ３３）。これにより、充電操作の煩雑さを解消して充電の忘れや充電の機会を逸することを防止し、常に快適な使用可能状態に電気自動車を維持することができる。

【選択図】図４



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【特許請求の範囲】
【請求項１】
電気自動車に搭載されるバッテリの充電情報を外部に送信可能な通信手段を備えた電気自動車のバッテリ充電システムであって、
予め登録された個々のユーザのバッテリ情報を一括して管理し、各車両から送信された現在のバッテリ情報と予め蓄積されたバッテリ情報とに基づいて充電スケジュールを設定するサービスシステムと、
上記サービスシステムと通信可能に接続され、上記サービスシステムからの指示により、上記バッテリを充電するための電力を上記車両と非接触で供給する非接触充電電力供給システムとを備えたことを特徴とする電気自動車のバッテリ充電システム。
【請求項２】
上記サービスシステムに接続し、上記サービスシステムから自己の車両のバッテリ情報を取得可能な通信端末を更に備えたことを特徴とする請求項１記載の電気自動車のバッテリ充電システム。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、電気自動車に搭載されるバッテリの充電情報を外部に送信可能な通信手段を備えた電気自動車のバッテリ充電システムに関する。
【背景技術】
【０００２】
近年、ガソリン等を燃料として動力を発生するエンジンによって走行する従来の自動車に対し、低公害、省資源の促進を目的として、エンジンに加えてバッテリからの電力で動力を発生するモータを搭載したハイブリッド自動車や、エンジンを搭載せずに電動モータのみで走行する電気自動車が開発されている。
【０００３】
これらのハイブリッド自動車や電気自動車においては、前者がエンジンにより電動モータを駆動してバッテリに充電できることから、基本的に外部の電力源による充電を不要としているのに対し、後者は、電動モータによってバッテリの電力を消費する一方であるため、所定の期間で市街地や自宅の車庫等に設けられた充電設備を利用してバッテリを充電する必要がある。
【０００４】
この外部の電力源による車載バッテリの充電に際しては、ユーザがバッテリの充電状態を把握しなければならず、煩雑な操作と管理が必要となってユーザの負担が大きくなる。従って、このユーザのバッテリ充電に係わる負担を軽減するための種々の提案がなされており、例えば、特許文献１には、遠隔地に置かれている充電管理装置から車両ステーションに設置されている充電器の状態や、保管されている車両の充電状態を監視し、車両の充電を行う車両ステーションを無人化する技術が開示されている。
【０００５】
また、特許文献２には、電気自動車を使用するユーザが、電気自動車から離れた遠隔地に居ながらも、充電に関する充電情報を所望のタイミングで取得することのできる電気自動車の充電システムが開示されている。
【特許文献１】特開２００２－１２３８８８号公報
【特許文献２】特開２００４－４８９００号公報
【発明の開示】
【発明が解決しようとする課題】
【０００６】
しかしながら、特許文献１や特許文献２に開示されているような従来の充電システムは、バッテリの充電状態に関する情報をユーザが遠隔地で取得可能にすることを主目的としており、実際に充電を開始させるには、ユーザが充電スタンド等の外部の充電器と車両と

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を充電パドル等のコネクタを介して手動で接続する必要がある。従って、コミュータ的な乗り方をされることの多い電気自動車では、バッテリ充電に際しての手動による接続操作という煩雑な操作が支障となり、充電の機会が減少して十分に活用されない虞がある。

【０００７】

本発明は上記事情に鑑みてなされたもので、電気自動車のバッテリ充電を自動化し、充電操作の煩雑さを解消することのできる電気自動車のバッテリ充電システムを提供することを目的としている。

【課題を解決するための手段】

【０００８】

上記目的を達成するため、本発明による電気自動車のバッテリ充電システムは、電気自動車に搭載されるバッテリの充電情報を外部に送信可能な通信手段を備えた電気自動車のバッテリ充電システムであって、予め登録された個々のユーザのバッテリ情報を一括して管理し、各車両から送信された現在のバッテリ情報と予め蓄積されたバッテリ情報とに基づいて充電スケジュールを設定するサービスシステムと、上記サービスシステムと通信可能に接続され、上記サービスシステムからの指示により、上記バッテリを充電するための電力を上記車両と非接触で供給する非接触充電電力供給システムとを備えたことを特徴とする。

【０００９】

その際、サービスシステムに接続して自己の車両のバッテリ情報を取得可能な通信端末を更に備えることが望ましい。

【発明の効果】

【００１０】

本発明の電気自動車のバッテリ充電システムは、電気自動車のバッテリ充電を自動化して充電操作の煩雑さを解消することができ、充電の忘れや充電の機会を逸することを防止し、常に快適な使用可能状態に維持することができる。

【発明を実施するための最良の形態】

【００１１】

以下、図面を参照して本発明の実施の形態を説明する。図１～図５は本発明の実施の一形態に係わり、図１はバッテリ充電システムの全体構成図、図２は車両システムの構成図、図３は車両システム側の処理を示すフローチャート、図４はサービスシステムサーバ側の処理を示すフローチャート、図５は充電ステーション側の処理を示すフローチャートである。

【００１２】

図１に示すように、本形態におけるバッテリ充電システムは、ユーザの電気自動車に備えられた車両システム１０と、ユーザが車両情報を遠隔操作で把握するための通信端末５０と、予め設定された充電スペースに駐車した車両のバッテリを非接触で充電可能な充電ステーション６０と、予め登録された個々のユーザの車両情報を一括して管理するサービスシステムの中核となるサービスシステムサーバ１００とを主として構成される。このバッテリ充電システムにおいては、車両システム１０と通信端末５０と充電ステーション６０とが通信網を介してサービスシステムサーバ１００に接続され、サービスシステムサーバ１００の管理下で自動的に車載バッテリを充電することができる。

【００１３】

通信端末５０としては、ユーザが所有する携帯型の情報端末（Personal Digital Assistant;PDA）、ノート型のコンピュータ（ノートパソコン）、携帯電話機等を用いることができる。ユーザは、自己の車両のバッテリを充電する際に、通信端末５０をパケット通信網等を介してサービスシステムサーバ１００に接続することにより、自己の車両のバッテリの充電量、充電状態、満充電までの時間、残存容量等のバッテリ状態や推定走行可能距離等の情報を受信し、表示や音声によって確認することができる。

【００１４】

また、通信端末５０として、ユーザの車両の車両システム１０内に備えられた表示装置

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や音声装置であっても良く、更には、通信端末５０として、ユーザの自宅等に設置するデスクトップ型のコンピュータを用いることも可能である。車両システム１０内の表示装置や音声装置を用いる場合には、車両システム１０をサービスシステム専用の無線通信網を介してサービスシステムサーバ１００に接続することが望ましく、サービスシステムサーバ１００からの情報を表示或いは音声によって自動的に確認することができる。また、デスクトップ型のコンピュータを用いる場合には、インターネット等のネットワークを経由してサービスシステムサーバ１００に接続することにより、サービスシステムサーバ１００からの情報をディスプレイに表示させて確認することができる。

【００１５】

車両システム１０は、図２に例示するように、マイクロコンピュータ及び各種インターフェースや周辺回路等を備えて構成される電子制御装置（ＥＣＵ）１１を中心として、バッテリ１２，バッテリ１２からの直流電圧を交流電圧に変換してモータ２０に供給するインバータ１３等を備えて構成されている。更に、本形態においては、電磁誘導による非接触のインダクティブ充電方式に対応して、充電カプラ１５ａからの交流電力を直流に変換して平滑化し、バッテリ１２を充電する整流・平滑化回路１４を備えている。充電カプラ１５ａは、充電ステーション６０の後述する充電カプラ１５ｂに対向されて絶縁変圧器を構成するものであり、例えば、車体の下部に配設されている。

【００１６】

ＥＣＵ１１は、インバータ１３を介したモータ２０の制御やバッテリ１２の管理を主として実行する制御装置であり、図２においては、システム全体を統括する単一のユニットとして図示しており、バッテリ１２の充電情報を外部に送信可能な通信手段としての通信モジュール１１ａをユニット内に備えている。この場合、ＥＣＵ１１は、各制御項目毎の複数のユニットで構成するようにしても良く、各ユニットを、例えばＣＡＮ（Controller Area Network）等の通信ラインを介して双方向通信可能に接続し、互いの制御情報や制御対象の動作状態に係わるセンシング情報を相互に通信するようにしても良い。

【００１７】

ＥＣＵ１１によるモータ制御においては、ＥＣＵ１１は、図示しないアクセルペダルの踏込み量を検出するセンサからの信号に基づいてドライバーの要求する駆動力を算出し、モータ２０の回転数や電圧・電流等の情報に基づいて、モータ２０の出力をドライバーの要求駆動力に一致させるべく、インバータ１３を制御する。また、ＥＣＵ１１によるバッテリ管理においては、ＥＣＵ１１は、バッテリ１２の充電状態(State of charge:SOC)で示される残存容量やバッテリ１２の劣化度等によるバッテリ状態を把握し、このバッテリ状態を把握した上でのバッテリ１２の冷却、サービスシステムを介した充電ステーション６０における充電状態の監視、異常検出及び異常検出時の保護動作等を行う。

【００１８】

特に、バッテリ１２の充電に際しては、ＥＣＵ１１は、ユニット内に備えた通信モジュール１１ａを介してサービスシステムサーバ１００との通信を行い、バッテリ１２の電圧、残存容量、フェール情報等のバッテリ情報をサービスシステムサーバ１００へ送信する。サービスシステムサーバ１００では、車両システム１０（ＥＣＵ１１）からのバッテリ情報とサービスシステムサーバ１００内に蓄積された情報とに基づいて最適な充電スケジュールを設定し、ユーザ側からの指示に応じて充電ステーション６０に充電開始／充電終了信号を送信し、バッテリの充電を制御する。

【００１９】

充電ステーション６０は、本形態においては、電磁誘導による非接触の充電方式を採用することにより、バッテリを充電するための電力を車両と非接触で供給する非接触充電電力供給システムを形成している。従って、充電ステーション６０には、ノイズフィルタ，整流・力率改善回路、共振型コンバータ等によって構成される充電装置６０ａが備えられ、更に、サービスシステムサーバ１００との通信を制御する通信装置６０ｂが備えられている。

【００２０】

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充電装置６０ａは、ノイズフィルタを介して入力される商用の交流電源を一旦直流に変換し、歪みを補正しつつ高周波の交流に変換して、充電用駐車スペースに設置された充電カプラ１５ｂ及び車両側の充電カプラ１５ａを介して車載のバッテリ１２を充電する。すなわち、車体下部に充電カプラ１５ａを配設した車両を、充電ステーション６０の予め規定された充電用駐車スペースに駐車すると、車両の充電カプラ１５ａと充電用駐車スペースに配置された充電カプラ１５ｂとが対向配置され、電磁誘導による非接触でのバッテリ１２の充電が可能となる。

【００２１】

尚、充電ステーション６０とサービスシステムサーバ１００との通信は、本形態においては、無線通信による通信網を利用するものとするが、光ファイバケーブル等による有線の通信網を利用しても良い。

【００２２】

サービスシステムサーバ１００は、定期的にユーザの車両情報を取得して保管管理しており、最適且つ柔軟な充電制御及び監視を可能としている。具体的には、サービスシステムサーバ１００は、サーバ内に蓄積されている車両情報とＥＣＵ１１から送信されたバッテリ状態とに基づいて、充電の可否を判断すると共に、満充電までの充電量及び充電時間、現在及び充電後の推定走行可能距離等を演算し、ユーザの通信端末５０或いは車両システム１０に充電情報を送信する。そして、ユーザが選択した自動充電、充電開始、充電終了等の選択結果に応じて、充電ステーション６０に充電指示を送信する。

【００２３】

以下、バッテリ１２の充電制御に係わる処理について、図３に示す車両システム１０側の処理、図４に示すサービスシステムサーバ１００側の処理、図５に示す充電ステーション６０側の処理に分けて、対応するフローチャートを用いて説明する。

【００２４】

図３のフローチャートに示す車両システム１０側の処理では、先ず、最初のステップＳ１において、通信モジュール１１ａ等のサービスシステム用通信機器を含む充電システムを起動させる。そして、ステップＳ２でサービスシステムサーバ１００との通信を開始し、ステップＳ３でサービスシステムサーバ１００における車両認証用の登録キーを送信する。

【００２５】

次いで、ステップＳ４へ進んでサービスシステムサーバ１００から登録キーの照合結果を受信し、ステップＳ５で登録キーによる認証がＯＫとなったか否かを調べる。その結果、未登録等でサービスシステムの認証が得られない場合には、ステップＳ５からステップＳ１２へ進み、ユーザの通信端末５０或いは車両システム１０の表示装置や音声装置を介して、ユーザに登録車両でない旨を通知し、処理を抜ける。

【００２６】

また、ステップＳ５において、登録キーによる車両認証を経てサービスシステムの認証ユーザであることが確認された場合には、ステップＳ６へ進み、サービスシステムサーバ１００に自己の車両のバッテリ電圧、バッテリ残存容量、フェール情報等の車両情報を送信する。次に、ステップＳ７へ進み、サービスシステムサーバ１００から送信された充電スケジュールを受信する。

【００２７】

その後、ステップＳ８において、ユーザの充電モードの選択が自動充電か否かを調べる。ユーザによる充電モードの選択は、例えば、自己の通信端末５０、或いは車両システム１０内の入力装置を使用して行われ、設定時間内にユーザが意図的に充電停止或いは充電操作のキャンセルを選択しない場合には、自動的に充電が行われる自動充電モードが選択されたものとして扱う。その結果、自動充電である場合には、ステップＳ８からステップＳ９へ進んでサービスシステムサーバ１００に自動充電の充電モード選択信号を送信し、処理を抜ける。

【００２８】

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また、ステップＳ８において自動充電でない場合には、ステップＳ８からステップＳ１０へ進み、ユーザが充電停止或いは充電操作のキャンセルを選択したか否かを調べる。そして、ユーザが未だ充電モードを選択しておらず、設定時間が経過していない場合には、ステップＳ８へ戻り、充電停止或いはキャンセルが選択されている場合、ステップＳ１０からステップＳ１１へ進み、サービスシステムサーバ１００へ充電停止或いは充電キャンセル信号を送信し、処理を抜ける。

【００２９】

次に、サービスシステムサーバ１００側の処理について、図４のフローチャートを用いて説明する。

【００３０】

サービスシステムサーバ１００側の処理は、充電ステーション６０の充電用駐車スペースに車両が進入したとき、システム待機状態から最初のステップＳ２１が実行され、このステップＳ２１で、車両が充電用駐車スペースの規定の位置に駐車されたか否かを調べる。そして、車両の駐車位置が規定位置でない場合には処理を抜け、車両が規定位置に駐車された場合、ステップＳ２２へ進んで車両システム１０から送信される登録キーを受信し、サーバ内に予め登録されている登録キーと照合して登録ユーザの車両か否かの認証を行う。

【００３１】

そして、ステップＳ２３で、登録キーの照合結果を、ユーザの通信端末５０（車両システム１０の表示装置や音声装置でも良い）及び充電ステーション６０に送信し、ステップＳ２４で、登録キーによる認証がＯＫか否かを調べる。登録キーが予め登録してある内容と一致せず、車両認証結果がＮＧの場合には、ステップＳ２４から処理を抜け、登録キーによる車両認証がＯＫの場合、ステップＳ２４からステップＳ２５へ進み、サービスシステムサーバ１００内に蓄積されている車両情報と受信した車両情報（バッテリ状態）とに基づいて、充電の可否、現在のバッテリ残存容量での推定走行可能距離、充電スケジュール等を演算する。

【００３２】

充電スケジュールは、例えば、車両システム１０から送信された現在のバッテリ１２の残存容量や電圧、サービスシステムサーバ１００に蓄積されているバッテリ１２の初期及び途中経過時の残存容量や電圧からバッテリ劣化状態を推定し、現在の残存容量や推定した劣化状態を考慮して決定される。すなわち、バッテリの劣化が少なく且つ充電効率の高い最適な充電電圧・充電電流・充電時間を設定し、これらの組合せを充電スケジュールとして決定する。

【００３３】

そして、ステップＳ２６で充電の可否を判断し、充電不可であれば、ステップＳ２６からステップＳ３４へ進んで充電不可であることをユーザに通知し、ステップＳ３５でシステム待機状態となる。ユーザへの充電不可の通知は、例えば、通信端末５０が携帯電話機である場合には、予め登録したユーザの電話番号を参照して充電不可を送信する。

【００３４】

また、充電可能であれば、ステップＳ２６からステップＳ２７へ進んで推定走行可能距離、バッテリ残存容量、充電スケジュールから演算される充電終了時間等をユーザに通知する。そして、ステップＳ２８で、ユーザからの充電開始指示があり、且つ充電開始指示までの経過時間が閾値未満であるか否かを調べる。その結果、充電開始指示がないまま閾値以上の時間が経過した場合には、ステップＳ２８から前述のステップＳ３４へ進んでユーザに時間切れである旨を通知し、ステップＳ３５でシステム待機状態となる。また、ユーザからの充電開始指示が閾値の時間内にあった場合には、ステップＳ２８からステップＳ２９へ進んで充電開始信号を充電ステーション６０に送信し、充電を開始させる。

【００３５】

その後、ステップＳ３０へ進み、車両システム１０でバッテリ１２の満充電を検出して送信された充電終了信号、或いはユーザからの充電停止指示の受信待ちとなり、充電終了

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或いは充電停止を受信したとき、ステップＳ３１へ進んで充電後の走行可能距離やバッテリ残存容量等の推定値を演算する。そして、ステップＳ３２でこれらの推定値をユーザへ通知し、ステップＳ３３で充電ステーション６０での充電を終了或いは停止させるための充電終了信号を充電ステーション６０へ送信し、処理を抜ける。

【００３６】

以上の車両システム１０及びサービスシステムサーバ１００側の処理に対応する充電ステーション６０側の処理は、図５のフローチャートに示される。この充電ステーション６０側の処理は、サービスシステムサーバ１００における車両認証結果を受けて起動し、最初のステップＳ４１で登録車両としての認証がＯＫか否かを調べる。

【００３７】

そして、登録ＮＣの場合には、車両に対する充電電力を出力することなくステップＳ４１から処理を抜け、登録ＯＫの場合、ステップＳ４１からステップＳ４２へ進んで、サービスシステムサーバ１００から充電開始信号を受信したか否かを調べる。その結果、充電開始信号を受信していない場合には、ステップＳ４２から処理を抜け、充電開始信号を受信した場合、ステップＳ４２からステップＳ４３へ進んで、充電装置６０ａから高周波の充電電力を出力し、充電用駐車スペースの充電カプラ１５ｂと車両側の充電カプラ１５ａとを介して、電磁誘導による非接触での車両のバッテリ１２に対する充電を開始する。

【００３８】

その後、ステップＳ４４へ進んでサービスシステムサーバ１００からの充電終了信号の受信待ちとなる。そして、サービスシステムサーバ１００から充電終了信号を受信したとき、ステップＳ４４からステップＳ４５へ進んで充電装置６０ａを停止させ、車両のバッテリ１２に対する充電を終了させる。

【００３９】

以上のように、本形態においては、電気自動車を充電用の駐車スペースに駐車するだけで自動的に充電を開始することができ、しかも、自己の車両から離れても、サービスシステムから送信される情報によって充電状態を把握することができる。これにより、充電操作の煩雑さを解消することができ、充電の忘れや充電の機会を逸することを防止し、常に快適な使用可能状態に維持することができる。

【図面の簡単な説明】

【００４０】

【図１】バッテリ充電システムの全体構成図

【図２】車両システムの構成図

【図３】車両システム側の処理を示すフローチャート

【図４】サービスシステムサーバ側の処理を示すフローチャート

【図５】充電ステーション側の処理を示すフローチャート

【符号の説明】

【００４１】

１０　車両システム

１１　電子制御装置

１１ａ　通信モジュール（通信手段）

１２　バッテリ

５０　通信端末

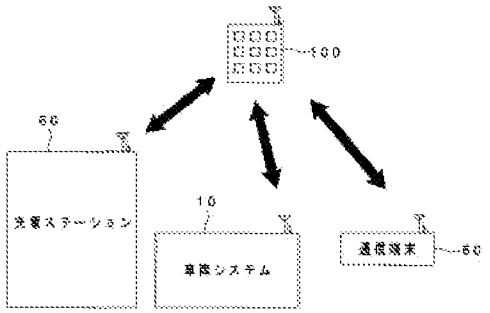
６０　充電ステーション（非接触充電電力供給システム）

１００　サービスシステムサーバ

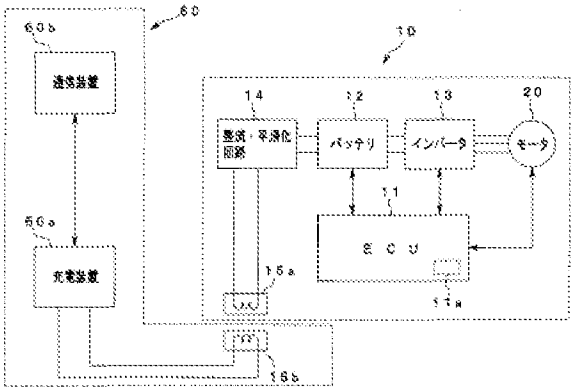
代理人　弁理士　伊　藤　進

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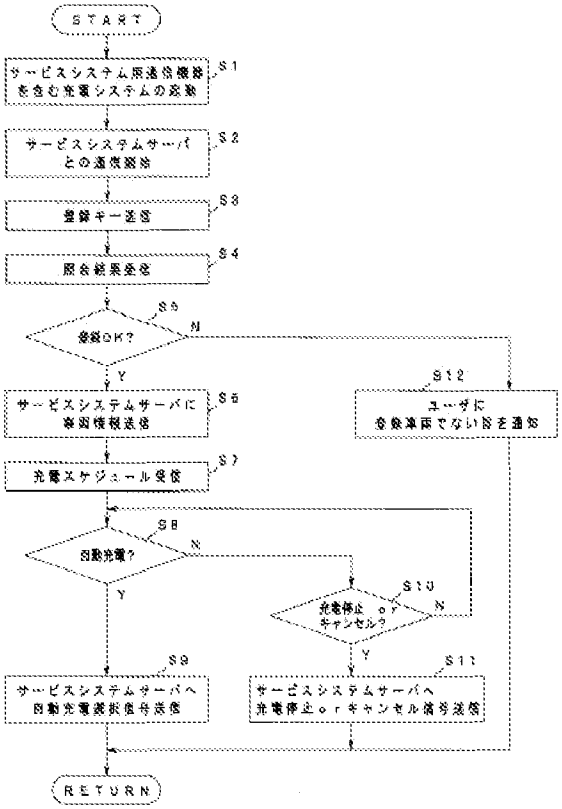
【図１】


100
50
充電ステーション
10
車両システム
通信端末
60

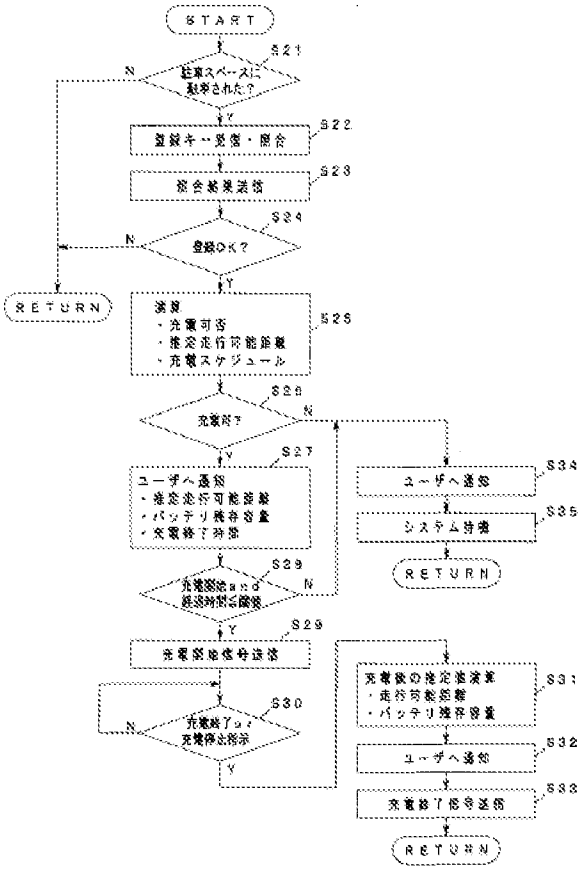
【図２】


60
60b
通信装置
10
14
12
13
20
監視・平滑化回路
バッテリ
インバータ
モータ
11
ECU
50a
充電装置
15a
17a
15b

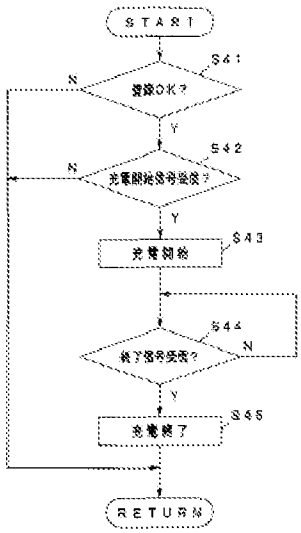
【図３】


START
サービスシステム用通信機器を含む充電システムの起動
S1
サービスシステムサーバとの通信接続
S2
登録キー送信
S3
照合結果受信
S4
登録OK?
S5
N
Y
サービスシステムサーバに車両情報送信
S6
ユーザに登録車両でないことを通知
S12
充電スケジュール受信
S7
自動充電?
S8
N
Y
充電停止 or キャンセル?
S10
N
Y
サービスシステムサーバへ自動充電開始信号送信
S9
サービスシステムサーバへ充電停止 or キャンセル信号送信
S11
RETURN

【図４】


START
駐車スペースに駐車された?
S21
N
Y
登録キー受信・照合
S22
照合結果送信
S23
登録OK?
S24
N
Y
RETURN
送信
・充電可否
・推定走行可能距離
・充電スケジュール
S25
充電?
S26
N
Y
ユーザへ通知
・推定走行可能距離
・バッテリ残存容量
・充電終了時間
S27
ユーザへ通知
S34
システム待機
S35
RETURN
充電開始and経過時間≦閾値
S28
N
Y
充電開始信号送信
S29
充電終了or充電停止指示
S30
N
Y
充電後の推定走行距離
・走行可能距離
・バッテリ残存容量
S31
ユーザへ通知
S32
充電終了信号送信
S33
RETURN

【図５】


START
登録OK?
S41
N
Y
充電開始信号受信?
S42
N
Y
充電開始
S43
終了信号受信?
S44
N
Y
充電終了
S45
RETURN

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THOMSON NATIVE MAT through DFP

SUBJECT OF THE INVENTION

SUBJECT OF THE INVENTION

The battery charge of an electric vehicle is automated,
The complexity of charge operation is eliminated.
PROBLEM to be solved
A vehicle parks a car at the position of prescription of the parking space for charge, and when a certification|authentication is OK, the propriety of charge, estimation runnable distance, a charge schedule, etc. are calculated (S25).
And by notifying a user of estimation runnable distance, a battery remaining capacity, and charge completion time (S27), and there existing charge start instructions, when, and the elapsed time to charge start instructions is under a threshold-value, a charge start signal is transmitted to a charge station, and charge is started (S29).
Then, when the charge completion or a charge stop is received, assessed values, such as runnable distance after charge and a battery remaining capacity, are calculated, a user is notified (S31, S32), and a charge completion signal is transmitted to a charge station (S33).
It prevents eliminating the complexity of charge operation and missing the forgetfulness of charge, and the opportunity of charge by this,
An electric vehicle can be maintained in an always comfortable useable state.

DETAILED DESCRIPTION of the INVENTION

[0001] TECHNICAL FIELD
This invention is related to the battery charge system of the electric vehicle equipped with a communication means by which the charge information of the battery mounted on an electric vehicle can be transmitted outside.

DESCRIPTION OF RELATED ART

[0002] The hybrid vehicle which mounted low pollution and the motor which generate|occur|produces power with the electric power from a battery for the purpose of promotion of saving resources in addition to an engine, and the electric vehicle it travel|drive|works only by an electric motor without

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mounting an engine are developed to the conventional motor vehicle it travel|drive|works with the engine which generate|occur|produces power by using gasoline etc. as a fuel in recent years.

[0003] In these hybrid vehicles and electric vehicles, the former drives an electric motor with an engine and can charge to a battery,
Since it is one in which the latter consumes the electric power of a battery by an electric motor to making unnecessary fundamentally charge by an external electric power source from this, it is necessary to charge a battery with a predetermined period using the charging equipment provided at the city area, the garage|carriage_shed of a house, etc.

[0004] In the case of the charge of the vehicle-mounted battery by this external electric power source, a user has to grasp|ascertain the charge state of a battery, complicated operation and management are needed, and a user's burden becomes larger.
Therefore, the various proposal for reduce|lightening the burden concerning this user's battery charge is comprised.
For example, to patent documents 1, the state of the charger currently installed in the vehicle station from the charge management apparatus currently put on the remote place and the charge state of the vehicle currently stored are monitored,
The technique which fully automates the vehicle station which charges a vehicle is disclosed.

[0005] Moreover, though the user who uses an electric vehicle is in the remote place distant from the electric vehicle, the charge system of the electric vehicle which can acquire the charge information related to charge at a desired timing is disclosed by patent documents 2.
Unexamined-Japanese-Patent No. 2002-123888
Unexamined-Japanese-Patent No. 2004-48900

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

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[0006] However
The conventional charge system which is disclosed by patent documents 1 and patent documents 2 makes it the main purpose that a user enables it to acquire the information related to the charge state of a battery in a remote place,
In order to actually start charge, a user needs to connect an external charger and external vehicles, such as a charge stand, by manual operation through connectors, such as a charge paddle.
Therefore, in an electric vehicle with adopting much commuter how riding, complicated operation called connection operation by manual operation becomes trouble in the case of battery charge,
There exists a possibility that the opportunity of charge may reduce and it may not fully use.

[0007] This invention was comprised in view of said situation, and automates the battery charge of an electric vehicle,
It aims at providing the battery charge system of the electric vehicle which can eliminate the complexity of charge operation.

MEANS TO SOLVE THE PROBLEM

[0008] In order to achieve said objective, the battery charge system of the electric vehicle by this invention is a battery charge system of the electric vehicle equipped with a communication means by which the charge information of the battery mounted on an electric vehicle can be transmitted outside,
Comprising:
Each user's battery information registered beforehand is managed collectively,
The service system which sets a charge schedule based on the present battery information transmitted from each vehicle, and the battery information accumulate|stored beforehand,
It connects so that it can communicate with said service system,
The non-contact charge electric power supply system which is non-contact and supplies the electric power for charging said battery with said vehicle with the instructions from said service system was provided.
It is characterized by the above-mentioned.

[0009] It is desirable in that case to provide further the communication terminal which connects to a service system and can acquire the battery information of a self vehicle.

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[0010] ADVANTAGE OF THE INVENTION

The battery charge system of the electric vehicle of this invention can automate the battery charge of an electric vehicle, and can eliminate the complexity of charge operation, and it prevents missing the forgetfulness of charge, and the opportunity of charge,
It can maintain in an always comfortable useable state.

PREFERRED EMBODIMENT OF THE INVENTION

[0011] Hereafter, Embodiment of this invention is demonstrated with reference to drawing.
FIGS. 1-5 is involved in one Embodiment of this invention,
FIG. 1 is the whole block diagram of a battery charge system,
FIG. 2 is the block diagram of a vehicle system,
FIG. 3 is a flowchart which shows processing of the vehicle system side,
FIG. 4 is a service-system server.
The flowchart which shows processing of the side, and FIG. 5 are flowcharts which show processing of the charge station side.

[0012] As shown in FIG. 1, the battery charge system in this form
The vehicle system 10 with which a user's electric vehicle was equipped, and the communication terminal 50 for a user to grasp|ascertain vehicle information by remote operation,
The service-system server 100 used as the charge station 60 which is non-contact and can charge the battery of the vehicle parked at the predetermined charge space, and the core of the service system which manages collectively each user's vehicle information registered beforehand can mainly be comprised.
In this battery charge system, the vehicle system 10, the communication terminal 50, and the charge station 60 are connected to the service-system server 100 through a communication network, and a vehicle-mounted battery can be automatically charged under management of the service-system server 100.

[0013] The computer (notebook personal computer) of the portable information terminal (Personal Digital Assistant;PDA) and the note(book) type|mold which a user owns, a mobile phone etc. can be used as a communication terminal 50.
When a user charges the battery of a self vehicle, he receives information, such as battery states, such as the charge amount of the battery of a self vehicle, a charge state, the time to a full charge, a remaining capacity, and estimation runnable distance, by connecting the communication terminal 50 to the service-system server 100 through a packet communication network etc.,
It can confirm by the display or an audio|voice.

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[0014] Moreover, the display device and audio|voice apparatus which were provided in the vehicle system 10 of a user's vehicle may be used as a communication terminal 50.
Furthermore, it is also possible to use the computer of the desk-top type|mold installed in a user's house etc. as a communication terminal 50.
When using the display device and audio|voice apparatus in the vehicle system 10, it is desirable to connect to the service-system server 100 through the radio|wireless-communication net|network only for the vehicle system 10 a service system, and the information from the service-system server 100 can be automatically confirmed by the display or an audio|voice.
Moreover, when using the computer of a desk-top type|mold, by going through networks, such as the internet, and connecting to the service-system server 100, the information from the service-system server 100 can be displayed on a display, and can be confirmed.

[0015] The vehicle system 10 centers on the electronic controller (ECU) 11 which is equipped with a microcomputer, various interface, a periphery circuit, etc., and is comprised, is equipped with inverter 13 grade which transform|converts the DC voltage from battery 12 and battery 12 into an alternating voltage, and is supplied to motor 20, and is comprised so that it may illustrate in FIG. 2.
Furthermore, in this form, it respond|corresponds to the non-contact inductive charge system by an electromagnetic induction, and the alternating current electric power from the charge coupler 15a is transform|converted into direct current|flow, and is smoothed,
The rectification * smoothing circuit 14 which charges battery 12 is provided.
The charge coupler 15a can oppose the charge coupler 15b which the charge station 60 mentions later, and an insulating transformer is comprised.
For example, it arranges at the lower part of a vehicle body.

[0016] ECU11 is a control apparatus which mainly performs control of motor 20 and management of battery 12 via inverter 13,
In FIG. 2, it is illustrating as a single unit which generalizes system whole,
The communication module 11a as a communication means by which the charge information of battery 12 can be transmitted outside is provided in the unit.
In this case, it is sufficient to make it comprise ECU11 in several units for each control item.
Each unit is connected so that two-way communication can be carried out, for example through communication lines, such as CAN(Controller Area Network).
It is sufficient to make mutual control information and the sensing information concerning the operation state of a control object communicate mutually.

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[0017] In the motor control by ECU11, ECU11 calculates the driving force which a driver requires based on the signal from the sensor which detects the treading-in amount of the accelerator pedal which is not illustrated,
Based on information, such as a rotation speed|number of motor 20, and a voltage * electric current, inverter 13 is controlled in order to coincide the output of motor 20 with the requirement driving force of a driver.
Moreover, in the battery management by ECU11, ECU11 grasps|ascertains the battery state by a remaining capacity, a degradation degree of battery 12, etc. which are shown in the charge state (State of charge;SOC) of battery 12,
It is the protected operation at the time of monitoring of the charge state in the charge station 60, abnormality detection, and abnormality detection via cooling of battery 12 when this battery state has been grasped|ascertained, and a service system etc. is performed.

[0018] In particular ECU11 performs communication with the service-system server 100 through the communication module 11a provided in the unit in the case of the charge of battery 12,
Battery information, such as a voltage of battery 12, a remaining capacity, and fail information, is transmitted to the service-system server 100.
In the service-system server 100, an optimal charge schedule is set based on the battery information from the vehicle system 10 (ECU11), and the information accumulate|stored into the service-system server 100,
According to the instructions from the user side, charge start / charge completion signal is transmitted to the charge station 60,
The charge of a battery is controlled.

[0019] The charge station 60 has formed the non-contact charge electric power supply system which is non-contact and supplies the electric power for charging a battery with a vehicle by employing the non-contact charge system by an electromagnetic induction in this form.
Therefore, the charge station 60 is equipped with charger 60a comprised by a noise filter, a rectification * power-factor-improvement circuit, a resonance type|mold converter etc.,
Furthermore, the communication apparatus 60b which controls communication with the service-system server 100 is provided.

[0020] Charger 60a once transform|converts into direct current|flow the commercial AC power supply input through a noise filter,
It transform|converts into alternating current of a high frequency, correcting distortion,
The vehicle-mounted battery 12 is charged through the charge coupler 15b installed in the parking space for charge, and the charge coupler 15a of the vehicle side.
That is, when the vehicle which arranged the charge coupler 15a at the vehicle-body lower part is parked at the parking space for charge as which it prescribed to the charge station 60 beforehand,

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the charge coupler 15a of a vehicle and the charge coupler 15b arranged at the parking space for charge will arrange opposite, and charge of battery 12 non-contact by an electromagnetic induction can be performed.

[0021] In addition, the communication with the charge station 60 and the service-system server 100 shall utilize the communication network by the radio|wireless communication in this form.
However
It is sufficient to utilize the wired communication network by an optical fiber cable etc.

[0022] The service-system server 100 is acquiring and carrying out storage management of a user's vehicle information regularly,
Optimal and flexible charge control and monitoring are enabled.
Specifically, the service-system server 100 calculates the estimation runnable distance after the charge amount to a full charge and charge time, the present, and charge etc. while judging the propriety of charge based on the vehicle information accumulate|stored into the server, and the battery state transmitted from ECU11,
Charge information is transmitted to a user's communication terminal 50 or vehicle system 10.
And according to selection results, such as automatic battery charge which the user selected, a charge start, and the charge completion, charge instructions are transmitted to the charge station 60.

[0023] Hereafter, it divides into the processing of the vehicle system 10 side shown in FIG. 3, the processing of the service-system server 100 side shown in FIG. 4, and the processing of the charge station 60 side shown in FIG. 5, and the processing concerning the charge control of battery 12 is demonstrated using the flowchart which respond|corresponds.

[0024] First in the processing of the vehicle system 10 side shown to the flowchart of FIG. 3, the charge system which contains communication apparatuses for service systems, such as a communication module 11a, in the first step S1 is started.
And communication with the service-system server 100 is started in step S2,
The register key for a vehicle certification|authentication in the service-system server 100 is transmitted in step S3.

[0025] Subsequently, it progresses to step S4 and the collation result of a register key is received from the service-system server 100,
It is investigated whether the certification|authentication by a register key was set to OK in step S5.
As a result, when the certification|authentication of a service system is not obtained by un-registering etc., it progresses to step S12 from step S5, and a user is notified of the purport which

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is not a registration vehicle through the display device and audio|voice apparatus of a user's communication terminal 50 or the vehicle system 10,
It pulls out from processing.

[0026] Moreover, when it is confirmed through the vehicle certification|authentication by a register key in step S5 that he is the certification|authentication user of a service system, it progresses to step S6 and vehicle information, such as the battery voltage of the vehicle of self server / 100 / service-system , a battery remaining capacity, fail information, is transmitted.
Next, it progresses to step S7 and the charge schedule transmitted from the service-system server 100 is received.

[0027] Then, in step S8, it is investigated whether the selection in a user's charge mode is automatic battery charge.
The selection (for example) in the charge mode by a user is handled as that by which the automatic-battery-charge mode in which charge was performed automatically was selected, when it is carried out by using the communication terminal 50 of self, or the input device in the vehicle system 10 and a user does not select cancellation of a charge stop or charge operation intentionally within setup time.
As a result, in being automatic battery charge, it progresses to step S9 from step S8, and transmits the charge mode-selection signal of automatic battery charge to the service-system server 100,
It pulls out from processing.

[0028] Moreover, in not being automatic battery charge in step S8, it progresses to step S10 from step S8, and it investigates whether the user selected cancellation of a charge stop or charge operation.
And when a user does not yet select charge mode and setup time is not passing, it returns to step S8, and when a charge stop or cancellation is selected, it progresses to step S11 from step S10, and a charge stop or a charge cancellation signal is transmitted to the service-system server 100,
It pulls out from processing.

[0029] Next, processing of the service-system server 100 side is demonstrated using the flowchart of FIG. 4.

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[0030] As for processing of the service-system server 100 side, when a vehicle approachs into the parking space for charge of the charge station 60, the first step S21 is performed from a system standby state,
It is investigated whether in this step S21, the vehicle parked a car at the position of prescription of the parking space for charge.
And when the parking position of a vehicle is not a prescription position, it pulls out from processing, and when a vehicle parks a car at a prescription position, the register key which progresses to step S22 and is transmitted from the vehicle system 10 is received,
It collates with the register key beforehand registered into the server, and certify|authenticates that it is a registered user's vehicle.

[0031] And the collation result of a register key is transmitted to a user's communication terminal 50 (The display device and audio|voice apparatus of the vehicle system 10 may be used.) and charge station 60 in step S23,
In step S24, it is investigated whether the certification|authentication by a register key is OK.
It does not correspond with the content into which the register key is registered beforehand, but when a vehicle certification|authentication result is NG|no_good, it pulls out from processing from step S24, and when the vehicle certification|authentication by a register key is OK, it progresses to step S25 from step S24, and the estimation runnable distance in the propriety of charge and the present battery remaining capacity, a charge schedule, etc. are calculated based on the vehicle information accumulate|stored into the service-system server 100, and the received vehicle information (battery state).

[0032] A charge schedule (for example) estimates a battery degradation state from the remaining capacity and voltage at the time of the initial stage of battery 12 accumulate|stored in the remaining capacity and voltage of the present battery 12 transmitted from the vehicle system 10, and the service-system server 100, and progress,
It determines in consideration of a present remaining capacity and the estimated present degradation state.
That is, degradation of a battery sets the few|small and high optimal charge voltage * charging-current * charge time of charge efficiency,
Such combination is determined as a charge schedule.

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[0033] And the propriety of charge is judged in step S26,
If charge is improper, a user will be notified of the ability for it not to progress to step S34 and not charge from step S26,
It will be in a system standby state in step S35.
The notification (for example) which cannot charge a user transmits a charge failure with reference to the telephone number of the user who registered beforehand, when the communication terminal 50 is a mobile phone.

[0034] Moreover, if chargeable, a user will be notified of the charge completion time which progresses to step S27 from step S26, and is calculated from estimation runnable distance, a battery remaining capacity, and a charge schedule.
And there exist charge start instructions from a user in step S28,
And it is investigated whether the elapsed time to charge start instructions is under a threshold-value.
As a result, when the time more than a threshold-value passes with no charge start instructions, it progresses to above-mentioned step S34 from step S28, and a user is notified of the purport which is the deadline,
It will be in a system standby state in step S35.
Moreover, when the charge start instructions from a user suit within the time of a threshold-value, it progresses to step S29 from step S28, and a charge start signal is transmitted to the charge station 60,
Charge is started.

[0035] Then, it progresses to step S30 and becomes the charge completion signal which detected the full charge of battery 12 and was transmitted by the vehicle system 10, or the receiving waiting of the charge stop instructions from a user,
When the charge completion or a charge stop is received, it progresses to step S31 and assessed values, such as runnable distance after charge and a battery remaining capacity, are calculated.
And a user is notified of these assessed values in step S32,
The charge completion signal for completing or stopping the charge in the charge station 60 in step S33 is transmitted to the charge station 60,
It pulls out from processing.

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[0036] Processing of the charge station 60 side which respond|corresponds to processing of the above vehicle system 10 and the service-system server 100 side is shown by the flowchart of FIG. 5.
Processing of this charge station 60 side receives and starts the vehicle certification|authentication result in the service-system server 100,
It is investigated in the first step S41 whether the certification|authentication as a registration vehicle is OK.

[0037] And in the case of registration NG, it is investigated whether it pulled out from processing from step S41, without outputting the charge electric power with respect to a vehicle, in Registration OK, it progressed to step S42 from step S41, and the charge start signal was received from the service-system server 100.
As a result, when the charge start signal is not received, it pulls out from processing from step S42, and when a charge start signal is received, it progresses to step S43 from step S42, and the charge electric power of a high frequency is output from Charger 60a,
The charge with respect to battery 12 of a vehicle non-contact by an electromagnetic induction is started through the charge coupler 15b of the parking space for charge, and the charge coupler 15a of the vehicle side.

[0038] Then, it progresses to step S44 and becomes the receiving waiting of the charge completion signal from the service-system server 100.
And when a charge completion signal is received from the service-system server 100, it progresses to step S45 from step S44, and Charger 60a is stopped,
The charge with respect to battery 12 of a vehicle is terminated.

[0039] As mentioned above, in this form, even if it can start charge automatically only by parking an electric vehicle at the parking space for charge and separates from the vehicle of further self, a charge state can be grasped|ascertained with the information transmitted from a service system.
Thereby, the complexity of charge operation can be eliminated and it prevents missing the forgetfulness of charge, and the opportunity of charge,
It can maintain in an always comfortable useable state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040]

FIG. 1: The whole block diagram of a battery charge system

FIG. 2: The block diagram of a vehicle system

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FIG. 3: The flowchart which shows processing of the vehicle system side

FIG. 4: The flowchart which shows processing of the service-system server side

FIG. 5: The flowchart which shows processing of the charge station side

DESCRIPTION OF SYMBOLS

[**0041**] 10 vehicle system
Eleven electronic controllers
11a communication module (communication means)
Twelve batteries
50 communication terminal
60 charge station (non-contact charge electric power supply system)
100 service-system server
Representative
Patent attorney

i

1. 1. It is the battery charge system of the electric vehicle equipped with a communication means by which the charge information of the battery mounted on an electric vehicle can be transmitted outside,
   Comprising:
   Each user's battery information registered beforehand is managed collectively,
   The service system which sets a charge schedule based on the present battery information transmitted from each vehicle, and the battery information accumulate|stored beforehand,
   It connects so that it can communicate with said service system,
   The non-contact charge electric power supply system which is non-contact and supplies the electric power for charging said battery with said vehicle with the instructions from said service system was provided.
   The battery charge system of the electric vehicle characterized by the above-mentioned.
2. 2. It connects to said service system,
   The communication terminal which can acquire the battery information of a self vehicle from said service system was provided further.
   The battery charge system of the electric vehicle of Claim 1 characterized by the above-mentioned.

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PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

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	2	4742283		1988-05-03	Bolger, John G., et al.	
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	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US20

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	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US20

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	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US20

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	Attorney Docket Number	013350-9003-US20

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	1	JP2006074868	JP		2006-03-16	Fuji Heavy Ind. Ltd.		☒
	2	WO2008026390	WO		2008-03-06	Tokai Rika Co.; Toyota Motor	(English Absract)	☒

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Search Report issued in corresponding PCT/US2009/054174; December 3, 2009	
	2	Written Opinion issued in corresponding PCT/US2009/054174; December 3, 2009	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US20

	3	Search Report issued in corresponding EP09808718.2; September 21, 2017
	4	Official Action issued in corresponding EP09808718.2; April 29, 2020
	5	Official Action issued in corresponding EP09808718.2; February 17, 2021
	6	Official Action issued in corresponding EP09808718.2; July 20, 2021

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	16249037
	Filing Date	2019-01-16
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US20

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/christopher b. austin/	Date (YYYY-MM-DD)	2021-09-29
Name/Print	Christopher B. Austin	Registration Number	41,592

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: CHRISTOPHER AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	03 DEC 2009

Applicant's or agent's file reference	FOR FURTHER ACTION
00000-0977WO	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2009/054174	18 August 2009	18 August 2008

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - H01M 10/44 (2009.01)
USPC - 320/128

Applicant AUSTIN, CHRISTOPHER

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	27 November 2009	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2009/054174

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2009/054174

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the appicable time limit:
   - ☒ paid additional fees
   - ☐ paid additional fees under protest and, where applicable, the protest fee
   - ☐ paid additional fees under protest but the applicable protest fee was not paid
   - ☐ not paid additional fees
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
   - ☐ complied with
   - ☒ not complied with for the following reasons:

See supplemental box.

4. Consequently, this opinion has been established in respect of the following parts of the international application:
   - ☐ all parts
   - ☒ the parts relating to claims Nos. 1-139, 142, 146-147

Form PCT/ISA/237 (Box No. IV) (July 2009)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2009/054174

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	4-5, 7-9, 15-17, 19, 22-29, 34-37, 39, 42-43, 46-139, 142, 146-147	YES
	Claims	1-3, 6, 10-14, 18, 20-21, 30-33, 38, 40-41, 44-45	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-139, 142, 146-147	NO
Industrial applicability (IA)	Claims	1-139, 142, 146-147	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-3, 6, 10-14, 18, 20-21, 30-33, 38, 40-41, 44-45 lack novelty under PCT Article 33(2) as being anticipated by Hobbs.

Regarding claim 1, Hobbs discloses a vehicle charger for charging a battery of a vehicle (abstract) and adapted for communication with a first controller remote from the vehicle and vehicle charger (diagnostic device 130, which may be a PDA, and be wireless "cellular telephony" col. 7, lines 30-48), the vehicle charger comprising:
an electrical power cord 125 releasably attachable to at least one of the vehicle (by plug 126, fig. 1; col. 8, lines 1-5) and a source of power (power grid, 105);
a second controller electrically coupled to the electrical power cord (see cord 125 connected to the controller 100); and
at least one of a transmitter and a receiver coupled to the second controller and adapted for communication with the first controller (network 275, fig. 2),
the second controller responsive to at least one signal from the first controller by changing a charging state of the vehicle charger (diagnostic device 130 can program charger 100, col. 7, lines 30-43).

Regarding claim 2, Hobbs discloses the electrical power cord 125 is releasably attachable to the vehicle (by connector 126, col. 6, lines 4-11) and the source of power 105/205 (via cable 120 and fuse or circuit breaker 222, fig. 1, 2; col. 5, lines 55-63; col. 9, lines 10-12).

Regarding claim 3, Hobbs discloses a housing 102 in which the second controller is located, the housing coupled to and at least partially located between opposite ends of the electrical power cord (see housing 102 between power cord end 126 and 120, fig. 1).

Regarding claim 6, Hobbs discloses the second controller is adapted for wireless communication with the first controller via the at least one of the transmitter and receiver (controller 270 communicates with internet through network 275, col. 11, lines 15-24; controller 270 communicates with diagnostic device 130, col. 11, lines 1-2; diagnostic device 130 may be wireless, col. 7, lines 30-48).

Regarding claim 10, Hobbs discloses the vehicle charger has a first charging state in which the vehicle charger is not charging the battery, and a second charging state in which the vehicle charger is charging the battery (see start 302, for not charging and start charging 315 for charging, fig. 3).

Regarding claim 11, Hobbs discloses a display 107 coupled to the second controller 100 (fig 1), the display displaying a level of charge of the battery (indication to alert user when battery is charged, col. 3, lines 15-26).

Regarding claim 12, Hobbs discloses a display 107 coupled to the second controller 100, the display displaying an amount of time for the battery to be fully charged (time to complete charge, col. 7, lines 16-19) based upon information regarding the battery received by the second controller (controller 270 controls display, col. 10, lines 31-38).

Regarding claim 13, Hobbs discloses the amount of time is an amount of time that is estimated by the second controller (amount of time estimated, col. 7, lines 17-18) or received by the second controller.

Regarding claim 14, Hobbs discloses the amount of time is updated on the display 107 by the second controller 100 during a charge session (time estimated is displayed, col. 7, lines 17-18; this is done in real time, col. 22, lines 44-46).

Regarding claim 18, Hobbs discloses a display 107 displaying a cost of power to the battery per unit time (time for charge and bill for fuel are displayed, col. 7, lines 16-19).

Regarding claim 20, Hobbs discloses a display displaying a total power cost of a charging session (bill for the fuel (charge) is displayed, col. 7, lines 16-19).

Regarding claim 21, Hobbs discloses the total power cost is updated on the display by the second controller during a charging session (bill for the fuel (charge) is displayed, col. 7, lines 16-19; power level is displayed in real time, col. 22, lines 44-46).

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Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Continuation of Box IV:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-45, 142, 147, drawn to a vehicle charger comprising a first remote controller and a second controller, a transmitter and a receiver coupled to the second controller, and adapted for communication with the first controller, the second controller responsive to at least one signal from the first controller by changing a charging state of the vehicle charger.
Group II, claims 46-139,146 drawn to a vehicle charger comprising a user manipulatable control and operable by a user to enter a time of day at which a charging session will end.
Group III, claim 140, drawn to a vehicle charger comprising a controller which supplies electric power to the battery if a level of battery charge is below a threshold level, until the threshold level of battery charge is reached.
Group IV, claims 141,143-145 drawn to a vehicle charger comprising a display and a controller operable to display at least two different screens upon the display, at least one of the screens displaying information regarding a charging session, and at least one of the screens displaying settings at least partially defining the manner of operation of the battery charger.
Group V, claims 148, drawn to a vehicle charger comprising a controller which transmits a signal responsive to detection of an interruption of power supply to the vehicle charger.
Group VI, claims 149, 152, drawn to a vehicle charger or method for controlling batteries of multiple vehicles comprising a controller capable of increasing or decreasing a rate of charge, starting charging or stopping charging based at least in part on the time of day.
Group VII, claims 150, drawn to a vehicle charger comprising a first core on a vehicle, a second core in a location stationary with respect to the vehicle, the second core providing an inductive charge to the first core; at least one sensor positioned to detect the position of the first core with respect to the second core; a display; and a controller coupled to the display and responsive to signals from the sensor to display at least one indicator on the display indicating a direction in which the vehicle must move for an improved positional relationship betweent he first and second cores.
Group VIII, claim 151, drawn to a vehicle charger comprising a first connector coupled to the battery and controller and located on one side of the vehicle; a second connector coupled to the battery and controller and located on a different side of the vehicle.

The inventions listed as Groups I-VIII do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a first remote controller, a transmitter and a receiver coupled to the second controller, and adapted for communication with the first controller, the second controller responsive to at least one signal from the first controller by changing a charging state of the vehicle charger as claimed therein is not present in the invention of Groups II-VIII. The special technical feature of the Group II invention: a user manipulatable control and operable by a user to enter a time of day at which a charging session will end as claimed therein is not present in the invention of Groups I, III-VIII. The special technical feature of the Group III invention: a controller which supplies electric power to the battery if a level of battery charge is below a threshold level, until the threshold level of battery charge is reached as claimed therein is not present in the invention of Groups I, II, IV-VIII. The special technical feature of the Group IV invention: a display having at least two different screens upon the display, at least one of the screens displaying information regarding a charging session, and at least one of the screens displaying settings at least partially defining the manner of operation of the battery charger as claimed therein is not present in the invention of Groups I, II, III or V-VIII. The special technical feature of the Group V invention: the controller transmitting a signal responsive to detection of an interruption of power supply to the vehicle charger as claimed therein is not present in the invention of Groups I-IV, VI-VIII. The special technical feature of the Group VI invention: a controller capable of increasing or decreasing a rate of charge, starting charging or stopping charging based at least in part on the time of day as claimed therein is not present in the invention of Groups I-V, VII-VIII. The special technical feature of the Group VII invention: a first core on a vehicle, a second core in a location stationary with respect to the vehicle, the second core providing an inductive charge to the first core; at least one sensor positioned to detect the position of the first core with respect to the second core; a display; and a controller coupled to the display and responsive to signals from the sensor to display at least one indicator on the display indicating a direction in which the vehicle must move for an improved positional relationship betweent he first and second cores as claimed therein is not present in the invention of Groups I-VI or VIII. The special technical feature of the Group VIII invention: a first connector coupled to the battery and controller and located on one side of the vehicle; a second connector coupled to the battery and controller and located on a different side of the vehicle as claimed therein is not present in the invention of Groups I-VII.

Groups I, II, III, IV, V, VI, VII and VIII lack unity of invention because even though the inventions of these groups require the technical features of a battery charger controller having a display, communications means, releasable connectors to connect power to the battery, the controller and a power source; a display and a memory, and increasing or decreasing power depending on a state of charge of the battery, these technical features are not special technical features as thet do not make a contribution over the prior art in view of US 6,963,186 B2 (HOBBS) 08 November 2005, column 10, lines 31-43; column11, lines 15-24; column17, lines 38-41; figures 2, 3.

Since none of the special technical features of the Group I, II, III, IV, V, VI, VII or VIII inventions are found in more than one of the inventions, unity of invention is lacking.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Continuation of Box V, 2:

Regarding claim 30, Hobbs discloses the vehicle charger comprises at least one transmitter coupled to the second controller (network 275, fig. 2), and wherein the second controller is adapted to transmit at least one electrical signal representative of a level of charge of the vehicle battery via the at least one transmitter (diagnostic device 130 and charger communicate to control charging, col. 7, lines 30-48).

Regarding claim 31, Hobbs discloses the vehicle charger comprises at least one transmitter coupled to the second controller (network 275, fig. 2), and wherein the second controller is adapted to transmit at least one electrical signal representative of an estimated amount of battery charge time via the at least one transmitter (col. 7, lines 11-48).

Regarding claim 32, Hobbs discloses the vehicle charger comprises at least one transmitter coupled to the second controller (network 275, fig. 2), and wherein the second controller is adapted to transmit at least one electrical signal representative of a characteristic of the battery via the at least one transmitter (diagnostic device 130 and charger communicate to control charging, col. 7, lines 30-48).

Regarding claim 33, Hobbs discloses at least one user-manipulatable control (diagnostic device 130) to change at least one of the charging voltage and the charging amperage of the vehicle charger (col. 7, lines 30-48).

Regarding claim 38, Hobbs discloses a display 107 coupled to the second controller to display information regarding a charging session (col. 7, lines 16-19), wherein the display is an LCD display or a LED display (col. 7, lines 19-23).

Regarding claim 40, Hobbs discloses the controller is adapted to communicate with the first controller by power line communication (cord 131, col. 7, lines 30-32).

Regarding claim 41, Hobbs discloses the electrical power cord comprises both power transmission and communication lines electrically connected to the second controller (wiring from input power 205 to controller 270 to diagnostic device 130 (fig. 2), which is shown physically connected to the controller by power/communication cord 131 in fig. 1; and which has communication with the controller, col. 7, lines 30-48).

Regarding claim 44, Hobbs discloses the at least one signal comprises data representative of a cost of electrical power (bill for the fuel, col. 7, lines 16-19).

Regarding claim 45, Hobbs discloses the at least one signal comprises at least one of data representative of a time of day and a signal to start or stop charging the battery of the vehicle (diagnostic device controls charger, col. 7, lines 34-48).

Claim 4 lacks an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of McGinley et al., hereinafter referred to as McGinley.

Regarding claim 4, Hobbs lacks the teaching the housing at least partially defines one of the opposite ends of the electrical power cord. McGinley teaches a charger (abstract) where the housing at least partially defines one of the opposite ends of the electrical power cord (fig. 1).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have a housing which at least partially defines one of the opposite ends of the electrical power cord as taught by McGinley as the grid connection end of the plug of Hobbs in order to have a small charger which is easily transportable (McGinley, para. 0005).

Claims 5, 7-9, 22-25, 36-37, 42-43 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Kaplan et al., hereinafter referred to as Kaplan.

Regarding claim 5, Hobbs lacks the teaching wherein the second controller is adapted for communication with the first controller over the electrical power cord 125.
Kaplan teaches a vehicle charger (para. 0044) in which the controller 102 (para. 0043) is adapted for communication with a first controller (network communications, para. 0047) over the electrical power cord 208. Kaplan teaches this enables communication with a remote IPF module 134 (para. 0045) with no need for other special wiring.
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the power and communications cord of Kaplan as the cord of Hobbs in order to connect with a remote network without need for special wiring.

Regarding claim 7, Hobbs discloses the second controller is adapted for automatic establishment of communication with the first controller upon connection of the vehicle charger with at least one of the battery and the source of power.
Kaplan teaches automatic establishment of communication with the first controller upon connection of the vehicle charger with at least one of the battery and the source of power (remote IPF module 134 initials connection to adjust flow of power, para. 0135).
It would have been obvious to one of ordinary skill in the art at the time of the invention to establish automatic communication with the first controller as taught by Kaplan in the invention of Hobbs in order to notify grid operators when there is a problem (para. 0140-0142).

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In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Regarding claim 8, Hobbs discloses the second controller is adapted for communication with a computer, but lacks the teaching of receiving electric power information from the Internet.
Kaplan teaches receiving electric power information from the Internet (para. 0078-0080, 0083). Kaplan further teaches this allows the invention to to optimize power transfer (para. 0093).
It would have been obvious to one of ordinary skill in the art at the time of the invention to receive electric power information from the internet as taught by Kaplan in the invention of Hobbs in order to optimize power transfer.

Regarding claim 9, Hobbs discloses the second controller is adapted for wireless communication with the computer via the at least one of the transmitter and receiver (network 275, fig. 2).

Regarding claims 22-24, Hobbs discloses the second controller automatically changes the charging state of the vehicle charger based at least in part upon a threshold (current threshold, col. 22, lines 17-20), but lacks the teaching the threshold is a cost of power to the battery (claim 22) or is received from a user (claim 23), or is input by a user-manipulatable control of the vehicle charger (claim 24).
Kaplan teaches the threshold is a cost of power to the battery received from a user (user controls participation in power aggregation preferences, para. 0227-0228; power aggregation includes a power cost by bidding, para. 0167), the user using a user-manipulatable control of the vehicle charger (para. 0227).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the cost of power to the battery be part of a charging threshold as taught by Kaplan in the threshold of Hobbs in order to allow the user to receive the best cost for the power by bidding.

Regarding claim 25, Hobbs discloses the second controller automatically changes the charging state of the vehicle charger by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56).

Regarding claims 36-37, Hobbs discloses there are two displays (107 and indicator lights 108, fig.1) at least one of the screens 108 displaying information regarding a charging session (charging complete or whether there is a fault, col. 7, lines 11-15), and at least one of the screens 107 displaying settings at least partially defining the manner of operation of the vehicle charger (amount of time to complete charging, etc., col. 7, lines 14-18), but lacks the teaching of a single display with at least two different screens upon the display or of a user manipulatable control enabling a user to navigate to another screen.
Kaplan teaches the display may be a user manipulatable control of a portable computer (para. 0227). It is inherent that a portable computer display can have two screens, where a user manipulatable control, such as a mouse, can toggle between two screens.
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the two screens of Hobbs both displayed on the computer screen of Kaplan, with a user manipulatable control to choose the screen as is known in the art, in order to allow the user to receive easily viewed updates to his charging session upon his laptop computer.

Regarding claim 42, Hobbs lacks the teaching of a battery of the vehicle charger, the battery of the vehicle charger coupled to the second controller and the electrical power cord, and supplying power to charge the battery of the vehicle in at least one state of the vehicle charger.
Kaplan teaches a battery 1508 of the vehicle charger, the battery of the vehicle charger coupled to a second controller and the electrical power cord, and supplying power to charge the battery of the vehicle in at least one state of the vehicle charger (backup battery for operation in case of power outage, para. 0198).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the vehicle charger of Hobbs include a battery as taught by Kaplan in order to retain setting during a power outage.

Regarding claim 43, Hobbs lacks the teaching the battery of the vehicle charger supplies power to charge the battery of the vehicle based at least in part upon the at least one signal from the first controller.
Kaplan teaches the battery of the vehicle charger supplies power to charge the battery of the vehicle (para. 0198) based at least in part upon the at least one signal from the first controller (processor 1502 receives signals from the processor 1502, which communicates with the remote system, para. 0196).
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the battery of the vehicle charger upon a signal from the first controller as taught by Kaplan in the invention of Hobbs in order to provide the battery charging of the vehicle during a power outage.

Claims 15-17, 19 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Keith.

Regarding claims 15-17, Hobbs discloses a display 107 coupled to the second controller 100, the display displaying a power level by the battery during a vehicle charging session (power level displayed, col. 22, lines 44-46), but lacks the teaching of displaying an amount of power consumed (claim 15), the amount of power consumed by the battery is an amount of power that is estimated by the second controller or is received by the second controller (claim 16) or that the amount of power consumed is updated on the display by the second controller during the charging session (claim 17).
Keith teaches diplaying the amount of power consumed, which is estimated by the second controller and the amount of power consumed is updated (if voltage is within limits, the kilowatt hours are calculated and displayed, col. 22, lines 18-23).
It would have been obvious to one of ordinary skill in the art at the time of the invention to provide an update on the display of the power consumed as taught by Keith in the invention of Hobbs in order to allow the user to estimate a total power bill he may incur, and stop the charging if the bill is too large.

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In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Regarding claim 19, Hobbs teaches displaying the cost of power (col. 7, lines 16-19), but lacks the teaching the cost of power to the battery is received from the second controller by the first controller.
Keith teaches the cost of power to the battery is received from the second controller by the first controller (cost of power information transmitted, col. 19, lines 40-51; fig. 13).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the cost of power to the battery be accessed from the first controller as taught by Keith in the invention of Hobbs in order to receive the best price for the power used.

Claims 34-35, 39 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Vasant.

Regarding claims 34-35, Hobbs lacks the teaching of a reel upon which the electrical power cord is retractable (claim 34), wherein the reel is located on the vehicle (claim 35).
Vasant teaches a vehicle charger a reel upon which the electrical power cord is retractable, wherein the reel is located on the vehicle (retractable cord on the vehicle, col. 5, lines 4-6).
It would have been obvious to one of ordinary skill in the art at the time of the invention to use a retractable reel on the vehicle as taught by Vasant with the cord of Hobbs, in order to keep the cord from extending from the vehicle body when not in use (Vasant, col. 5, lines 4-6).

Regarding claim 39, Hobbs teaches a display 107 coupled to the second controller 100 to receive vehicle charge setting commands from a user (by key pad 104 or diagnostic device 130) and to display information regarding a charging session (col. 7, lines 11-51; fig. 1).
Hobbs lacks the teaching the display is a touch screen display.
Vasant teaches a vehicle charger having a touch screen display (col. 10, lines 18-24, 45-50; fig. 11).
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the touch screen display of Vasant as the display of Hobbs in order to have a display which will record responses which is more rugged in open air environments.

Claims 26-29, 46-47, 51-52, 55, 59-62, 66, 68-69, 73-79, 84, 86, 91-95, 98, 100, 104-107, 111, 113-114, 118-124, 129, 131, 136-139, 146-147 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Nor et al., hereinafter referred to as Nor.

Regarding claim 26, Hobbs lacks the teaching the second controller automatically changes the charging state of the vehicle charger based at least in part upon a time of day (claim 26); the time of day is received by the second controller from a user of the vehicle charger (claim 27), or the time of day is input to the vehicle charger via a user-manipulatable control of the vehicle charger (claim 28).
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49).
Nor further teaches the time of day is input to the controller of the vehicle charger via a user-manipulatable control of the vehicle charger (manual interface for personality data, col. 10, lines 17-33).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

Regarding claim 29, Hobbs discloses the second controller automatically changes the charging state of the vehicle charger by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56).

Regarding claim 46, Hobbs discloses a vehicle charger for charging a battery of a vehicle in the course of a charging session (abstract), the vehicle charger comprising:
a controller 100;
a display 107 coupled to the controller 100 and adapted to display a time (time estimated to complete charge, col. 7, lines 17-18); and
a user-manipulatable control 130 coupled to the controller 100 (col. 6, line 59 to col. 7, line 27);
the controller changing the supply of electric power to the vehicle battery during the course of the charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56);
based at least in part upon the time needed to charge the vehicle battery and adapted to display a time (time estimated is displayed, col. 7, lines 17-18).
Hobbs lacks the teaching the user-manipulatable control is operable by a user to enter a time of day at which the charging session will end, or the controller changes the supply of electric power supplied based on the time of day entered by the user.
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49)
Nor further teaches the time of day is input to the controller of the vehicle charger via a user-manipulatable control of the vehicle charger (manual interface for personality data, col. 10, lines 17-33).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

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In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Regarding claim 95, Hobbs discloses a vehicle charger for charging a battery of a vehicle (abstract), the vehicle charger comprising:
a display 107;
a user-manipulatable control 130 within reach of the user seated within the vehicle (the diagnostic device may be a hand held PDA, col. 7, lines 34-40; and may be wireless "cellular telephony" col. 7, lines 30-48);
a controller 100 coupled to the display 107 and to the battery 152 (fig. 1-2);
the controller changing a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56) based at least in part upon the time (time estimated is displayed, col. 7, lines 17-18), but lacks the teaching the user-manipulatable control is operable by a user to enter a time of day at which the charging session will end, or the controller changes the supply of electric power supplied based on the time of day entered by the user.
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49).
Nor further teaches the time of day is input to the controller of the vehicle charger via a user-manipulatable control of the vehicle charger (manual interface for personality data, col. 10, lines 17-33).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

Regarding claim 146, Hobbs discloses a vehicle charger for charging a battery of a vehicle in the course of a charging session (abstract), the vehicle charger comprising:
an electrical power cord 125 releasably attachable to the vehicle (by connector 126, col. 6, lines 4-11) and the source of power 105/205 (via cable 120 and fuse or circuit breaker 222, fig. 1, 2; col. 5, lines 55-63; col. 9, lines 10-12);
a controller 100/270 (fig. 1-2);
a housing 102 attached to the electrical cord 125;
a display 107 on the housing 102, coupled to the controller (see fig. 1), and adapted to display a time (time estimated is displayed, col. 7, lines 17-18); and
a user-manipulatable control 130 coupled (by wire 131 or wirelessly, col. 7, lines 30-48) to the controller 100 and operable by a user (technician, col. 7, line 37-40);
the controller changing the supply of electric power to the vehicle battery during the course of the charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56) based at least in part upon the time (time estimated is displayed, col. 7, lines 17-18), but lacks the teaching the user-manipulatable control is operable by a user to enter a time of day or the charging is based at least in part upon the time of day entered by the user.
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49)
Nor further teaches the time of day is input to the controller of the vehicle charger via a user-manipulatable control of the vehicle charger (manual interface for personality data, col. 10, lines 17-33).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

Regarding claim 147, Hobbs discloses a vehicle charger for charging a battery of a vehicle in the course of a charging session (abstract), and adapted for communication with a first controller 130 remote from the vehicle and vehicle charger 100 (diagnostic controller 130 may be a handheld PDA and may be "cellular telephony", col. 7, lines 29-48), the vehicle charger comprising:
a display 107;
a user-manipulatable control 130;
a second controller 100 coupled to the display 107 and operable to change a supply of electric power to charge the battery during the course of a charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56; fig. 1-2); and
at least one of a transmitter and a receiver coupled to the second controller and adapted for communication with the first controller (network 275, fig. 2),
the second controller responsive to at least one signal from the first controller by changing a charging state of the vehicle charger (diagnostic device 130 can program charger 100, col. 7, lines 30-43), but lacks the teaching of changing the charging based at least in part upon the time of day entered by the user.
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49).
Nor further teaches the time of day is input to the controller of the vehicle charger via a user-manipulatable control of the vehicle charger (manual interface for personality data, col. 10, lines 17-33).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

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Regarding claims 47, 98, Hobbs discloses the electrical power cord 125 is releasably attachable to the vehicle (by connector 126, col. 6, lines 4-11) and the source of power 105/205 (via cable 120 and fuse or circuit breaker 222, fig. 1, 2; col. 5, lines 55-63; col. 9, lines 10-12).

Regarding claim 51, Hobbs discloses the electrical power cord 125 is releasably attachable to the vehicle (by connector 126, col. 6, lines 4-11) and the source of power 105/205 (via cable 120 and fuse or circuit breaker 222, fig. 1, 2; col. 5, lines 55-63; col. 9, lines 10-12).

Regarding claim 52, Hobbs discloses a housing 102 in which the second controller is located, the housing coupled to and at least partially located between opposite ends of the electrical power cord (see housing 102 between power cord end 126 and 120, fig. 1).

Regarding claims 55, 100, Hobbs discloses at least one of a transmitter and a receiver (network 275, fig. 2), wherein the controller is adapted for wireless communication with a computer via the at least one of the transmitter and receiver (col. 11, lines 15-24).

Regarding claims 59, 104, Hobbs discloses a display 107 coupled to the second controller 100 (fig 1), the display displaying a level of charge of the battery (indication to alert user when battery is charged, col. 3, lines 15-26).

Regarding claims 60, 105, Hobbs discloses a display 107 coupled to the second controller 100, the display displaying an amount of time for the battery to be fully charged (time to complete charge, col. 7, lines 16-19) based upon information regarding the battery received by the second controller (controller 270 controls display, col. 10, lines 31-38).

Regarding claims 61, 106, Hobbs discloses the amount of time is an amount of time that is estimated by the second controller (amount of time estimated, col. 7, lines 17-18) or received by the second controller.

Regarding claims 62, 107, Hobbs discloses the amount of time is updated on the display 107 by the second controller 100 during a charge session (time estimated is displayed, col. 7, lines 17-18; this is done in real time, col. 22, lines 44-46).

Regarding claim 66, 111, Hobbs discloses a display 107 displaying a cost of power to the battery per unit time (time for charge and bill for fuel are displayed, col. 7, lines 16-19).

Regarding claims 68, 113, Hobbs discloses a display displaying a total power cost of the charging session (bill for the fuel (charge) is displayed, col. 7, lines 16-19).

Regarding claims 69, 114, Hobbs discloses the total power cost is updated on the display by the second controller during a charging session (bill for the fuel (charge) is displayed, col. 7, lines 16-19; power level is displayed in real time, col. 22, lines 44-46).

Regarding claim 73-75, 118-120, Hobbs lacks the teaching the second controller automatically changes the charging state of the vehicle charger based at least in part upon a time of day the charging of the battery will begin (claims 73, 118); the time of day the charging will begin is received by the second controller from a user of the vehicle charger (claims 74, 119), or the time of day is input to the vehicle charger via a user-manipulatable control of the vehicle charger (claims 75, 120).
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49)
Nor further teaches the time of day is input to the controller of the vehicle charger via a user-manipulatable control of the vehicle charger (manual interface for personality data, col. 10, lines 17-33).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

Regarding claims 76, 121, Hobbs discloses the vehicle charger comprises at least one transmitter coupled to the second controller (network 275, fig. 2), and wherein the second controller is adapted to transmit at least one electrical signal representative of a level of charge of the vehicle battery via the at least one transmitter (diagnostic device 130 and charger communicate to control charging, col. 7, lines 30-48).

Regarding claims 77, 122, Hobbs discloses the vehicle charger comprises at least one transmitter coupled to the second controller (network 275, fig. 2), and wherein the second controller is adapted to transmit at least one electrical signal representative of an estimated amount of battery charge time via the at least one transmitter (col. 7, lines 11-48).

Regarding claims 78, 123, Hobbs discloses the vehicle charger comprises at least one transmitter coupled to the second controller (network 275, fig. 2), and wherein the second controller is adapted to transmit at least one electrical signal representative of a characteristic of the battery via the at least one transmitter (diagnostic device 130 and charger communicate to control charging, col. 7, lines 30-48).

Regarding claims 79, 124, Hobbs discloses at least one user-manipulatable control (diagnostic device 130) to change at least one of the charging voltage and the charging amperage of the vehicle charger (col. 7, lines 30-48).

Regarding claims 84, 129, Hobbs discloses the display is an LCD display or a LED display (col. 7, lines 19-23).

Regarding claims 86, 131, Hobbs discloses the controller is adapted to communicate with another controller remote from the vehicle charger and the vehicle by power line communication (cord 131, col. 7, lines 30-32).

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Regarding claims 91, 136, Hobbs the controller of the vehicle charger is responsive to at least one signal from a controller remote from the vehicle charger and the vehicle by changing the supply of electric power to the battery (programming of the controller 100 by diagnostic device 130, col. 7, lines 29-43), but lacks the teaching wherein the at least one signal comprises data representative of a time of day.
Nor teaches a time of day signal received from a remote controller, and using the signal to change the supply of electric power to the battery (setting the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.

Regarding claims 92, 137, Hobbs discloses the controller of the vehicle charger is responsive to at least one signal from a controller remote from the vehicle charger 130 and the vehicle by changing the supply of electric power to the battery, and wherein the at least one signal comprises a signal to start or stop charging the battery of the vehicle (diagnostic device 130 controls programming of charger, col. 7, lines 34-48).

Regarding claims 93, 138, modified Hobbs teaches a time of day as shown above, and Hobbs further teaches the controller supplies electric power to the battery if a level of battery charge is below a threshold level of battery charge independent of the time of day entered by the user, the controller supplying electric power to the battery until the threshold level of battery charge is reached (predetermined limit of charging monitored, col. 18, lines 42-60).

Regarding claims 94, 139, Hobbs discloses the controller transmits a signal to another controller remote from the vehicle charger in the event of power loss to the vehicle charger (charger 100 communicates with remote diagnostic device 130 to diagnose faults, col. 7, lines 45-48; loss of power is a type of fault).

Claims 48-50, 80-81, 85, 96-97, 125-126, 130 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view Nor and further in view of Vasant.

Regarding claims 48-49, 96-97, Hobbs lacks the teaching the display is mounted in a console or a dashboard within the vehicle.
Vasant teaches the display may be mounted in a console or a dashboard within the vehicle (display 110 in dashboard, fig. 11; a dashboard is inherently a console).
It would have been obvious to one of ordinary skill in the art at the time of the invention to mount the display in a console or dashboard as taught by Vasant in the invention of Hobbs in order to enable the user to monitor or control the charge the vehicle without exposing himself to the elements.

Regarding claim 50, Hobbs lacks teaching the user-manipulatable control is within reach of the user while the user is seated within the vehicle.
Vasant teaches the user-manipulatable control is within reach of the user while the user is seated within the vehicle (display 110 in dashboard, fig. 11; the display may be a touch screen, col. 10, lines 18-24, 45-50).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the user-manipulatable control is within reach of the user while the user is seated within the vehicle as taught by Vasant in the invention of Hobbs in order to enable the user to monitor or control the the charge the vehicle without exposing himself to the elements.

Regarding claims 80-81, 125-126, Hobbs lacks the teaching of a reel upon which the electrical power cord is retractable (claim 80, 125), wherein the reel is located on the vehicle (claims 81, 126).
Vasant teaches a vehicle charger a reel upon which the electrical power cord is retractable, wherein the reel is located on the vehicle (retractable cord on the vehicle, col. 5, lines 4-6).
It would have been obvious to one of ordinary skill in the art at the time of the invention to use a retractable reel on the vehicle as taught by Vasant with the cord of Hobbs, in order to keep the cord from extending from the vehicle body when not in use (Vasant, col. 5, lines 4-6).

Regarding claims 85, 130, Hobbs teaches a display 107 coupled to the second controller 100 to receive vehicle charge setting commands from a user (by key pad 104 or diagnostic device 130) and to display information regarding a charging session (col. 7, lines 11-51; fig. 1).
Hobbs lacks the teaching the display is a touch screen display.
Vasant teaches a vehicle charger having a touch screen display (col. 10, lines 18-24, 45-50; fig. 11).
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the touch screen display of Vasant as the display of Hobbs in order to have a display which will record responses which is more rugged in open air environments.

Claim 53 lacks an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Nor and further in view of McGinley.

Regarding claim 53, Hobbs lacks the teaching the housing at least partially defines one of the opposite ends of the electrical power cord.
McGinley teaches a charger (abstract) where the housing at least partially defines one of the opposite ends of the electrical power cord (fig. 1).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have a housing which at least partially defines one of the opposite ends of the electrical power cord as taught by McGinley as the grid connection end of the plug of Hobbs in order to have a small charger which is easily transportable (McGinley, para. 0005).

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Claims 54, 56-58, 70-72, 82-83, 87-90, 99, 101-103, 115-117, 127-128,132-135 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Nor and further in view of Kaplan.

Regarding claim 54, 99, Hobbs discloses the controller 100 is adapted for communication (through network 275 or through wired or wireless connection 131 with another controller 131 remote from the vehicle and the vehicle charger, col. 7, lines 29-43), but lacks the teaching the communication is over the power cord.
Kaplan teaches a vehicle charger (para. 0044) in which the controller 102 (para. 0043) is adapted for communication with a first controller (network communications, para. 0047) over the electrical power cord 208. Kaplan teaches this enables communication with a remote IPF module 134 (para. 0045) with no need for other special wiring.
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the power and communications cord of Kaplan as the cord of Hobbs in order to connect with a remote network without need for special wiring.

Regarding claims 56, 101, Hobbs lacks the teaching the second controller is adapted for automatic establishment of communication with the first controller upon connection of the vehicle charger with at least one of the battery and the source of power.
Kaplan teaches automatic establishment of communication with the first controller upon connection of the vehicle charger with at least one of the battery and the source of power (remote IPF module 134 initials connection to adjust flow of power, para. 0135).
It would have been obvious to one of ordinary skill in the art at the time of the invention to establish automatic communication with the first controller as taught by Kaplan in the invention of Hobbs in order to notify grid operators when there is a problem (para. 0140-0142).

Regarding claims 57, 102, Hobbs discloses the second controller is adapted for communication with a computer (controller 100/270 communicates over line 131 or wirelessly with diagnostic controller 130, col. 7, lines 10-48), but lacks the teaching of receiving electric power information from the Internet.
Kaplan teaches receiving electric power information from the Internet (para. 0078-0080, 0083). Kaplan further teaches this allows the invention to to optimize power transfer (para. 0093).
It would have been obvious to one of ordinary skill in the art at the time of the invention to receive electric power information from the internet as taught by Kaplan in the invention of Hobbs in order to optimize power transfer.

Regarding claims 58, 103, Hobbs discloses the second controller is adapted for wireless communication with the computer via the at least one of the transmitter and receiver (network 275, fig. 2).

Regarding claims 70-72, 115-117,Hobbs discloses the second controller automatically changes the charging state of the vehicle charger based at least in part upon a threshold (current threshold, col. 22, lines 17-20), but lacks the teaching the threshold is a cost of power to the battery (claims 70, 115) or is received from a user (claims 71, 116), or is input by a user-manipulatable control of the vehicle charger (claims 72, 117).
Kaplan teaches the threshold is a cost of power to the battery received from a user (user controls participation in power aggregation preferences, para. 0227-0228; power aggregation includes a power cost by bidding, para. 0167), the user using a user-manipulatable control of the vehicle charger (para. 0227).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the cost of power to the battery be part of a charging threshold as taught by Kaplan in the threshold of Hobbs in order to allow the user to receive the best cost for the power by bidding.

Regarding claims 82-83, 127-128, Hobbs discloses there are two displays (107 and indicator lights 108, fig.1) at least one of the screens 108 displaying information regarding a charging session (charging complete or whether there is a fault, col. 7, lines 11-15), and at least one of the screens 107 displaying settings at least partially defining the manner of operation of the vehicle charger (amount of time to complete charging, etc., col. 7, lines 14-18), but lacks the teaching of a single display with at least two different screens upon the display or of a user manipulatable control enabling a user to navigate to another screen.
Kaplan teaches the display may be a user manipulatable control of a portable computer (para. 0227). It is inherent that a portable computer display can have two screens, where a user manipulatable control, such as a mouse, can toggle between two screens.
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the two screens of Hobbs both displayed on the computer screen of Kaplan, with a user manipulatable control to choose the screen as is known in the art, in order to allow the user to receive easily viewed updates to his charging session upon his laptop computer.

Regarding claims 87, 132, Hobbs lacks the teaching wherein the electrical power cord comprises both power transmission and communication lines electrically connected to the controller.
Kaplan teaches a vehicle charger (para. 0044) in which the controller 102 (para. 0043) is adapted for communication with a first controller (network communications, para. 0047) over the electrical power cord 208. Kaplan teaches this enables communication with a remote IPF module 134 (para. 0045) with no need for other special wiring.
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the power and communications cord of Kaplan as the cord of Hobbs in order to connect with a remote network without need for special wiring.

Regarding claims 88, 133, Hobbs lacks the teaching of a battery of the vehicle charger, the battery of the vehicle charger coupled to the second controller and the electrical power cord, and supplying power to charge the battery of the vehicle in at least one state of the vehicle charger.
Kaplan teaches a battery 1508 of the vehicle charger, the battery of the vehicle charger coupled to the second controller and the electrical power cord, and supplying power to charge the battery of the vehicle in at least one state of the vehicle charger (backup battery for operation in case of power outage, para. 0198).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the vehicle charger of Hobbs include a battery as taught by Kaplan in order to retain setting during a power outage.

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Regarding claims 89, 134, Hobbs lacks the teaching the battery of the vehicle charger supplies power to charge the battery of the vehicle based at least in part upon the at least one signal from the first remote controller.
Kaplan teaches the battery of the vehicle charger supplies power to charge the battery of the vehicle (para. 0198) based at least in part upon the at least one signal from a controller remote from the vehicle charger and the vehicle (processor 1502 receives signals from the processor 1502, which communicates with the remote system, para. 0196).
It would have been obvious to one of ordinary skill in the art at the time of the invention to use the battery of the vehicle charger upon a signal from the first controller as taught by Kaplan in the invention of Hobbs in order to provide the battery charging of the vehicle during a power outage.

Regarding claims 90, 135,Hobbs discloses the at least one signal comprises data representative of a cost of electrical power (bill for the fuel, col. 7, lines 16-19), but lacks the teaching that the at least one signal is responsive to a signal from a controller remote from the vehicle charger and the vehicle by changing the supply of electric power to the battery.
Kaplan teaches the at least one signal is responsive to a signal from a controller remote from the vehicle charger and the vehicle by changing the supply of electric power to the battery (receiving electrical power information from the internet, para. 0078-0080, 0083).
Kaplan further teaches this allows the invention to to optimize power transfer (para. 0093).
It would have been obvious to one of ordinary skill in the art at the time of the invention to receive electric power information from the internet as taught by Kaplan in the invention of Hobbs in order to optimize power transfer.

Claims 63-65, 67, 108-110, 112, 142 lack an inventive step under PCT Article 33(3) as being obvious over Hobbs in view of Nor and further in view of Keith.

Regarding claims 63-65, 108-110, Hobbs discloses a display 107 coupled to the second controller 100, the display displaying a power level by the battery during a vehicle charging session (power level displayed, col. 22, lines 44-46), but lacks the teaching of displaying an amount of power consumed (claims 63, 108), the amount of power consumed by the battery is an amount of power that is estimated by the second controller or is received by the second controller (claims 64, 109) or that the amount of power consumed is updated on the display by the second controller during the charging session (claims 65, 110).
Keith teaches displaying the amount of power consumed, which is estimated by the second controller and the amount of power consumed is updated (if voltage is within limits, the kilowatt hours are calculated and displayed, col. 22, lines 18-23).
It would have been obvious to one of ordinary skill in the art at the time of the invention to provide an update on the display of the power consumed as taught by Keith in the invention of Hobbs in order to allow the user to estimate a total power bill he may incur, and stop the charging if the bill is too large.

Regarding claims 67, 112, Hobbs teaches displaying the cost of power (col. 7, lines 16-19), but lacks the teaching the cost of power to the battery is received from the second controller by the first controller remote from the second controller.
Keith teaches the cost of power to the battery is received from the second controller by the first controller (cost of power information transmitted, col. 19, lines 40-51; fig. 13).
It would have been obvious to one of ordinary skill in the art at the time of the invention to have the cost of power to the battery be accessed from the first controller as taught by Keith in the invention of Hobbs in order to receive the best price for the power used.

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Regarding claim 142, Hobbs discloses a vehicle charger for charging a battery of a vehicle in the course of a charging session (abstract), and adapted for communication with a first controller 130 remote from the vehicle and vehicle charger 100 (diagnostic controller 130 may be a handheld PDA and may be "cellular telephony", col. 7, lines 29-48), the vehicle charger comprising:
a controller 100;
a display 107;
the second controller changing the supply of electric power to the vehicle battery during the course of the charging session by at least one of increasing a rate of charge of the battery, decreasing the rate of charge of the battery, starting battery charging, or stopping battery charging (col. 14, lines 47-56);
based at least in part upon the time (time estimated is displayed, col. 7, lines 17-18);
and at least one of a transmitter and a receiver coupled to the second controller and adapted for communication with the first controller (network 275 communicates with diagnostic device 130, in the embodiment where it is wireless, col. 7, lines 29-48; fig. 1-2).
Hobbs lacks the teaching the charging is based on a time of day or second controller displays an indicator indicating a status of communication between the first and second controllers.
Nor teaches a vehicle charger (abstract) in which the controller 82 automatically changes the charging state of the vehicle the charger based at least in part upon a time of day (set the price depending on the time of day, and operate the charging during that time, col. 10, lines 34-49).
It would have been obvious to one of ordinary skill in the art at the time of the invention to update the charging state of the vehicle charger with respect to a user defined time of day as taught by Nor in the invention of Hobbs in order to allow the user to charge the vehicle during times when the prices are lower.
Hobbs as modified lacks the teaching of the second controller displaying an indicator indicating a status of communication between the first and second controllers.
Keith teaches a second controller (charge station computer 34, col. 5, lines 10-19) displaying an indicator indicating a status of communication (proper connection made between the controllers, and displayed to operator, col. 15, lines 25-53) between the first 34 and second (vehicle charge controller 72, col. 5, lines 57-61) controllers.
It would have been obvious to one of ordinary skill in the art at the time of the invention to display a communications indicator as taught by Keith in the invention of Hobbs in order to allow the operator to know when it is appropriate to proceed to the next step, such as entering the credit card for payment of the fuel.

Claims 1-139, 142, 146-147 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

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PATENT AND TRADEMARK OFFICE

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
16/249,037	09/29/2021 01:29:00 PM ET	013350-9003-US20

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	4725	FILED BY	Eliana Carter
PATENT CENTER #	60333379	AUTHORIZED BY	Christopher Austin
CUSTOMER #	--	FILING DATE	01/16/2019
CORRESPONDENCE ADDRESS	CHRISTOPHER B. AUSTIN, - 935 17TH AVENUE, - GRAFTON, WISCONSIN 53024 UNITED STATES	FIRST NAMED INVENTOR	Christopher B. Austin

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 6504	E20219SD31131519	Eliana Carter

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2801	REQUEST FOR CONTINUED EXAMINATION (RCE) - 1ST REQUEST (SEE 37 CFR 1.114)	680.00	1	680.00
			TOTAL AMOUNT:	$680.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d)

and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

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16/249,037	**09/29/2021 01:29:00 PM ET**	**013350-9003-US20**

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CUSTOMER #	–	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	CHRISTOPHER B. AUSTIN, - 935 17TH AVENUE, - GRAFTON, WISCONSIN 53024 UNITED STATES	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 10

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US20_RCE_as_filed_09-29-21.pdf	3	Request for Continued Examination (RCE)	1318 KB
013350-9003-US20_IDS_Filed_09-29-21.pdf	9	Information Disclosure Statement (IDS) Form (SB08)	985 KB
JP2006074868_w_English_Translation.pdf	20	Foreign Reference	3893 KB
WO2008026390_w_English_Abstract.pdf	28	Foreign Reference	1315 KB

EP_Search_Report_issued_in_corresponding_EP09808718-2_September_21_2017.pdf	7	Non Patent Literature	206 KB
Official_Action_issued_in_corresponding_EP09808718-2_February_17_2021.pdf	13	Non Patent Literature	475 KB
Official_Action_issued_in_corresponding_EP09808718-2_July_20_2021.pdf	12	Non Patent Literature	488 KB
Search_Report_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	4	Non Patent Literature	224 KB
Official_Action_issued_in_corresponding_EP09808718-2_April_29_2020.pdf	7	Non Patent Literature	203 KB
Written_Opinion_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	14	Non Patent Literature	966 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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JP2006074868_w_English_Translation.pdf	C343DA8CCC9A1BD6B4B7B02D44E735CD972D7062EB589A45BFE948898647D1DEE3B21C3B3BF11E72C6D02BC9C3B20CC213FB9A244FF2777672FF4F31F8A89039
WO2008026390_w_English_Abstract.pdf	88D3F4A571D687D88E3AA4302688243FFF926B20CEC8D6F25C61B0D9D494F6141E7A40F1EF10BB72681C864317E3DB1404D9C43FEAC1FE79EA9FE7598D0CD7BD
EP_Search_Report_issued_in_corresponding_EP09808718-2_September_21_2017.pdf	DAF0040FADE1CAB281AEDF2A50D968128033478EACA0E954C86A7DA857512EFDA2D7BD777FB44097F98EE61756161DBA34C08D327378C7C5993CC97E25A57A90
Official_Action_issued_in_corresponding_EP09808718-2_February_17_2021.pdf	937A11FAD3C173547A754BC4D1DA7ECC403875845AE149D8033F516E991408D11C0E3034F397A41B67E40A674B06916B092E2A1FBBD7617B03EBA6F0C9B05384
Official_Action_issued_in_corresponding_EP09808718-2_July_20_2021.pdf	33E79D37C6C9F763C9A96EC9846E9436749DDD25406F9376A06EE10E1BB386AB8D4A57A53B23DA43882B38AF3055FDC7F55BFF6B5582A152A873DA2E3E4D03B7
Search_Report_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	0254856B8A6E5D906165D4023652E1F7A1CB2650A5896A20A28621152A079905A010FF3B1C3052D350FEDA1CB2450BF3E5788350915317A4109FA8214A199AE1
Official_Action_issued_in_corresponding_EP09808718-2_April_29_2020.pdf	1654524EE35193CC4D178332F3F1687A284954C9F6A74D7CD8B65B486DB7F78E9AF14A27846E5768134B7626FCF94825461E87D19A80A95773659885FA70B2FE
Written_Opinion_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	293D5785962E8EC231DEC51AF981BC2BB2F6A1855BA52DC1EB30891C9101F56CF234639ACD33B1C59AD150EBB33ACB50053DA3368E7A9079B2CC74489B650A36

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C.

371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/249,037	Filing Date 01/16/2019	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/29/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $240 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ALEXANDER R JENKINS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 10/15/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

EXAMINER
PELTON, NATHANIEL R

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 10/15/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

TITLE OF INVENTION: VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	01/18/2022

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7590 10/15/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

TITLE OF INVENTION: VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	01/18/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
PELTON, NATHANIEL R	2859	320-109000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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Tesla EX1002 Page 324

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

7590 10/15/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

EXAMINER	
PELTON, NATHANIEL R	
ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 10/15/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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Tesla EX1002 Page 325

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IPR2026-00378
Tesla EX1002 Page 326

Notice of Allowability	Application No. 16/249,037	Applicant(s) Austin, Christopher B.	
	Examiner NATHANIEL R PELTON	Art Unit 2859	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to RCE filed on 09/29/2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 09/29/2021.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☑ Other see detailed action.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Continuation of 3. The allowed claim(s) is/are: 8-12,15-18,21-23 and 26-27

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 09/29/2021 has been entered.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 09/29/2021 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Allowable Subject Matter

Claims 8-12, 15-18, 21-23, and 26-27 are allowed for the reasons detailed in the previous notice of allowability.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHANIEL R PELTON whose telephone number is (571)270-1761. The examiner can normally be reached M-F 9am to 5pm.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricardo Isla can be reached on 571-272-5056. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	12/02/2020	03/12/2021	07/13/2021	10/08/2021					
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	7	÷	-	-	-					
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	26		✓	=	=					
	27		N	=	=					

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M 10/44	03/12/2021	nrp
B60L 53/68,126,14,305,18,38,63	03/12/2021	nrp
G01R 31/371	03/12/2021	nrp
H02J 7/0042,0047	03/12/2021	nrp
H01M 10/44	07/14/2021	nrp
B60L 53/68,126,14,305,18,38,63	07/14/2021	nrp
G01R 31/371	07/14/2021	nrp
H02J 7/0042,0047	07/14/2021	nrp

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
320	109	03/12/2021	nrp
320	109	07/14/2021	nrp

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

Search Notes		
Search Notes	**Date**	**Examiner**
performed inventor and assignee searches	03/12/2021	nrp
requested PLUS search on spec and claims	03/12/2021	nrp
text searched for key concepts	03/12/2021	nrp
updated East search (see attached)	07/14/2021	nrp
considered IDS	10/08/2021	nrp

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
	((charg$5 or recharg$5)(batter$3 or cell or accumulator or storage)(cord or plug or connector)(vehicle or car or auto or automobile)(data or information)(level or limit or threshold or percentage)(voltage or soc or (state adj2 charge))).clm.	07/14/2021	nrp

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

CPC						
Symbol					**Type**	**Version**
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B60L	/	53	/	38	I	2019-02-01
B60L	/	53	/	63	I	2019-02-01
B60L	/	53	/	18	I	2019-02-01
B60L	/	53	/	305	I	2019-02-01
B60L	/	53	/	68	I	2019-02-01
B60L	/	53	/	126	I	2019-02-01
G01R	/	31	/	371	A	2019-01-01
H02J	/	7	/	0042	A	2013-01-01
H02J	/	7	/	0047	A	2013-01-01
Y02T	/	90	/	14	A	2013-01-01
Y02T	/	90	/	16	A	2013-01-01
Y04S	/	10	/	126	A	2013-01-01
Y02E	/	60	/	00	A	2013-01-01
Y02T	/	10	/	70	A	2013-01-01
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Symbol					**Type**	**Set**	**Ranking**	**Version**
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	14	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	08 October 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office

Part of Paper No.: 20211008

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H01M	/	10	/	44	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
320	109

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	14	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	08 October 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office

Part of Paper No.: 20211008

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/249,037	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	14	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	08 October 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

EAST Search History

EAST Search History (Prior Art)

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S3	1,050	320/109.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/14 21:18
S4	48	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2013/07/14 21:18
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S15	2,140	S14 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2016/03/21 11:38
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S29	1	S27 and S28	US-PGPUB; USPAT; USOCR	OR	ON	2016/04/27 14:04
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S38	20,884	320/108 or h02j7/025.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/04/27 20:00
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S45	368	S43 or S44	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/04/27 20:27
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S47	29,042	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/09 16:17
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S56	38,844	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/14 14:21

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S61	3	"6963186".pn. or "20090243549".pn. or "5548200".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/16 09:33
S62	1	"20020079868".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/04/16 09:48
S63	38,868	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/16 10:53
S64	9,253	S63 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/16 10:53
S65	10	S64 and (overrid$3 with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2017/04/16 10:53

			DERWENT; IBM_TDB			
S66	41,747	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:39
S67	9,450	S66 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:39
S68	0	S67 and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (start$4 or initiat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:42
S69	8	("320".clas. or h02j7/$$.cpc. or b60l11/$$.cpc.) and (automatic$4 with ((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (start$4 or initiat$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:43
S70	83	S67 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (below or lower or less))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 10:59
S71	2	"20040164711".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/09/30 11:53
S72	1	"20040164711".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:53

S73	171	"320".clas. and (decrypt$3)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:56
S74	5	"320".clas. and (decrypt$3 with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 11:57
S75	1	"20100076825".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:00
S76	2,222	(decrypt$3 with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:04
S77	1,513	S76 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:04
S78	1,216	((decrypt$3 near5 key) with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:05
S79	856	S78 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:05
S80	82	((decrypt$3 near5 key) with (manufacturer or supplier) with server)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:07
S81	47	S80 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:07
S82	242	((decrypt$3 near5 key) with (manufacturer or supplier) with request$3)	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:13
S83	131	S82 and @ad<"20110114"	US-PGPUB; USPAT; USOCR	OR	ON	2017/09/30 12:13
S84	11,740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S85	2,157	S84 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S86	293	S85 and (tim$3 near5 (end$3 or complet$4 or finish$3))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 09:06
S87	50,398	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc. or b60l11/1816.cpc. or b60l11/1824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2018/10/02 13:43

			DERWENT; IBM_TDB			
S88	9,772	S87 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/02 13:43
S89	372	S88 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/02 13:43
S90	1,291	((decrypt$3 near5 key) with (manufacturer or supplier))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/02 17:10
S91	2,233	dunn.xa.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S92	1,675	S91 and @ad<"20080101"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S93	1,401	S91 and @ad<"20040101"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/03 12:22
S95	2,033	320/109.ccls.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/03 17:09
S96	53,838	h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/088.cpc. or h01m10/44.cpc. or b60l11/1824.cpc. or 320/109	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/03 17:09
S97	1,324	(S95 or S96) and (vehicle with (charg$5 or recharg$5) with control$4 with transmit$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/03 17:09
S98	11,740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44

S99	2,157	S98 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44
S100	293	S99 and (tim$3 near5 (end$3 or complet$4 or finish$3))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/05 08:44
S101	2	"20110175569".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/13 14:00
S102	1	"20110175569".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:00
S103	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:48
S104	11,629	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:49
S105	4,808	h01m10/44.cpc. or g01r31/3689.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:50
S106	3,622	(S104 or S105) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:50
S107	194	S106 and (((charg$5 or recharg$5 or re$1charg$5) near5 (cable or cord or plug)) with (vehicle or car or auto or automobile))	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 14:55
S108	40,433	(b60l11/1816 or b60l11/182 or b60l11/1824 or b60l11/1829 or b60l11/1844 or b60l2230/12 or b60l2230/16 or b60l2230/40).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/10/13 15:36
S109	876	S108 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2018/10/13 15:36
S110	2	"20180375175".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/06/16 15:26

			DERWENT; IBM_TDB			
S111	103,122	h01m10/44.cpc. or 320/109 or b60l53/12,68,14,305,18,30,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/17 14:03
S112	5,602	S111 and ((coil or core or inductiv$3) near5 (position$3 or align$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/06/17 14:05
S113	262	S112 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/06/17 14:05
S114	6	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$).did.	US-PGPUB	OR	OFF	2020/09/14 08:56
S115	2	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB	OR	OFF	2020/09/14 08:58
S116	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/14 08:58
S117	31,994	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:02
S118	7,985	S117 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:02
S119	39,132	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:03

S120	3,591	S119 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:03
S121	103	(S118 or S120) and ((control$4 or display$3) with (onboard or inside or dash) with (vehicle or car or auto or automobile))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:06
S122	18	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:32
S123	6	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/14 09:32
S124	93	(S118 or S120) and ((delay$4 near3 (tim$3 or period)) with (charg$5 or recharg$5))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:33
S125	27	(S118 or S120) and ((input$4 or user) with (time near2 day))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 09:54
S126	2	"20180375175".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/09/14 10:33
S127	192	(US-16056043-$ | US-3603860-$ | US-3624723-$ | US-3673379-$ | US-3740896-$ | US-3870855-$ | US-3898547-$ | US-3900784-$ | US-	US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	OFF	2020/09/14 12:25

		3911284-$ | US-4012681-$ | US-4146825-$ | US-4218644-$ | US-4229687-$ | US-4252217-$ | US-4258305-$ | US-4282475-$ | US-4286911-$ | US-4355275-$ | US-4454926-$ | US-4508090-$ | US-4819139-$ | US-4829223-$ | US-4983904-$ | US-5194799-$ | US-5220268-$ | US-5229703-$ | US-5283470-$ | US-5285963-$ | US-5289103-$ | US-5323099-$ | US-5337237-$ | US-5349535-$ | US-5351283-$ | US-5359308-$ | US-5418437-$ | US-5421427-$ | US-5422822-$ | US-5434494-$ | US-5437939-$ | US-5441123-$ | US-5452983-$ | US-5454767-$ | US-5506489-$ | US-5524726-$ | US-5528234-$ | US-5539296-$ | US-5556284-$ | US-5577920-$ | US-5581171-$ | US-5596258-$ | US-5602459-$ | US-5623194-$ | US-5645279-$ | US-5646507-$ | US-5647450-$ | US-5656916-$ | US-5659240-$ | US-5668460-$ | US-5686812-$ | US-5703464-$ | US-5713426-$ | US-5730237-$ | US-5736831-$ | US-5760569-$ | US-5778329-$ | US-5816643-$ | US-5844384-$ | US-5853058-$ | US-5881559-$ | US-5890555-$ | US-5896022-$ | US-5903134-$ | US-5910714-$ | US-5921708-$ | US-5926004-$ | US-5937831-$ | US-5951229-$ | US-5952813-$ | US-5966285-$ | US-5967115-$ | US-5977744-$ | US-6021862-$ | US-6037746-$ | US-6087805-$ | US-6087806-$ | US-6104160-$ | US-6114833-$ | US-6154005-$ | US-6160374-$ | US-6184656-$ | US-6220538-$ | US-6232743-$ | US-6243644-$ | US-6267190-$ | US-6316908-$ | US-6320358-$ | US-6345772-$ | US-6357244-$ | US-6362594-$ | US-6426606-$ | US-RE36225-$).DID.	JPO; DERWENT; IBM_TDB			
S128	194	(US-16056043-$ | US-4245640-$ | US-4320333-$ | US-4380725-$ | US-4389608-$ | US-4402524-$ | US-4430569-$ | US-4446680-$ | US-4449049-$ | US-4468605-$ | US-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2020/09/14 12:25

		4591778-$ | US-4602204-$ | US-4616169-$ | US-4774449-$ | US-4873160-$ | US-4956563-$ | US-4990099-$ | US-5194799-$ | US-5204611-$ | US-5206577-$ | US-5219034-$ | US-5229703-$ | US-5237257-$ | US-5287052-$ | US-5350993-$ | US-5371456-$ | US-5397991-$ | US-5402056-$ | US-5408170-$ | US-5422558-$ | US-5422560-$ | US-5444352-$ | US-5446364-$ | US-5455637-$ | US-5455638-$ | US-5465038-$ | US-5469043-$ | US-5506646-$ | US-5510694-$ | US-5528148-$ | US-5536979-$ | US-5537023-$ | US-5548200-$ | US-5557190-$ | US-5565756-$ | US-5583416-$ | US-5589757-$ | US-5600225-$ | US-5602459-$ | US-5605769-$ | US-5606851-$ | US-5610499-$ | US-5619845-$ | US-5631536-$ | US-5633574-$ | US-5642031-$ | US-5644210-$ | US-5656920-$ | US-5668462-$ | US-5670861-$ | US-5670863-$ | US-5672952-$ | US-5701069-$ | US-5703471-$ | US-5710502-$ | US-5710506-$ | US-5739673-$ | US-5773962-$ | US-5776119-$ | US-5783927-$ | US-5793185-$ | US-5801512-$ | US-5801515-$ | US-5811958-$ | US-5812382-$ | US-5835185-$ | US-5847912-$ | US-5850134-$ | US-5867008-$ | US-5895440-$ | US-5900720-$ | US-5903764-$ | US-5963012-$ | US-6016047-$ | US-6018227-$ | US-6043625-$ | US-6060185-$ | US-6060865-$ | US-6066938-$ | US-6075341-$ | US-6118250-$ | US-6118254-$ | US-6133766-$ | US-6160376-$ | US-6160378-$ | US-6163086-$ | US-6184650-$ | US-6184660-$ | US-7876068-$ | US-RE36225-$).DID.	DERWENT; IBM_TDB			
S129	1	"20190148794".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:25
S130	11,666	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:36

S131	20,499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:37
S132	4,231	(S130 or S131) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 09:38
S133	4	"20080007202".pn. or "7243746".pn. or "5548200".pn. or "20080103370".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:03
S134	10	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did.	US-PGPUB	OR	OFF	2020/09/29 10:07
S135	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:08
S136	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$).did.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:08
S137	1	"6983186".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:09
S138	1	"6963186".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 10:10
S139	13	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:10
S140	1	"20080052145".pn.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:15

S141	14	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:17
S142	410	S132 and ((cost or price) near5 (power or energy))	US-PGPUB; USPAT	OR	OFF	2020/09/29 10:40
S143	236	S132 and ((display$3 or indicat$3 or led) near5 (connect$3 or coupl$3) near5 (power or energy or cable or plug))	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:32
S144	1	"20080103370".pn.	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:45
S145	1,551	(((data or information) near5 (progress)) with (indicator))	US-PGPUB; USPAT	OR	OFF	2020/09/29 11:49
S146	437	S145 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 11:50
S147	1	"20190148785".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 14:42
S148	15	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$).did.	US-PGPUB; USPAT	OR	OFF	2020/09/29 14:49
S149	11,666	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S150	20,499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S151	4,231	(S149 or S150) and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 15:58
S152	4	S151 and ((controller or display) near3 (on or within or built$1in) with (cord or cable or plug))	US-PGPUB; USPAT	OR	OFF	2020/09/29 15:58

S153	1,716	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	US-PGPUB; USPAT	OR	OFF	2020/09/29 16:06
S154	219	S153 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/29 16:07
S155	1	"20070164704".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 08:48
S156	1	"10090567".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 08:57
S157	2,049	((charg$5 or recharg$5) adj4 (cable or plug)) with (display or transmit$4 or reciev$3)	US-PGPUB; USPAT	OR	OFF	2020/09/30 09:03
S158	2,290	((charg$5 or recharg$5) adj4 (cable or plug or cord)) with (display or transmit$4 or reciev$3)	US-PGPUB; USPAT	OR	OFF	2020/09/30 09:03
S159	328	S158 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/09/30 09:03
S160	2	"20160294427".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2020/09/30 14:27
S161	1	"20160294427".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/09/30 14:27
S162	1	"20200185933".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 09:48
S163	3	"20120130556".pn. or "20140088781".pn. or "20170110894".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:06
S164	1	"20160380440".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:15
S165	1	"20200238847".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 10:33
S166	2	"20180191176".pn. or "20160141896".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:00
S167	1	"20200278936".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:30

S168	1	"20050029867".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:37
S169	1	"20190270391".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/01 11:41
S170	2	"20110050173".pn. or "9352635".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/05 09:02
S171	1	"20190148792".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/10/05 09:25
S172	133	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 09:00
S173	32,481	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S174	7,999	S173 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S175	39,828	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S176	3,602	S175 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2020/11/30 09:10
S177	444	(S174 or S176) and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/11/30 09:10

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S178	17,859	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 10:45
S179	2,346	S178 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2020/11/30 10:45
S180	450	S179 and ((indicat$3 or send$3 or notify$3 or transmit$4) with (complete or full or full$1charge or threshold))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/11/30 10:45
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S183	1	"20140055088".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/02 10:13
S184	3	"20150054460".pn. or "20180229616".pn. or "20120153874".pn.	US-PGPUB; USPAT; USOCR	OR	ON	2020/12/02 10:53
S185	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	US-PGPUB; USPAT	OR	OFF	2020/12/02 11:12
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S187	139	((CHRISTOPHER) near2 (AUSTIN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2021/03/11 14:31
S188	33,922	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT;	OR	OFF	2021/03/11 16:00

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S189	8,013	S188 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
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S191	3,631	S190 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/11 16:00
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S193	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	US-PGPUB; USPAT	OR	OFF	2021/03/11 16:01
S194	1	"20090139781".pn.	US-PGPUB; USPAT	OR	OFF	2021/03/12 08:21
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		$ or US-20090243538-$ or US-20100090524-$ or US-20100010698-$ or US-20090139781-$ or US-20080007202-$ or US-20080052145-$ or US-20090313174-$ or US-20080054845-$ or US-20070164704-$ or US-20110266996-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.				
S196	9	S195 and interrupt$3	US-PGPUB; USPAT	OR	OFF	2021/03/12 13:20
S197	33,922	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S198	8,013	S197 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S199	41,855	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S200	3,631	S199 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/03/12 13:29
S201	283	(S198 or S200) and ((signal$3 or communicat$3 or send$3) with ((interrupt$3 or stop$4 or halt$3 or fault$3) near3 (power or energy or charg$3 or recharg$3)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/03/12 13:29
S202	1,792	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:19

S203	0	S202 and g01r31/371	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:19
S204	5	S202 and g01r31/371.cpc.	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:23
S205	2,017	((charg$5 or recharg$5) near3 (cable or plug)) with (send$3 or transmit$4)	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:23
S206	4	S205 and g01r31/371.cpc.	US-PGPUB; USPAT	OR	OFF	2021/03/12 14:26
S207	4	"20200244075".pn. or "20070188134".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2021/03/15 11:59
S208	4	"20160344070".pn. or "20140055092".pn.	US-PGPUB; USPAT; USOCR; DERWENT	OR	OFF	2021/03/15 13:37
S209	2	"20160344070".pn. or "20140055092".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2021/03/15 13:37
S210	2	"20150326031".pn. or "20180048162".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2021/03/15 14:20
S211	1	"9260025".pn.	US-PGPUB; USPAT; USOCR	OR	OFF	2021/03/16 08:02
S212	34,769	320/109 or h01m10/44.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35
S213	8,015	S212 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35
S214	43,109	b60l53/68,126,14,305,18,38,63.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35

S215	3,644	S214 and @ad<"20080818"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2021/07/13 13:35
S216	115	(S213 or S215) and ((indicat$3 or send$3 or notify$3 or transmit$4) with ((level or threshold or limit) near (soc or (state adj2 charge) or voltage)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 13:35
S217	6,462	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((indicat$3 or send$3 or notify$3 or transmit$4) with ((level or threshold or limit) near (soc or (state adj2 charge) or voltage)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 14:11
S218	1,360	S217 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2021/07/13 14:12
S219	7	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((send$3 or notify$3 or transmit$4) with ((percentage or percent) near (soc or (state adj2 charge) or voltage)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 16:16
S220	49	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((send$3 or notify$3 or transmit$4) with ((percentage or percent) near (soc or (state adj2 charge) or voltage or charge)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/13 16:17
S221	59,036	(b60l53/$$.cpc. or b60l58/$$.cpc. or h02j7/$$.cpc. or h01m10/$$.cpc.) and ((send$3 or notify$3 or transmit$4 or communicat$3) with ((soc or (state adj2 charge) or voltage or charge)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/14 08:36
S222	6,159	S221 and @ad<"20080818"	US-PGPUB; USPAT; USOCR	OR	ON	2021/07/14 08:36

S223	2,620	S222 and ((level or threshold or limit) near (soc or (state adj2 charge) or voltage))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/07/14 08:37
S225	46	("20020079868" | "20030015995" | "20030127155" | "20030209375" | "20050046387" | "20060276938" | "20070080827" | "20070144605" | "20070164704" | "20080040223" | "20080040296" | "20080052017" | "20080052145" | "20080103370" | "20080156553" | "20080203973" | "20080238355" | "20080265684" | "20080281168" | "20080296978" | "20090021213" | "20090063193" | "20090237034" | "20090243538" | "20090243549" | "20090278492" | "20090313034" | "20090313103" | "20100010698" | "20100030389" | "20100081378" | "20100169008" | "20100281183" | "4532418" | "4742283" | "5202617" | "5311973" | "5461298" | "5462439" | "5548200" | "5594318" | "5595271" | "5650710" | "6281663" | "6421600" | "7243746").PN.	US-PGPUB; USPAT	OR	OFF	2021/10/08 13:11

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S224	295	((charg$5 or recharg$5)(batter$3 or cell or accumulator or storage)(cord or plug or connector)(vehicle or car or auto or automobile)(data or information)(level or limit or threshold or percentage)(voltage or soc or (state adj2 charge))).clm.	US-PGPUB; USPAT	AND	ON	2021/07/14 15:40

10/8/2021 1:20:29 PM
C:\Users\npelton\Documents\EAST\Workspaces\16249037.wsp

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4532418		1985-07-30	Meese, William G., et al.	
	2	4742283		1988-05-03	Bolger, John G., et al.	
	3	5202617		1993-04-13	Nor, Jiri K.	
	4	5311973		1994-05-17	Tseng, Ling-yuan, et al.	
	5	5461298		1995-10-24	Lara, Jesus D., et al.	
	6	5462439		1995-10-31	Keith, Arlie L.	
	7	5548200		1996-08-20	Nor, Jiri K., et al.	
	8	5594318		1997-01-14	Nor, Jiri K., et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.R.P./

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Tesla EX1002 Page 363

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	9	5595271		1997-01-21	Tseng, Ling-yuan	
	10	5650710		1997-07-22	Hotta, Yoshihiko	
	11	6281663		2001-08-28	Yagi, Kazuhiko, et al.	
	12	6421600		2002-07-16	Ross, Howard R.	
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	14	7243746		2007-07-17	Vasant, Abraham	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020079868		2002-06-27	Gaza, Brian Scott	
	2	20030015995		2003-01-23	Tamura, Hiroshi, et al.	
	3	20030127155		2003-07-10	Mulvenna, Alan John, et al.	

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	4	20030209375		2003-11-13	Suzuki, Furmio, et al.	
	5	20050046387		2005-03-03	Aker, John F., et al.	
	6	20060276938		2006-12-07	Miller, Craig Howard	
	7	20070080827		2007-04-12	Huang, Ching Tiem	
	8	20070144605		2007-06-28	Horowitz, Alan M., et al.	
	9	20070164704		2007-07-19	Mcginley, James W., et al.	
	10					
	11	20080040223		2008-02-14	Bridges, Seth W., et al.	
	12	20080040296		2008-02-14	Bridges, Seth W., et al.	
	13	20080052017		2008-02-28	Smith, Wendell M., et al.	
	14	20080052145		2008-02-28	Kaplan, David L., et al.	

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	16	20080103370		2008-05-01	Dicks, Kent, et al.	
	17	20080156553		2008-07-03	Hoogenraad, Reinier	
	18	20080203973		2008-08-28	Gale, Allan R., et al.	
	19	20080238355		2008-10-02	Muramatsu, Yasuyuki	
	20	20080265684		2008-10-30	Farkas, Laszlo	
	21	20080281168		2008-11-13	Gibson, Grant S., et al.	
	22	20080296978		2008-12-04	Finkenzeller, Klaus, et al.	
	23	20090021213		2009-01-22	Johnson, Oriz Wickline	
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	25					

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	26	20090237034		2009-09-24	Lindemann, Robert, et al.	
	27	20090243538		2009-10-01	Kelty, Kurt Russell, et al.	
	28	20090243549		2009-10-01	Matsumura, Naoki, et al.	
	29	20090278492		2009-11-12	Shimizu, Tomomi, et al.	
	30	20090313034		2009-12-17	Ferro, Erica Haefner, et al.	
	31	20090313103		2009-12-17	Ambrosio, Ronald, et al.	
	32					
	33	20100010698		2010-01-14	Iwashita, Hiroaki, et al.	
	34	20100030389		2010-02-04	Palmer, Doug, et al.	
	35	20100081378		2010-04-01	Kawamura, Hirofumi	
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	37					
	38	20100281183		2010-11-04	Van Bebber, Achim	
	39					

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	JP2006074868	JP		2006-03-16	Fuji Heavy Ind. Ltd.		☒
	2	WO2008026390	WO		2008-03-06	Tokai Rika Co.; Toyota Motor	(English Absract)	☒

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	1	Search Report issued in corresponding PCT/US2009/054174; December 3, 2009	
	2	Written Opinion issued in corresponding PCT/US2009/054174; December 3, 2009	

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	Attorney Docket Number	013350-9003-US20

	3	Search Report issued in corresponding EP09808718.2; September 21, 2017	
	4	Official Action issued in corresponding EP09808718.2; April 29, 2020	
	5	Official Action issued in corresponding EP09808718.2; February 17, 2021	
	6	Official Action issued in corresponding EP09808718.2; July 20, 2021	

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Examiner Signature	/NATHANIEL R PELTON/	Date Considered	10/08/2021

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Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/christopher b. austin/	Date (YYYY-MM-DD)	2021-09-29
Name/Print	Christopher B. Austin	Registration Number	41,592

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

IPR2026-00378
Tesla EX1002 Page 370

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.R.P./

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.R./

IPR2026-00378
Tesla EX1002 Page 371

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6424158		2002-07-23	Klang	
	2	7917179		2011-03-29	Kokubo	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090063183		2009-03-05	McNeely et al.	
	2	20100106631		2010-04-29	Kurayama et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

If you wish to add additional Foreign Patent Document citation information please click the Add button [Add]

NON-PATENT LITERATURE DOCUMENTS [Remove]

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

If you wish to add additional non-patent literature document citation information please click the Add button [Add]

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16249037
	Filing Date	2019-01-16
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US20

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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See attached certification statement.

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Signature	/christopher b. austin/	Date (YYYY-MM-DD)	2022-01-07
Name/Print	Christopher B. Austin	Registration Number	41,592

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	16249037
Filing Date:	16-Jan-2019
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Filer:	Christopher B. Austin/Eliana Carter
Attorney Docket Number:	013350-9003-US20

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	130	130
		Total in USD ($)		**130**

Electronic Acknowledgement Receipt

EFS ID:	44713860
Application Number:	16249037
International Application Number:	
Confirmation Number:	4725
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Correspondence Address:	CHRISTOPHER B. AUSTIN - 935 17TH AVENUE - GRAFTON WI 53024 US 414.331.0988 cbaustin@michaelbest.com
Filer:	Christopher B. Austin/Eliana Carter
Filer Authorized By:	Christopher B. Austin
Attorney Docket Number:	013350-9003-US20
Receipt Date:	11-JAN-2022
Filing Date:	16-JAN-2019
Time Stamp:	10:03:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$130

RAM confirmation Number	E20221AA03434999
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	013350-9003-US20_IDS_as_filed.pdf	1034406 9bd6d667b756d86c7562c1b09332979fa3804ed6	no	4
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	37935 916b7b73348c841fb81e382eefad56d791c52e78	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1072341		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Group Art Unit 2859

In re

Patent Application of

Christopher B. Austin

Application No.: 16/249,037

Confirmation No.: 4725

Filed: January 16, 2019

"VEHICULAR BATTERY CHARGER,
CHARGING SYSTEM, AND METHOD
FOR TRANSMITTING BATTERY CHARGE
THRESHOLD INFORMATION"

Atty. Docket No. 013350-9003-US20

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

The following comments are submitted in response to the Notice of Allowance issued on October 15, 2021. In the Notice, the Examiner provides Reasons for Allowance for the allowed claims. Applicant respectfully submits that the Examiner's statement regarding the Reasons for Allowance refers only to certain features found in independent claim 8, references claim text not found in independent claim 15 (e.g., "the at least one signal indicative of the predetermined threshold level of charge of the battery" and "wherein the portable controller generates a notification to a user indicating the predetermined threshold level of charge of the battery following and as the result of receiving the at least one signal indicative of the predetermined threshold level of charge of the battery"), references claim text not found in independent claim 21 (e.g., "the at least one signal indicative of the predetermined threshold level of charge of the battery", "a portable controller remote from the vehicle and battery charger", and "wherein the portable controller generates a notification to a user indicating the

predetermined threshold level of charge of the battery following and as the result of receiving the at least one signal indicative of the predetermined threshold level of charge of the battery"), and are not the only reasons why the allowed claims are allowable. The allowed claims include other patentable features and combinations of features not mentioned by the Examiner, or taught or suggested by the prior art.

Each allowed claim is allowable based upon the combination of features, elements, and steps set forth in the claim, rather than upon any specific feature, element, or step (or sub-combination of features, elements, or steps) recited in the claim.

Respectfully submitted,

/christopher b. austin/

Christopher B. Austin
Reg. No. 41,592

MICHAEL BEST & FRIEDRICH LLP
790 N. Water Street, Suite 2500
Milwaukee, Wisconsin 53202
Phone: 414-271-6560
Fax: 414-277-0656

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Tesla EX1002 Page 381

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7590 07/19/2021

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
ELECTRONICALLY FILED (Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

TITLE OF INVENTION: VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	10/19/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
PELTON, NATHANIEL R	2859	320-109000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Michael Best & Friedrich LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 133080

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /christopher b. austin/ Date January 18, 2022

Typed or printed name Christopher B. Austin Registration No. 41,592

IPR2026-00378
Tesla EX1002 Page 382

Electronic Patent Application Fee Transmittal

Application Number:	16249037
Filing Date:	16-Jan-2019
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Filer:	Christopher B. Austin/Dorothy Hauser
Attorney Docket Number:	013350-9003-US20

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	600	600

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**600**

Electronic Acknowledgement Receipt

EFS ID:	44767157
Application Number:	16249037
International Application Number:	
Confirmation Number:	4725
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD FOR TRANSMITTING BATTERY CHARGE THRESHOLD INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Correspondence Address:	CHRISTOPHER B. AUSTIN - 935 17TH AVENUE - GRAFTON WI 53024 US 414.331.0988 cbaustin@michaelbest.com
Filer:	Christopher B. Austin/Dorothy Hauser
Filer Authorized By:	Christopher B. Austin
Attorney Docket Number:	013350-9003-US20
Receipt Date:	18-JAN-2022
Filing Date:	16-JAN-2019
Time Stamp:	14:21:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$600

RAM confirmation Number	E20221HE24030264
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Post Allowance Communication - Incoming	013350-9003-US20_As_Filed_Comments.pdf	83125 c16cd132e5d06e05e7754e9101229ddefc2eb93b	no	2
Warnings:					
Information:					
2	Issue Fee Payment (PTO-85B)	013350-9003-US20_As_Filed_Issue_Fee_Transmittal.pdf	581863 6231cff5b486e2852a01e5476983951bf143e7e9	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	37991 ee8d0c913d73221208a467db3d579e048ec92b06	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	702979		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	01/16/2019	Christopher B. Austin	013350-9003-US20	4725

7590 01/19/2022

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

MAIL DATE	DELIVERY MODE
01/19/2022	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Supplemental ***Notice of Allowability***	**Application No.** 16/249,037	**Applicant(s)** Austin, Christopher B.	
	Examiner NATHANIEL R PELTON	**Art Unit** 2859	**AIA (FITF) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to IDS filed on 01/11/2022.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 8-12,15-18,21-23 and 26-27 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 01/11/2022.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6424158		2002-07-23	Klang	
	2	7917179		2011-03-29	Kokubo	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090063183		2009-03-05	McNeely et al.	
	2	20100106631		2010-04-29	Kurayama et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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Tesla EX1002 Page 390

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

If you wish to add additional Foreign Patent Document citation information please click the Add button [Add]

NON-PATENT LITERATURE DOCUMENTS [Remove]

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

If you wish to add additional non-patent literature document citation information please click the Add button [Add]

EXAMINER SIGNATURE

Examiner Signature	/NATHANIEL R PELTON/	Date Considered	01/18/2022

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.R.P./

IPR2026-00378
Tesla EX1002 Page 391

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16249037
Filing Date	2019-01-16
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US20

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/christopher b. austin/	Date (YYYY-MM-DD)	2022-01-07
Name/Print	Christopher B. Austin	Registration Number	41,592

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Tesla EX1002 Page 392

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.R.P./

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.P./

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Tesla EX1002 Page 393

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/249,037	02/22/2022	11258107	013350-9003-US20	4725

7590 02/02/2022

CHRISTOPHER B. AUSTIN
935 17TH AVENUE
GRAFTON, WI 53024

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 201 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site http://pair.uspto.gov for additional inventors):

Christopher B. Austin, Grafton, WI;

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Midland-Odessa Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
7:26-cv-00100	3/23/2026	Western District of Texas - Midland-Odessa Division

PLAINTIFF	DEFENDANT
ChargeLogic LLC	Tesla, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,090,567	10/2/2018	ChargeLogic LLC
2	11,258,107	2/22/2022	ChargeLogic LLC
3	11,721,844	8/8/2023	ChargeLogic LLC
4	11,508,996	11/22/2022	ChargeLogic LLC
5	11,909,010	2/20/2024	ChargeLogic LLC

In the above---entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	11,909,011	2/20/2024	ChargeLogic LLC
2			
3			
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy