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Christopher B. Austin

Application No. NOT YET ASSIGNED
(continuation of U.S. Application No. 16/249,028)

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"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION"

Attorney Docket No. 013350-9003-US57

PRELIMINARY AMENDMENT

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

Commissioner:

Entry of this Preliminary Amendment is respectfully requested prior to examination of the present application. Please charge any required fees for this communication to Deposit Account No. 13-3080.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 7 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please amend the title on page 1 of the specification as follows:

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Please amend Paragraph [0001] of the application as filed (amendments shown in markup).

[0001] The present patent application is a continuation of U.S. Patent Application No. 16/249,028, filed January 16, 2019, which 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, the entire contents of which are incorporated herein by reference in their entireties.

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AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all prior versions and listings of claims in the application.

1-20. (Canceled)

21. (New) A system for charging a battery of a vehicle with a vehicular battery charger, the system comprising:

a controller configured to:

establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger,

receive a wireless signal from the portable controller,

responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and

during charging of the battery with the vehicular battery charger:

repeatedly receive at least one signal indicative of a level of charge of the battery,

repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and

repeatedly display:

information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and

information indicative of the level of charge of the battery.

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22. (New) The system of claim 21, wherein the controller is configured to display information indicative of the amount of time remaining to charge the battery by displaying the information on a display electrically coupled to the controller.

23. (New) The system of claim 21, wherein the controller is configured to display information indicative of the amount of time remaining to charge the battery by displaying the information on a display mounted within the vehicle.

24. (New) The system of claim 21, wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery.

25. (New) The system of claim 21, wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

26. (New) The system of claim 21, wherein the controller is further configured to receive data indicative of a cost of power and, based on the received data indicative of the cost of power, stop charging of the battery of the vehicle.

27. (New) The system of claim 21, wherein the controller is included in the vehicular battery charger.

28. (New) The system of claim 21, wherein the wireless signal includes a time of day and wherein the controller is configured to supply electricity from the source of power to the battery based on the time of day.

29. (New) The system of claim 28, wherein the time of day includes at least one selected from a group consisting of a time of day to start charging and a time of day to complete charging.

30. (New) The system of claim 21, wherein the wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold.

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31. (New) A method of charging a battery of a vehicle with a battery charger, the method comprising:

receiving, at a controller, at least one signal indicative of a level of charge of the battery;

transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller the at least one signal indicative of the level of charge of the battery and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery;

displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller.

32. (New) The method of claim 31, wherein the portable remote controller is defined at least in part by a phone.

33. (New) The method of claim 31, wherein the level of charge is a full charge of the battery.

34. (New) The method of claim 31, wherein the display is a first display, the method further comprising displaying, on a second display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery.

35. (New) The method of claim 34, further comprising displaying, on the second display, the amount of time remaining to charge the battery.

36. (New) The method of claim 31, further comprising repeatedly sending, with the controller, signals to update the level of charge of the battery on the display.

37. (New) The method of claim 31, further comprising displaying, on the display electrically coupled to the portable remote controller during charging of the battery, the amount of time remaining to charge the battery received by the portable controller.

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38. (New) The method of claim 31, further comprising receiving, at the controller, a wireless signal from the portable controller.

39. (New) The method of claim 38, wherein receiving the wireless signal from the portable controller includes receiving a time of day and further comprising supplying, with the controller, electricity to the battery based on the time of day.

40. (New) The method of claim 38, wherein receiving the wireless signal from the portable controller includes receiving a cost threshold and further comprising supplying, with the controller, electricity to the battery based on the cost threshold.

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REMARKS

By this Preliminary Amendment, Applicant has canceled Claims 1-20 and added new Claims 21-40. The title has also been updated and the "Related Applications" paragraph has been amended to recite the full priority claim of this continuation application. Entry of these amendments prior to substantive examination of the present application is respectfully requested. The undersigned is available for telephone consultation at the below number.

Respectfully submitted,

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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. 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, the entire contents 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.

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[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 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 controller electrically coupled to the electrical power cord and adapted for receiving at least one signal indicative of a level of charge of the battery; and

at least one of a group consisting of a transmitter and a receiver electrically coupled to the controller;

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; and

a display adapted for displaying information indicative of an amount of time remaining to charge the battery.

2. The system of claim 1, wherein the display is electrically coupled to the controller of the battery charger.

3. The system of claim 1, wherein the controller of the battery charger is located in a housing of the battery charger located along the electrical power cord.

4. The system of claim 1, wherein the controller of the battery charger repeatedly sends signals to update the level of charge of the battery on the display.

5. The system of claim 1, wherein the portable controller is adapted to send signals to the controller of the battery charger to start and stop charging of the battery.

6. The system of claim 5, wherein the signals to start and stop charging of the battery are based at least in part upon commands entered by a user relating to a time of day.

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7. The system of claim 1, wherein the controller of the battery charger receives the at least one signal indicative of the level of charge of the battery and generates an estimate of the amount of charge time remaining to charge the battery at least partially based upon the at least one signal.

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8. 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 at the controller at least one signal indicative of a level of charge of the battery;

estimating, based at least in part upon the at least one signal, an amount of time remaining to charge the battery;

displaying information indicative of the amount of time remaining to charge the battery based upon the estimating step;

sending a wireless signal from the portable controller to the controller of the vehicular battery charger to begin charging the battery of the vehicle;

supplying electricity from the source of power to the battery of the vehicle responsive to the wireless signal from the portable controller.

9. The method of claim 8, wherein displaying information indicative of the amount of time remaining the charge the battery comprises displaying the information on a display electrically coupled to the controller of the vehicular battery charger.

10. The method of claim 8, further comprising displaying the level of charge of the battery on a display that is the same display upon which the information indicative of the amount of time remaining to charge the battery is displayed.

11. The method of claim 10, further comprising continuously updating the level of charge of the battery on the display.

12. The method of claim 8, further comprising repeating the estimating and displaying steps to update the information indicative of the amount of time remaining to charge the battery.

13. The method of claim 8, further comprising displaying a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery.

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14. The method of claim 8, further comprising sending another wireless signal from the portable controller to the vehicular battery charger to stop charging the battery of the vehicle.

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15. 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 interruption of power supply to the battery charger by sending at least one signal indicative of the power interruption 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 power interruption to the battery charger following and as a result of the at least one signal indicative of the power interruption.

16. The system of claim 15, wherein the notification is an indicator on a display viewable by the user.

17. The system of claim 16, wherein the display is electrically coupled to the controller of the battery charger.

18. The system of claim 15, wherein the notification is at least one of a group consisting of a text and an e-mail automatically generated to the user.

19. The system of claim 15, wherein the portable controller is adapted to send signals to the controller of the battery charger to start and stop charging of the battery.

20. The system of claim 16, wherein the display is also adapted for displaying a level of charge 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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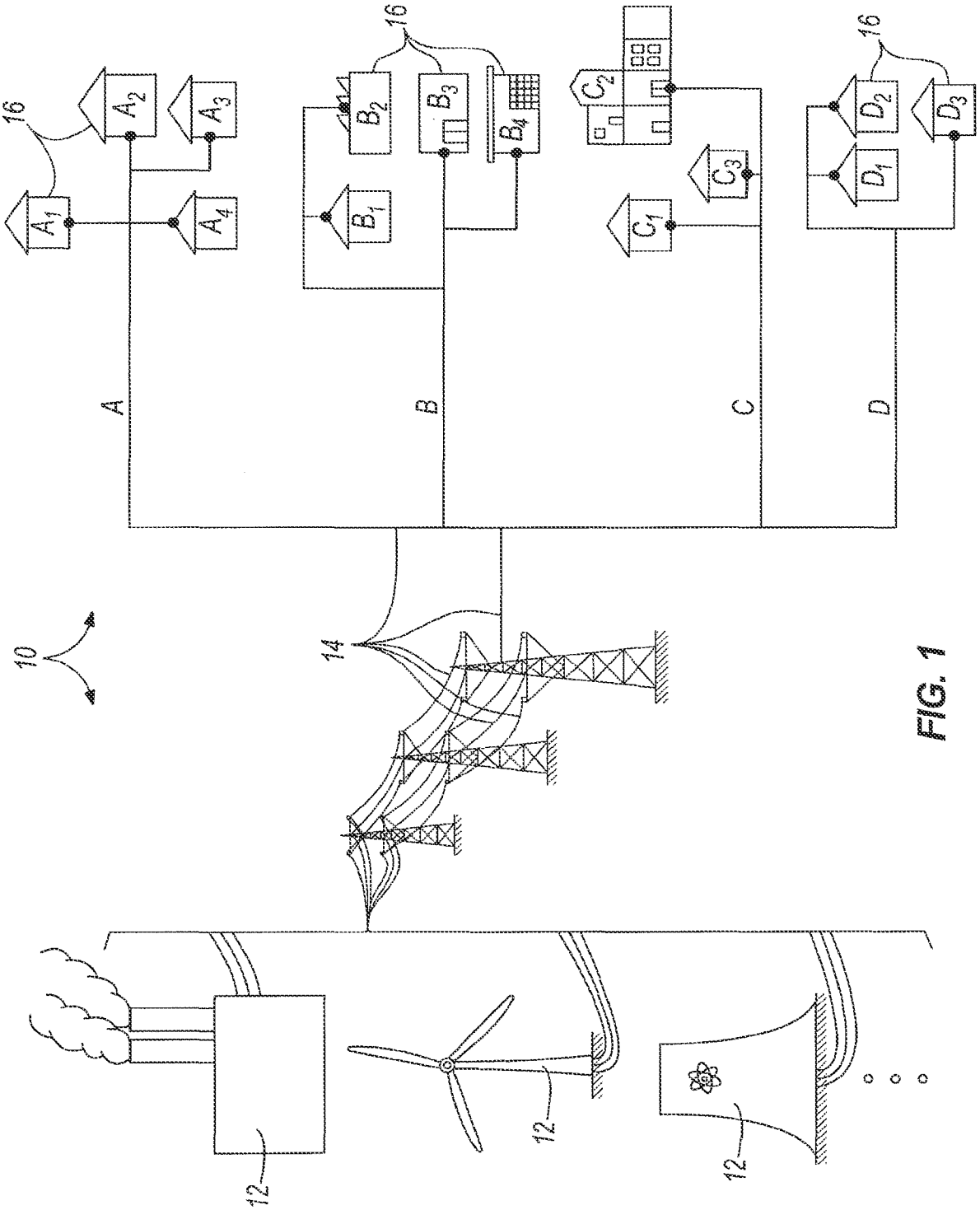

FIG. 1

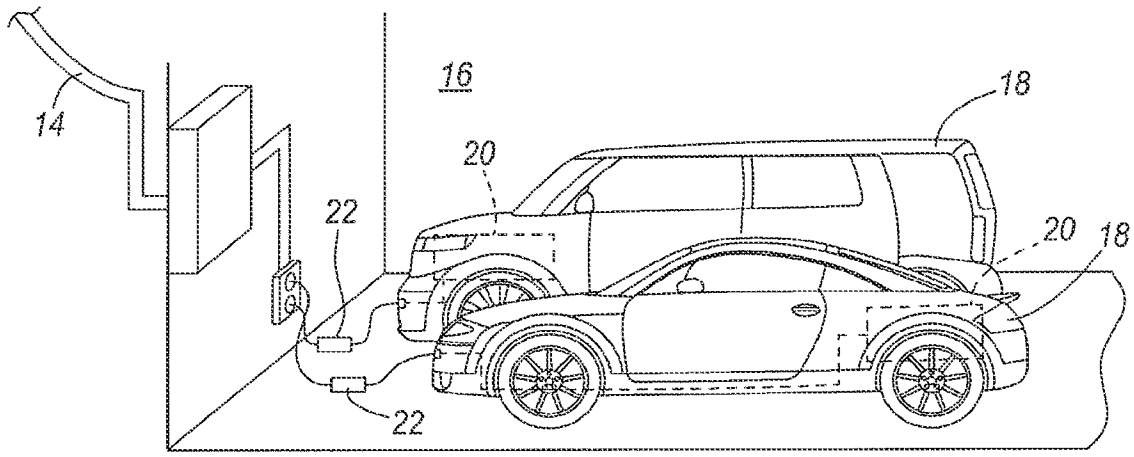

FIG. 2

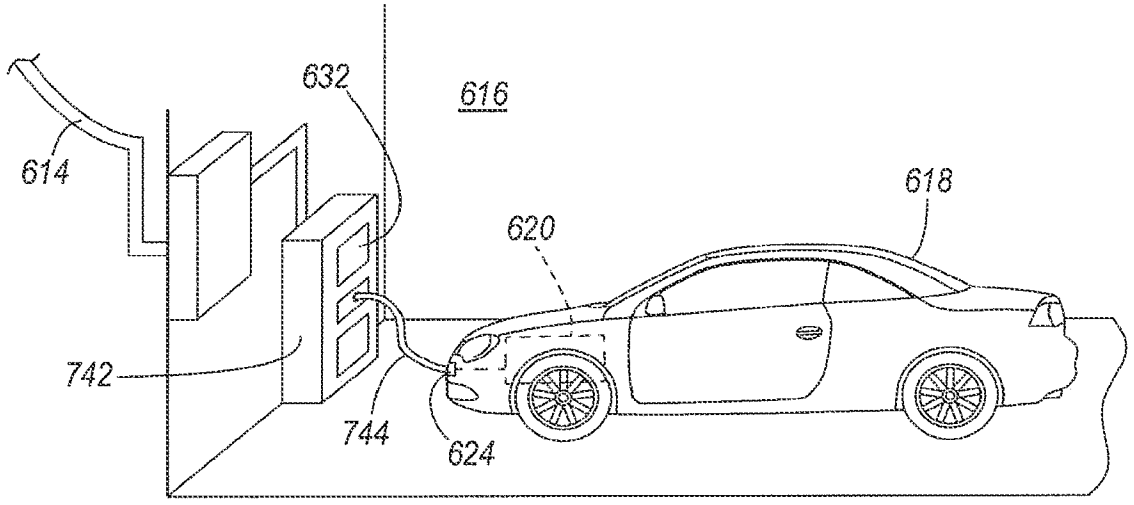

FIG. 3

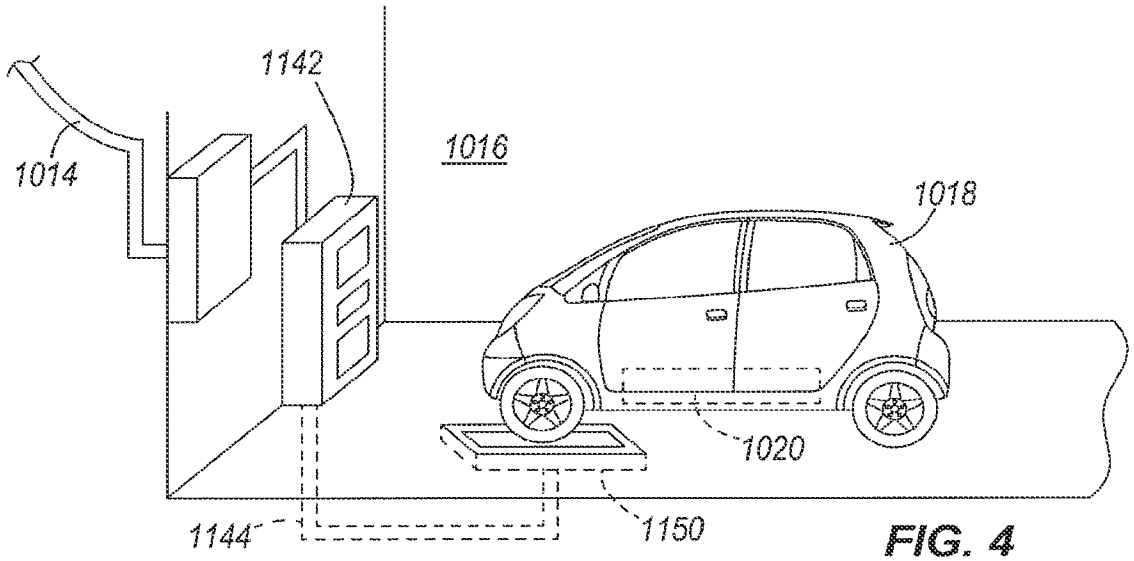

FIG. 4

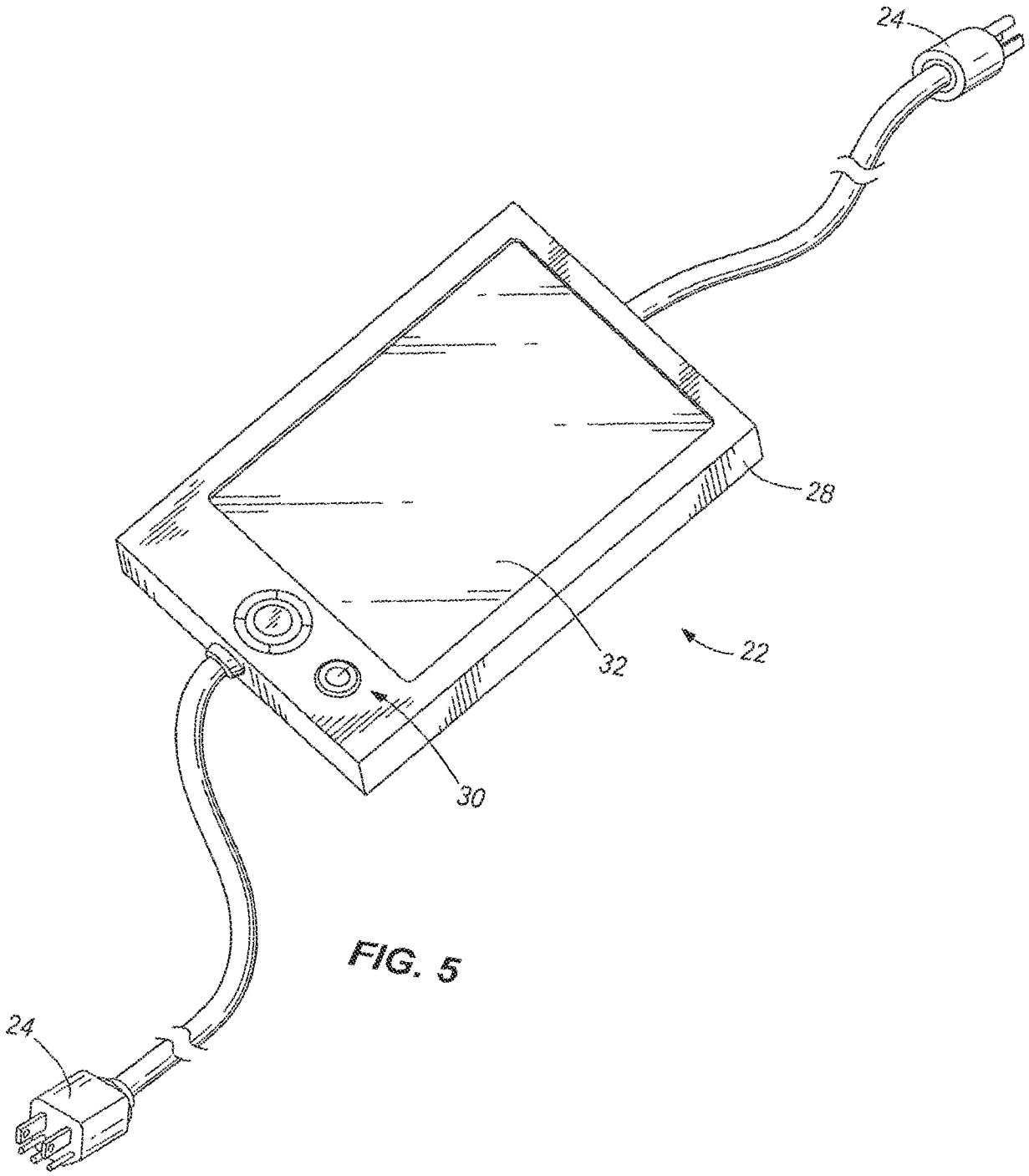

FIG. 5

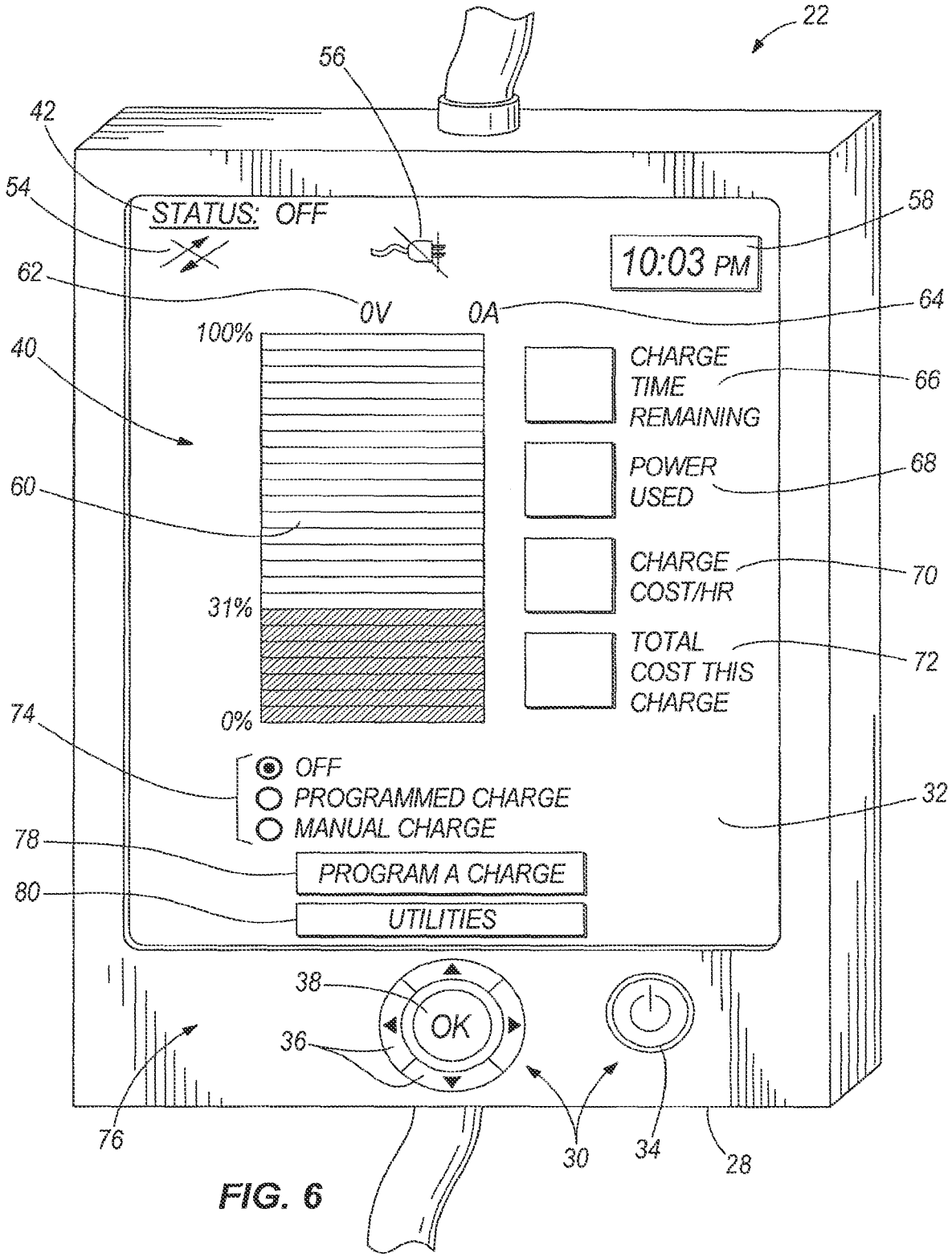
22
56
42
54
STATUS: OFF
58
10:03 PM
62
0V
0A
64
100%
40
CHARGE TIME REMAINING
66
POWER USED
68
60
CHARGE COST/HR
70
31%
TOTAL COST THIS CHARGE
72
0%
74
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
36
76
30
34
28

FIG. 6

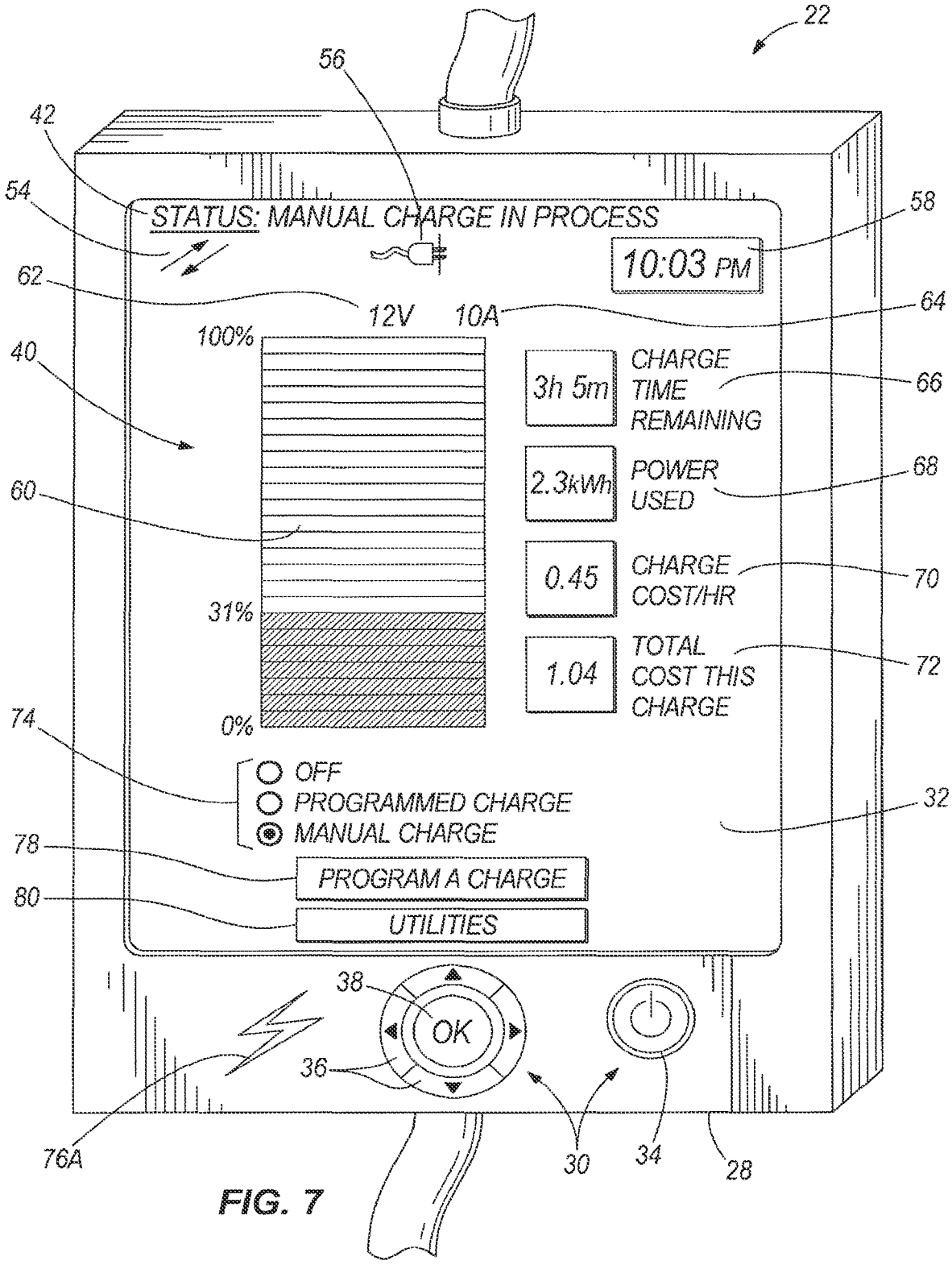
22
56
42
54
STATUS: MANUAL CHARGE IN PROCESS
58
10:03 PM
62
12V
10A
64
100%
40
3h 5m
CHARGE TIME REMAINING
66
60
2.3kWh
POWER USED
68
0.45
CHARGE COST/HR
70
31%
1.04
TOTAL COST THIS CHARGE
72
74
0%
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
36
76A
30
34
28

FIG. 7

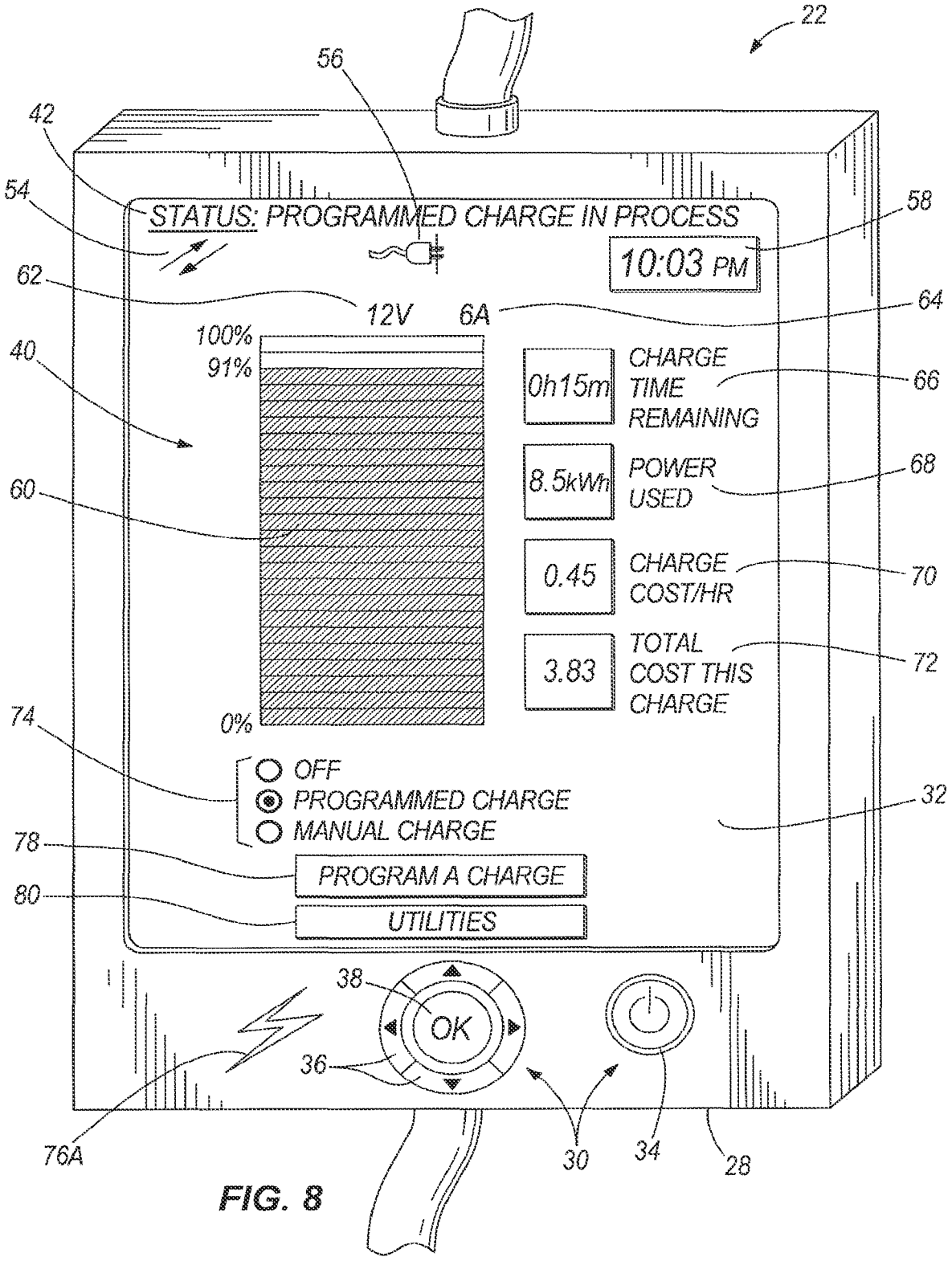
22
56
42
54
STATUS: PROGRAMMED CHARGE IN PROCESS
58
10:03 PM
62
12V
6A
64
100%
91%
40
0h15m
CHARGE TIME REMAINING
66
8.5kWh
POWER USED
68
60
0.45
CHARGE COST/HR
70
3.83
TOTAL COST THIS CHARGE
72
0%
74
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
36
76A
30
34
28

FIG. 8

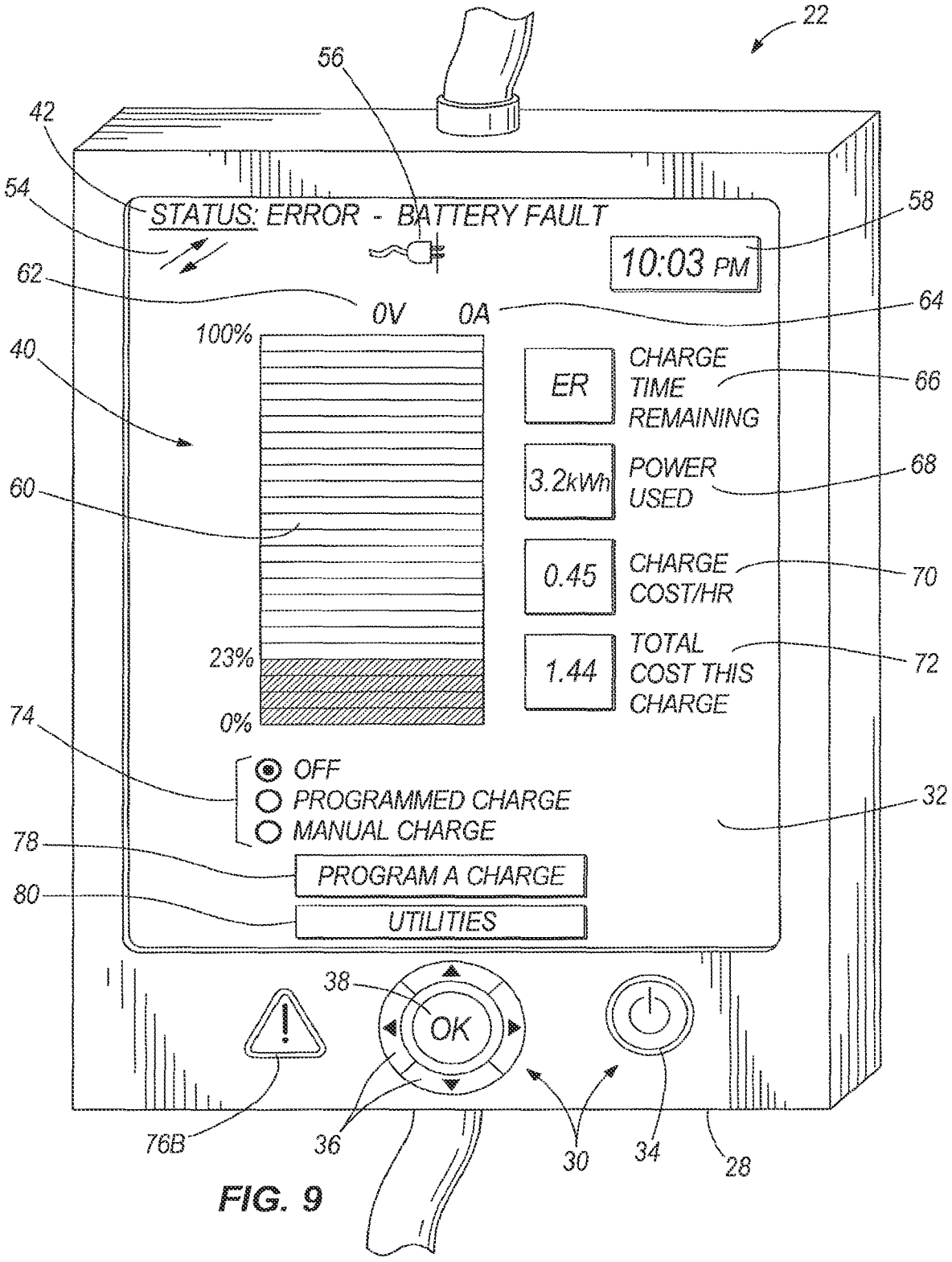
22
56
42
54
STATUS: ERROR - BATTERY FAULT
58
10:03 PM
62
0V
0A
64
100%
40
ER
CHARGE TIME REMAINING
66
60
3.2kWh
POWER USED
68
0.45
CHARGE COST/HR
70
23%
1.44
TOTAL COST THIS CHARGE
72
0%
74
OFF
PROGRAMMED CHARGE
MANUAL CHARGE
32
78
PROGRAM A CHARGE
80
UTILITIES
38
OK
76B
36
30
34
28

FIG. 9

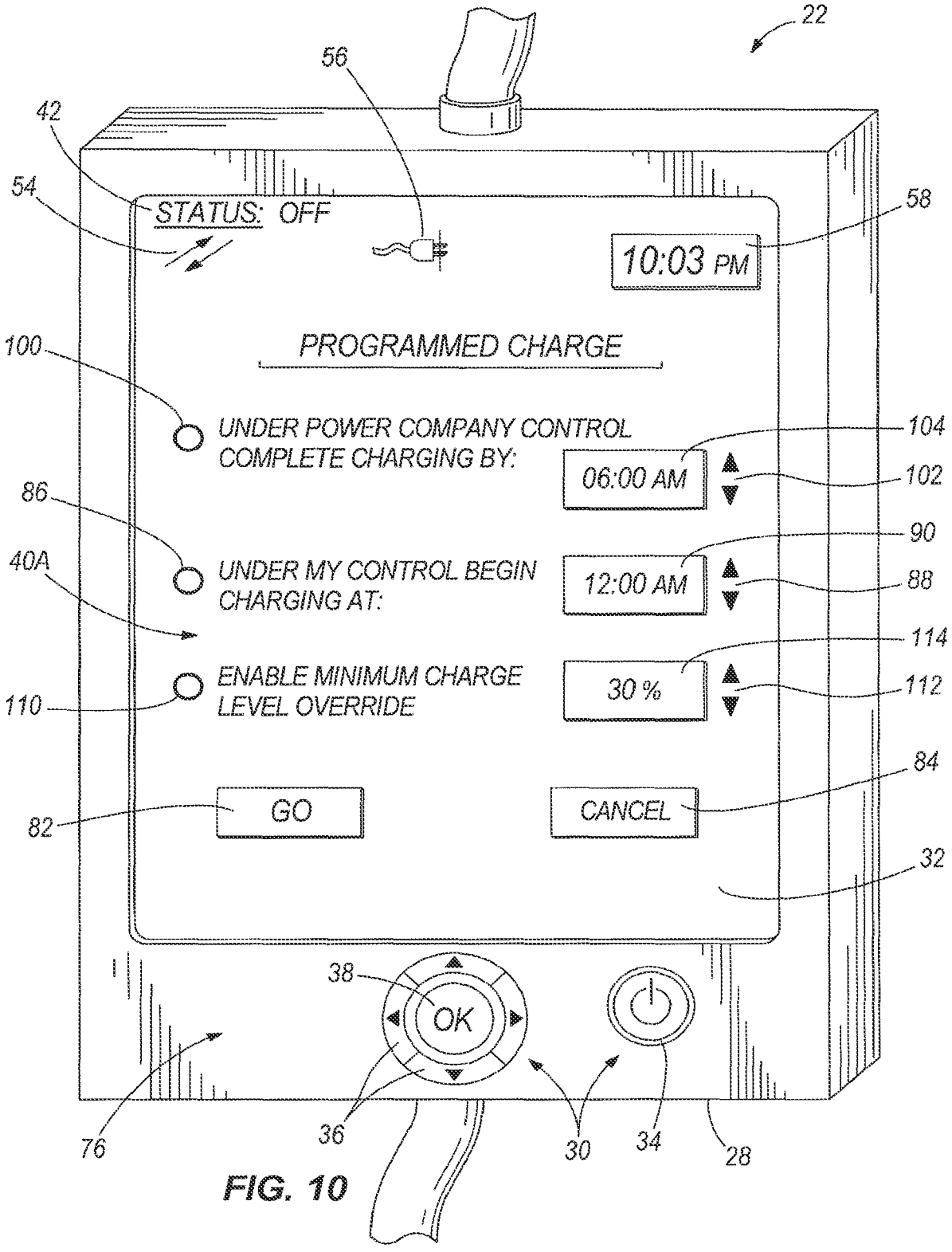
22
56
42
54
STATUS: OFF
58
10:03 PM
PROGRAMMED CHARGE
100
UNDER POWER COMPANY CONTROL
COMPLETE CHARGING BY:
104
06:00 AM
102
86
90
40A
UNDER MY CONTROL BEGIN
CHARGING AT:
12:00 AM
88
114
ENABLE MINIMUM CHARGE
LEVEL OVERRIDE
30 %
110
112
84
82
GO
CANCEL
32
38
OK
76
36
30
34
28

FIG. 10

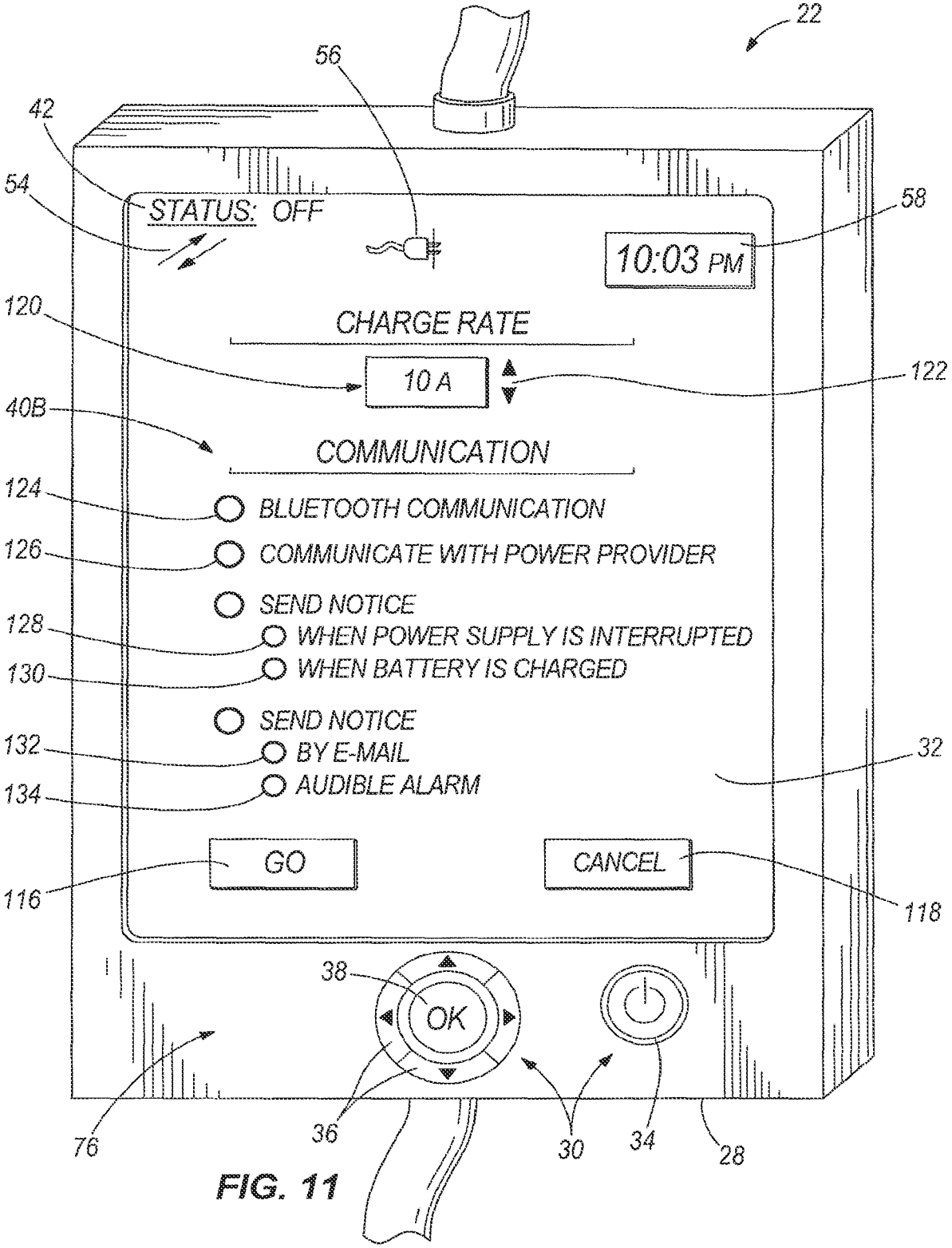
22
56
42
54
STATUS: OFF
58
10:03 PM
120
CHARGE RATE
10 A
122
40B
COMMUNICATION
124
BLUETOOTH COMMUNICATION
126
COMMUNICATE WITH POWER PROVIDER
SEND NOTICE
128
WHEN POWER SUPPLY IS INTERRUPTED
130
WHEN BATTERY IS CHARGED
SEND NOTICE
132
BY E-MAIL
134
AUDIBLE ALARM
32
GO
CANCEL
116
118
38
OK
76
36
30
34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

FIG. 11

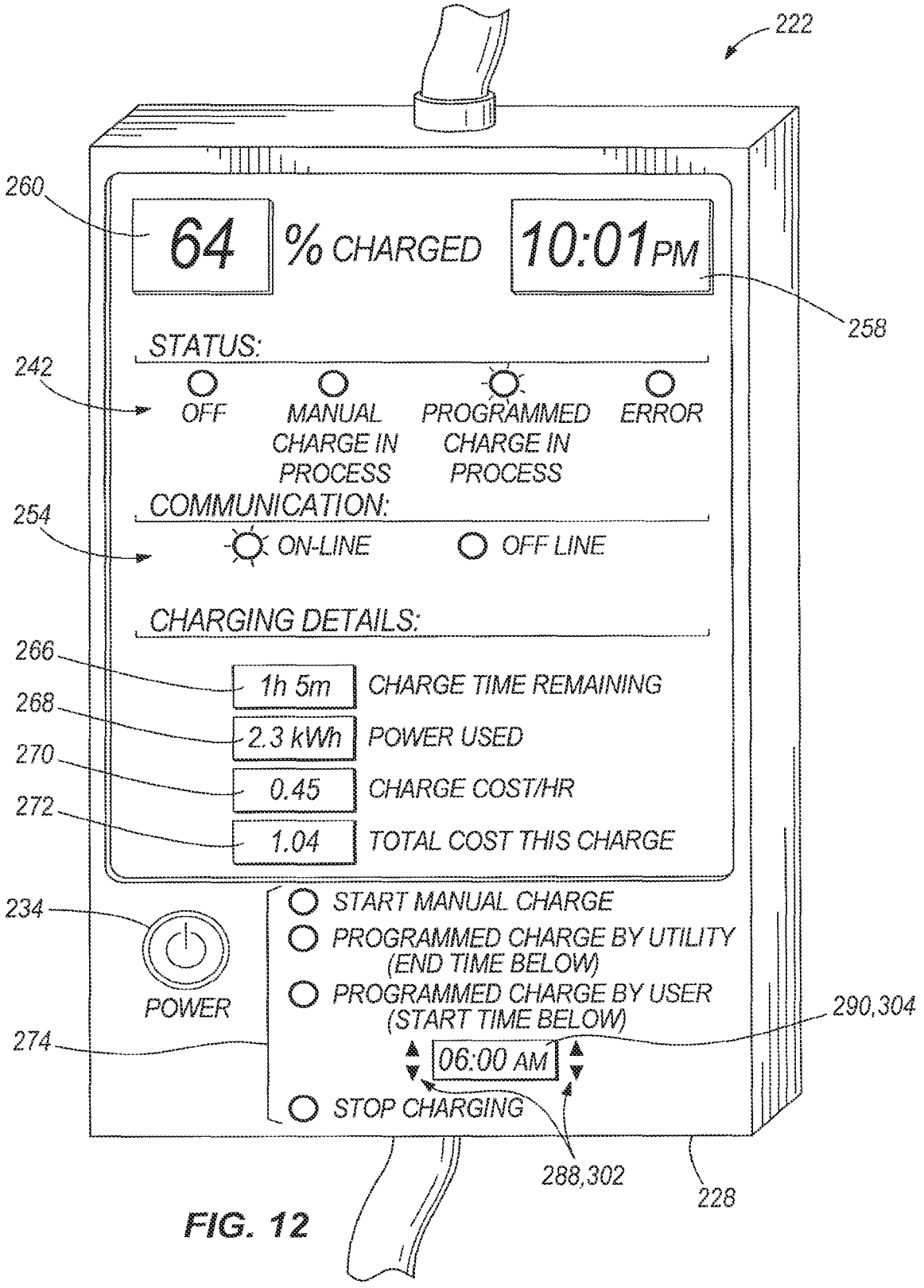
222
260
64
% CHARGED
10:01 PM
258
STATUS:
242
OFF
MANUAL CHARGE IN PROCESS
PROGRAMMED CHARGE IN PROCESS
ERROR
COMMUNICATION:
254
ON-LINE
OFF LINE
CHARGING DETAILS:
266
1h 5m
CHARGE TIME REMAINING
268
2.3 kWh
POWER USED
270
0.45
CHARGE COST/HR
272
1.04
TOTAL COST THIS CHARGE
234
POWER
START MANUAL CHARGE
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

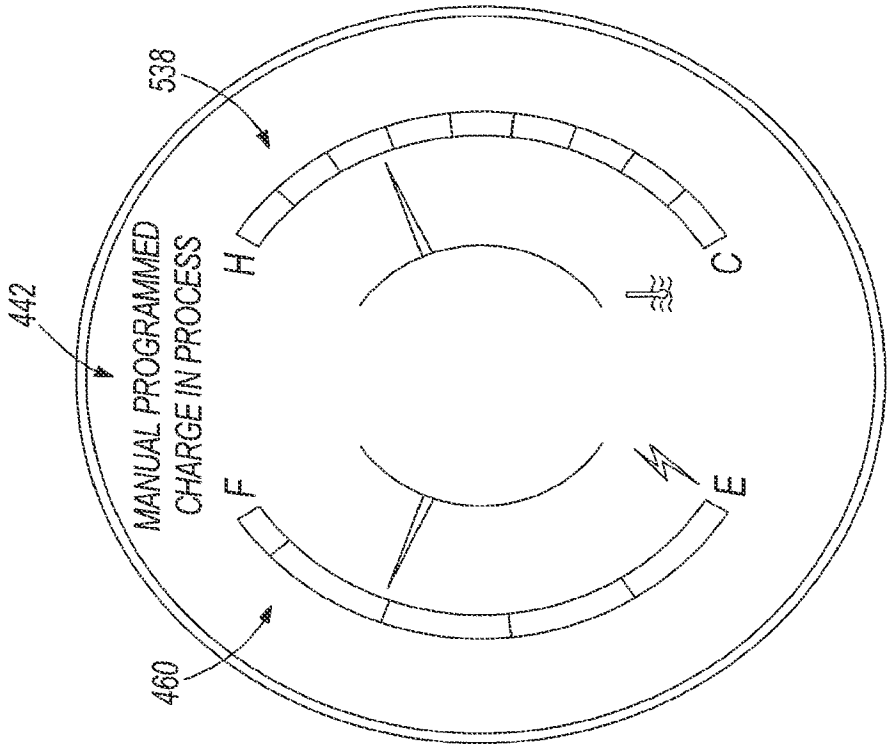
442
MANUAL PROGRAMMED
CHARGE IN PROCESS
538
H
C
F
E
460

FIG. 13

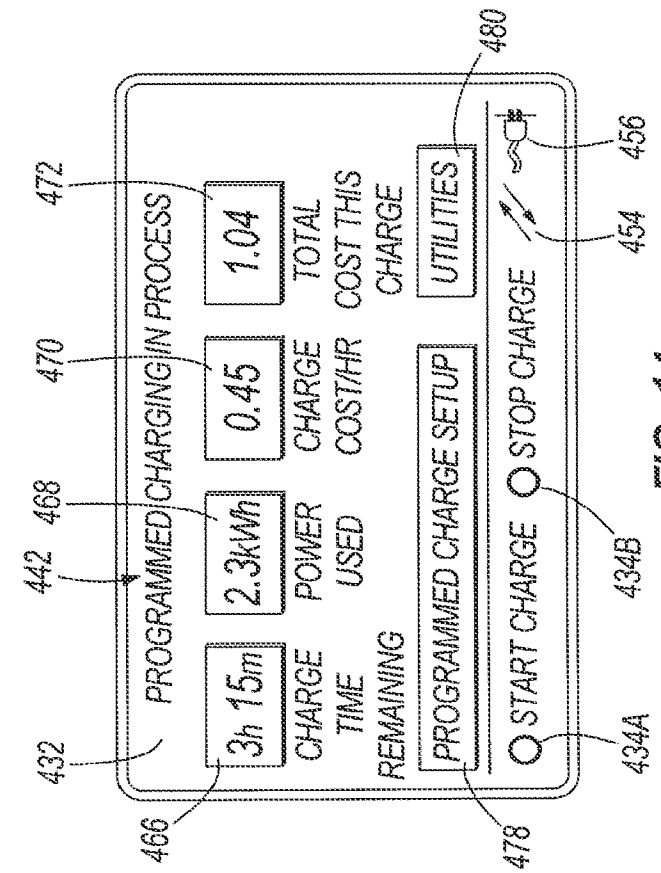
480
456
454
472
442
468
470
PROGRAMMED CHARGING IN PROCESS
1.04
TOTAL COST THIS CHARGE
0.45
CHARGE COST/HR
2.3kWh
POWER USED
3h 15m
CHARGE TIME REMAINING
UTILITIES
PROGRAMMED CHARGE SETUP
START CHARGE
STOP CHARGE
432
466
478
434A
434B

FIG. 14

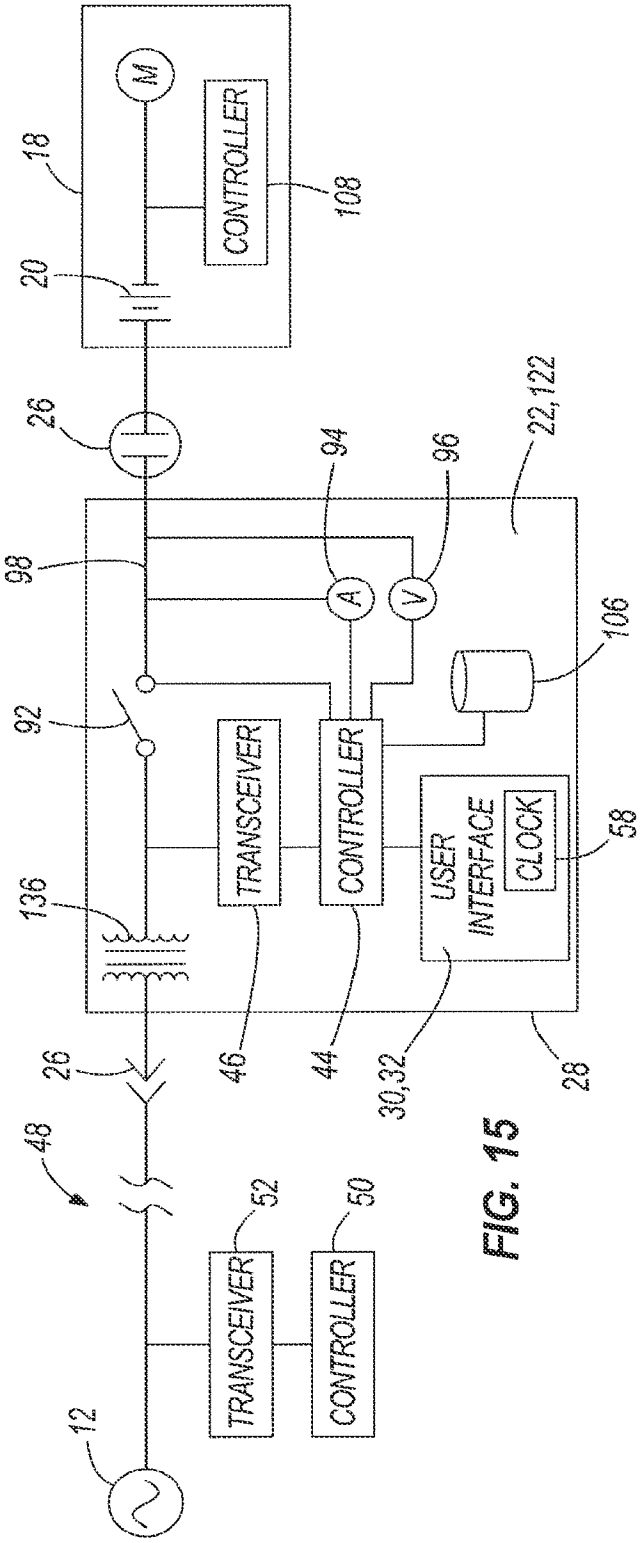
M
CONTROLLER
18
108
20
26
22,122
94
96
98
A
V
106
92
TRANSCEIVER
CONTROLLER
USER INTERFACE
CLOCK
58
136
46
44
30,32
28
26
48
52
50
TRANSCEIVER
CONTROLLER
12

FIG. 15

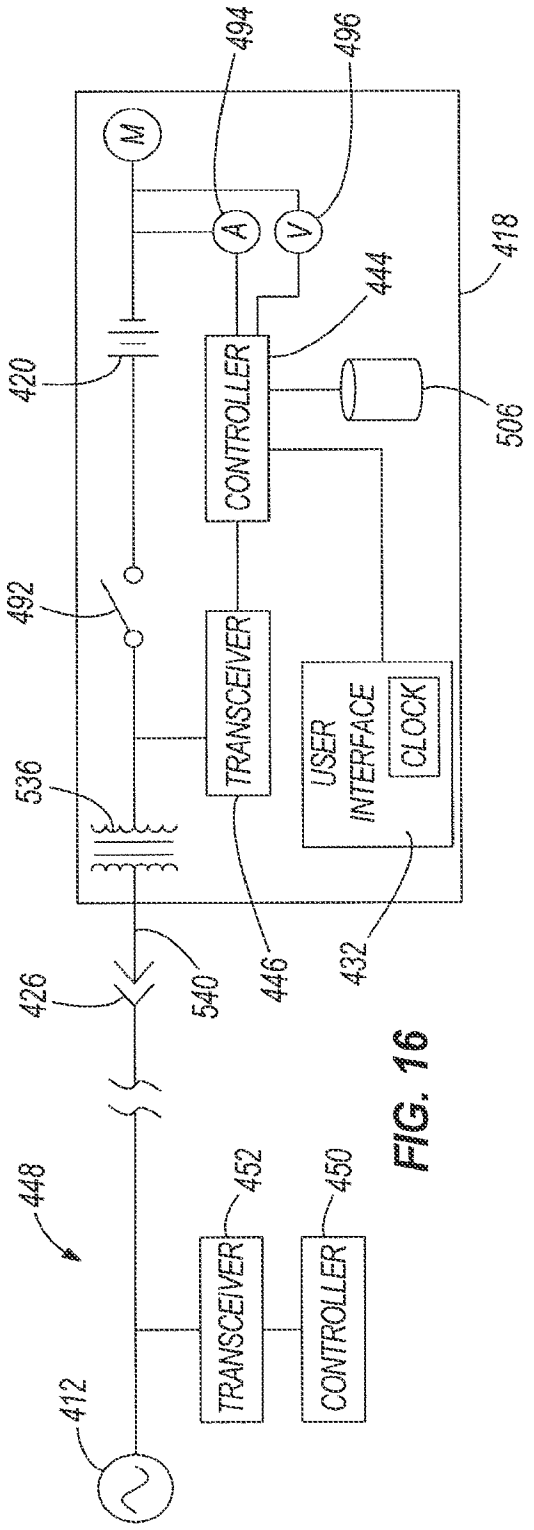
494
496
M
A
V
418
444
420
CONTROLLER
506
492
TRANSCEIVER
USER INTERFACE
CLOCK
536
426
540
446
432
448
452
450
TRANSCEIVER
CONTROLLER
412

FIG. 16

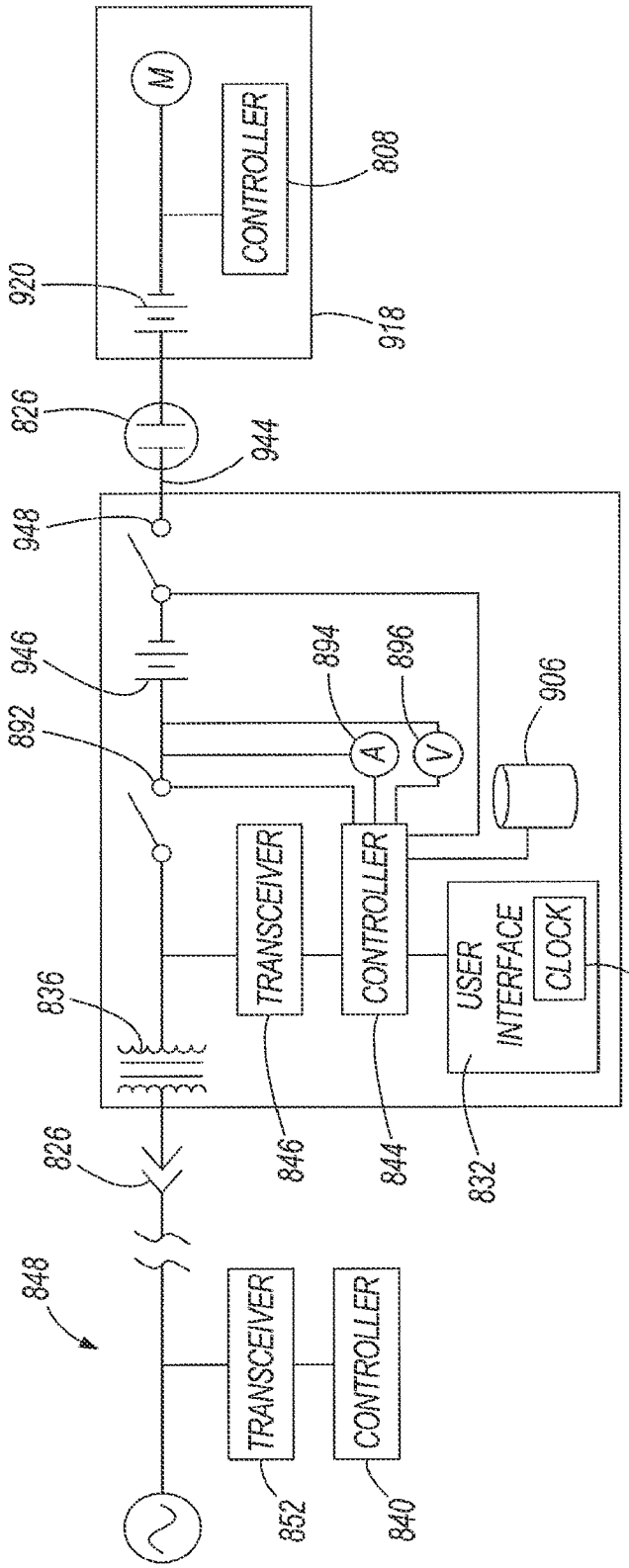
M
CONTROLLER
808
920
918
826
944
948
946
894
896
892
A
V
906
TRANSCEIVER
CONTROLLER
USER INTERFACE
CLOCK
858
836
826
846
844
832
848
TRANSCEIVER
CONTROLLER
852
840

FIG. 17

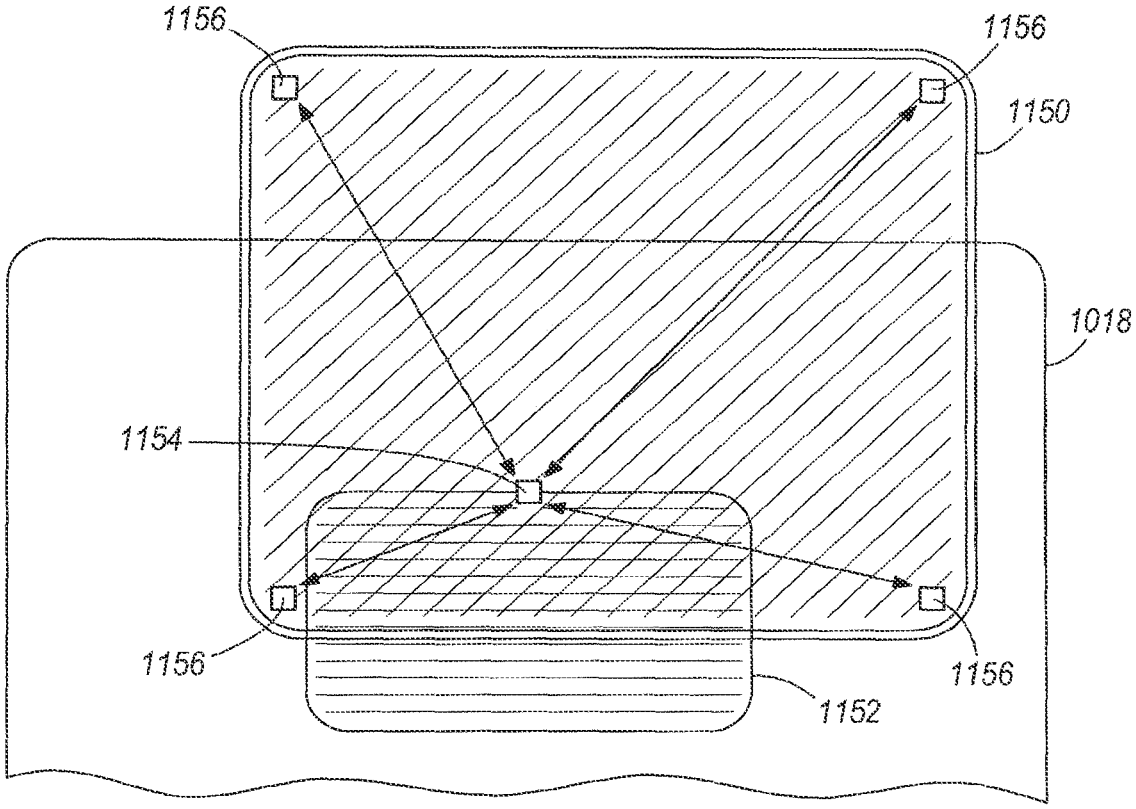
1156
1156
1150
1018
1154
1156
1156
1152

FIG. 18

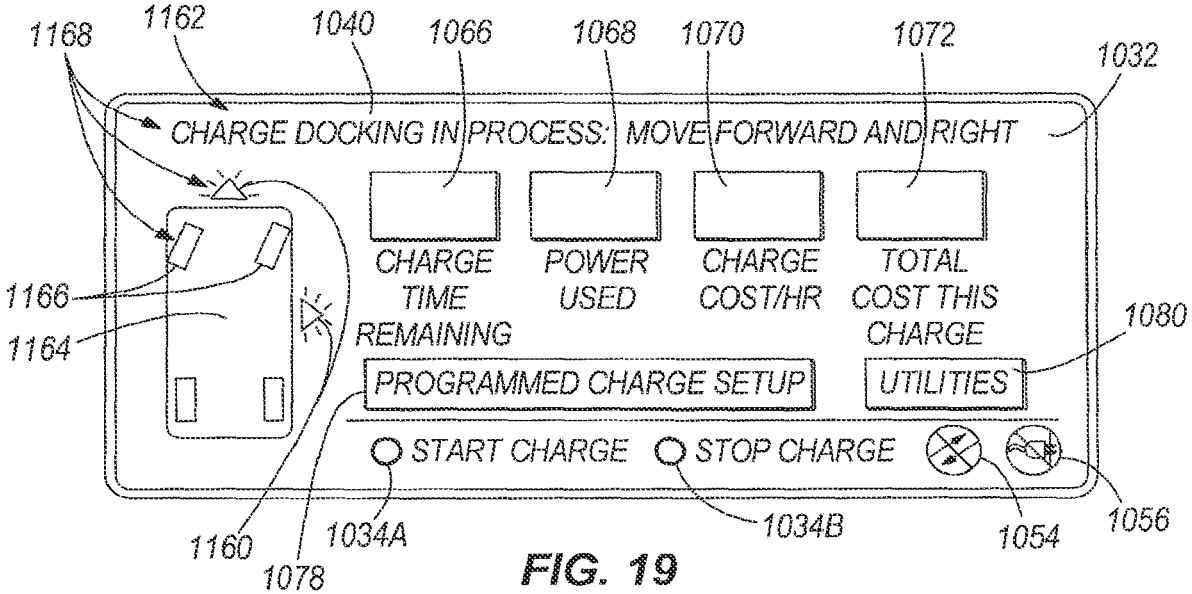
1168
1162
1040
1066
1068
1070
1072
1032
CHARGE DOCKING IN PROCESS: MOVE FORWARD AND RIGHT
CHARGE TIME REMAINING
POWER USED
CHARGE COST/HR
TOTAL COST THIS CHARGE
1166
1164
1080
PROGRAMMED CHARGE SETUP
UTILITIES
START CHARGE
STOP CHARGE
1160
1078
1034A
1034B
1054
1056

FIG. 19

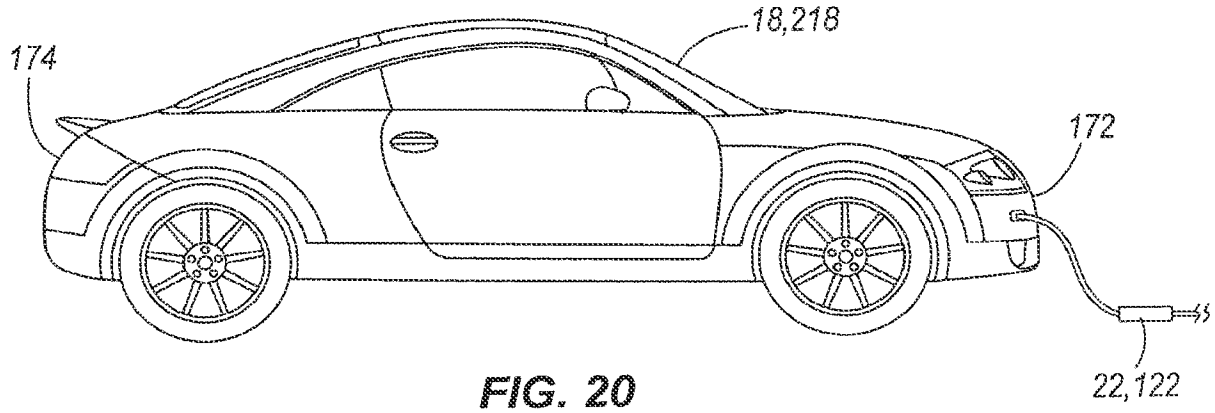

FIG. 20

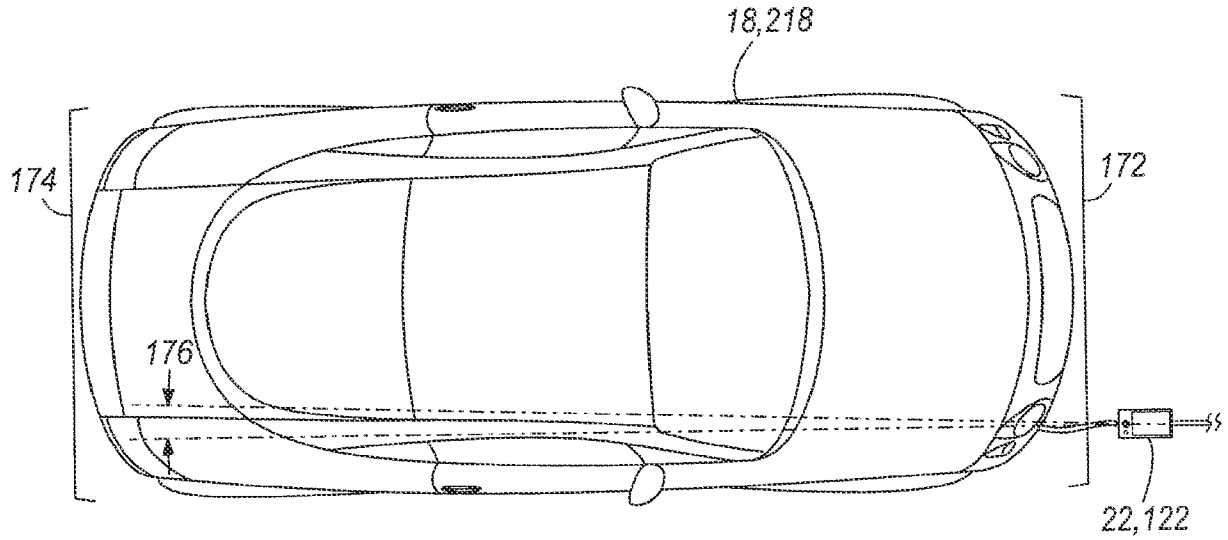

FIG. 21

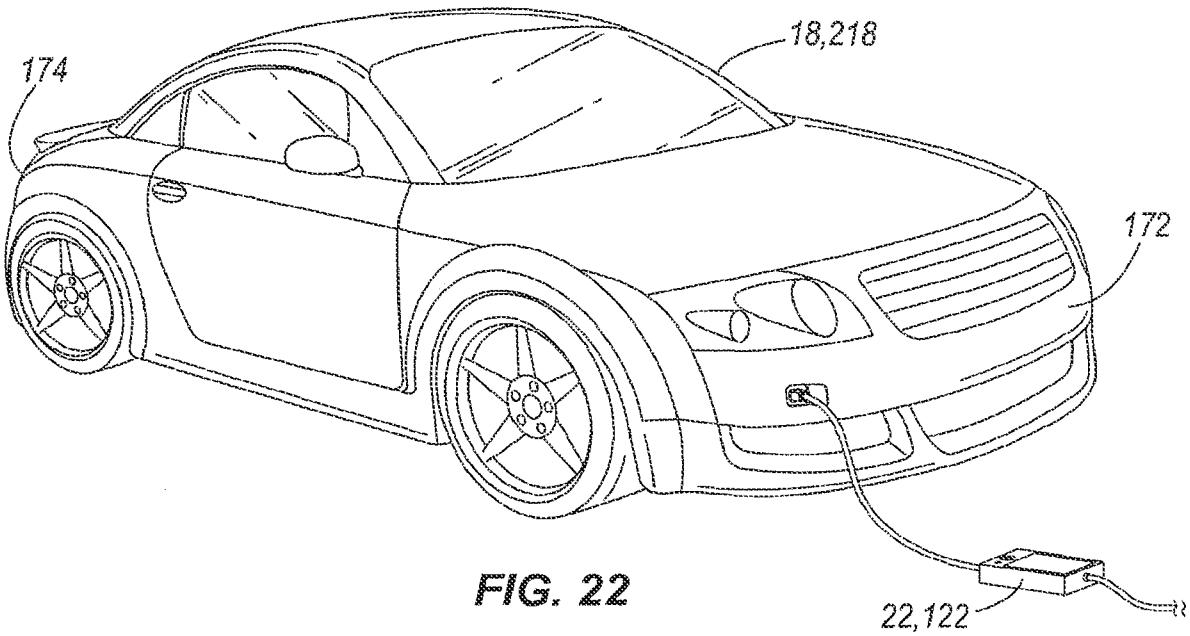

FIG. 22

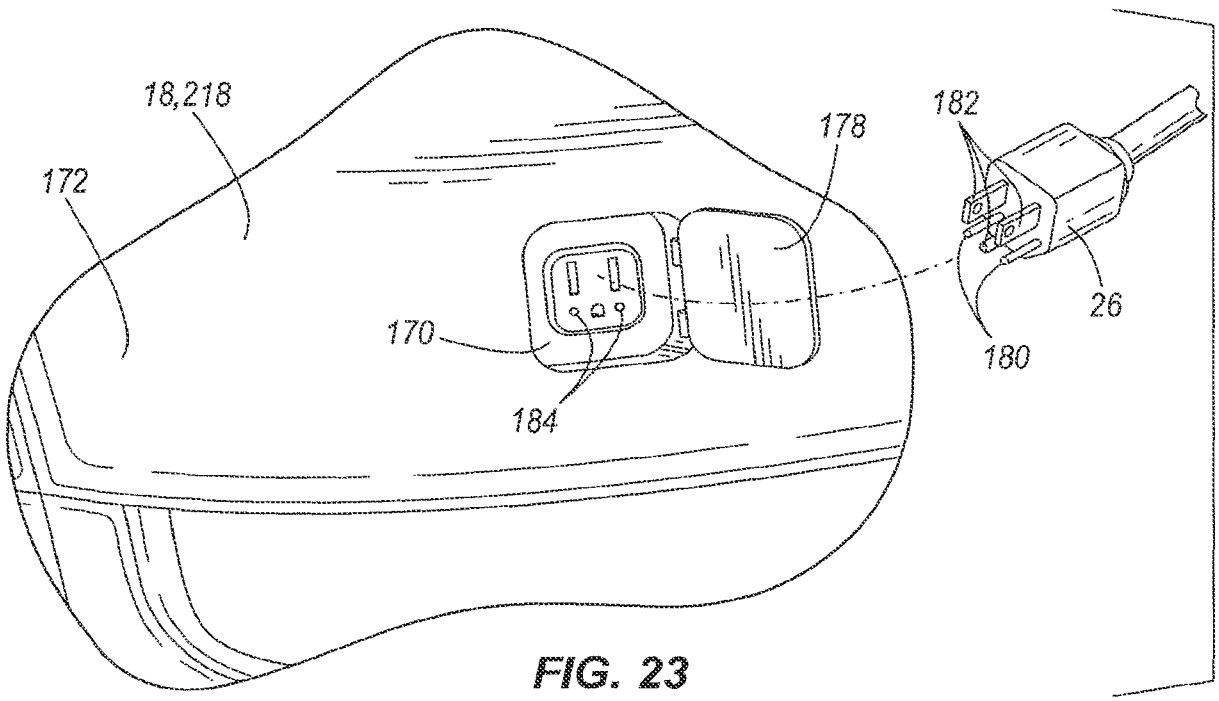

FIG. 23

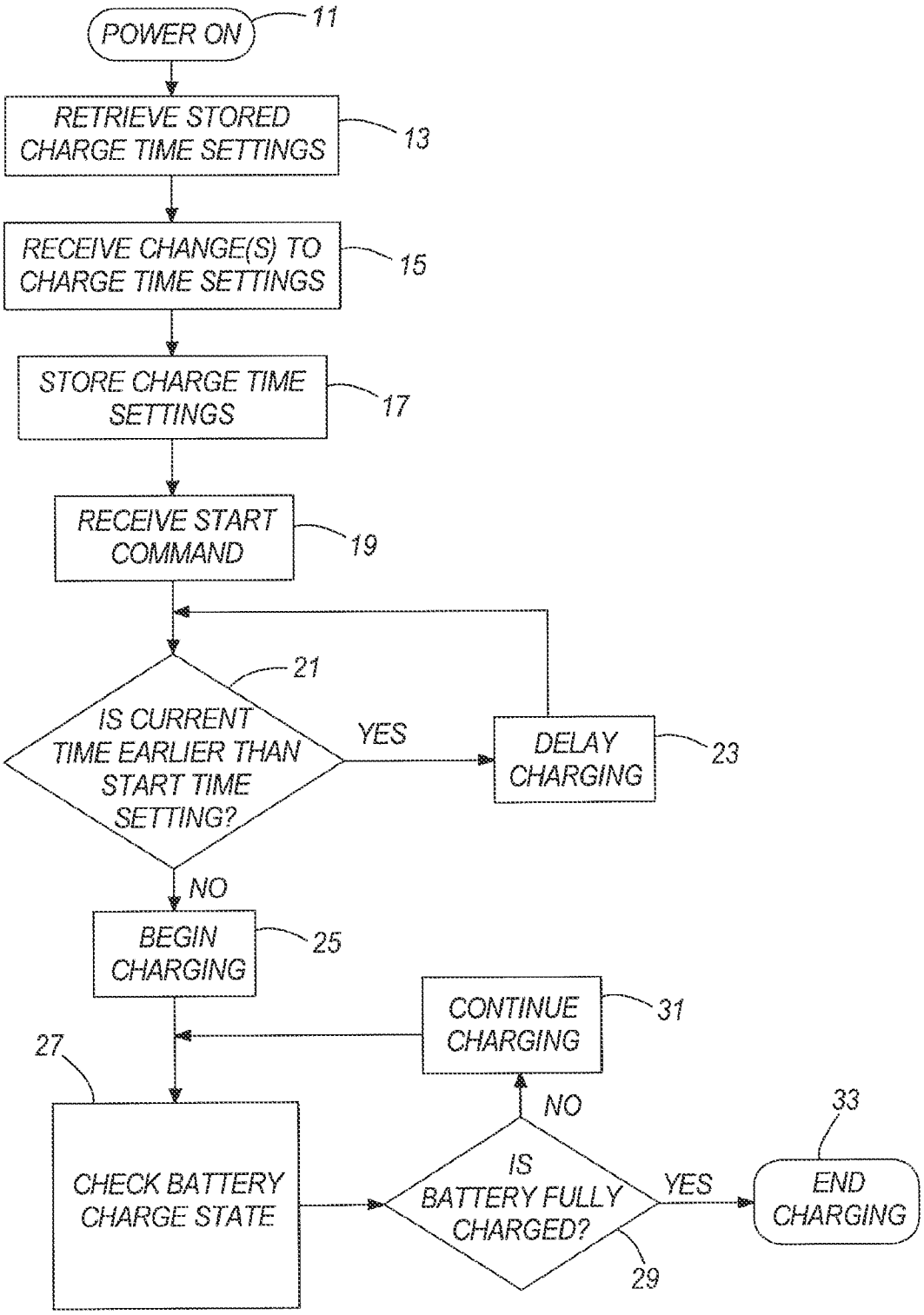
POWER ON
11
RETRIEVE STORED CHARGE TIME SETTINGS
13
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
15
STORE CHARGE TIME SETTINGS
17
RECEIVE START COMMAND
19
21
IS CURRENT TIME EARLIER THAN START TIME SETTING?
YES
DELAY CHARGING
23
NO
BEGIN CHARGING
25
CONTINUE CHARGING
31
27
CHECK BATTERY CHARGE STATE
NO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

FIG. 24

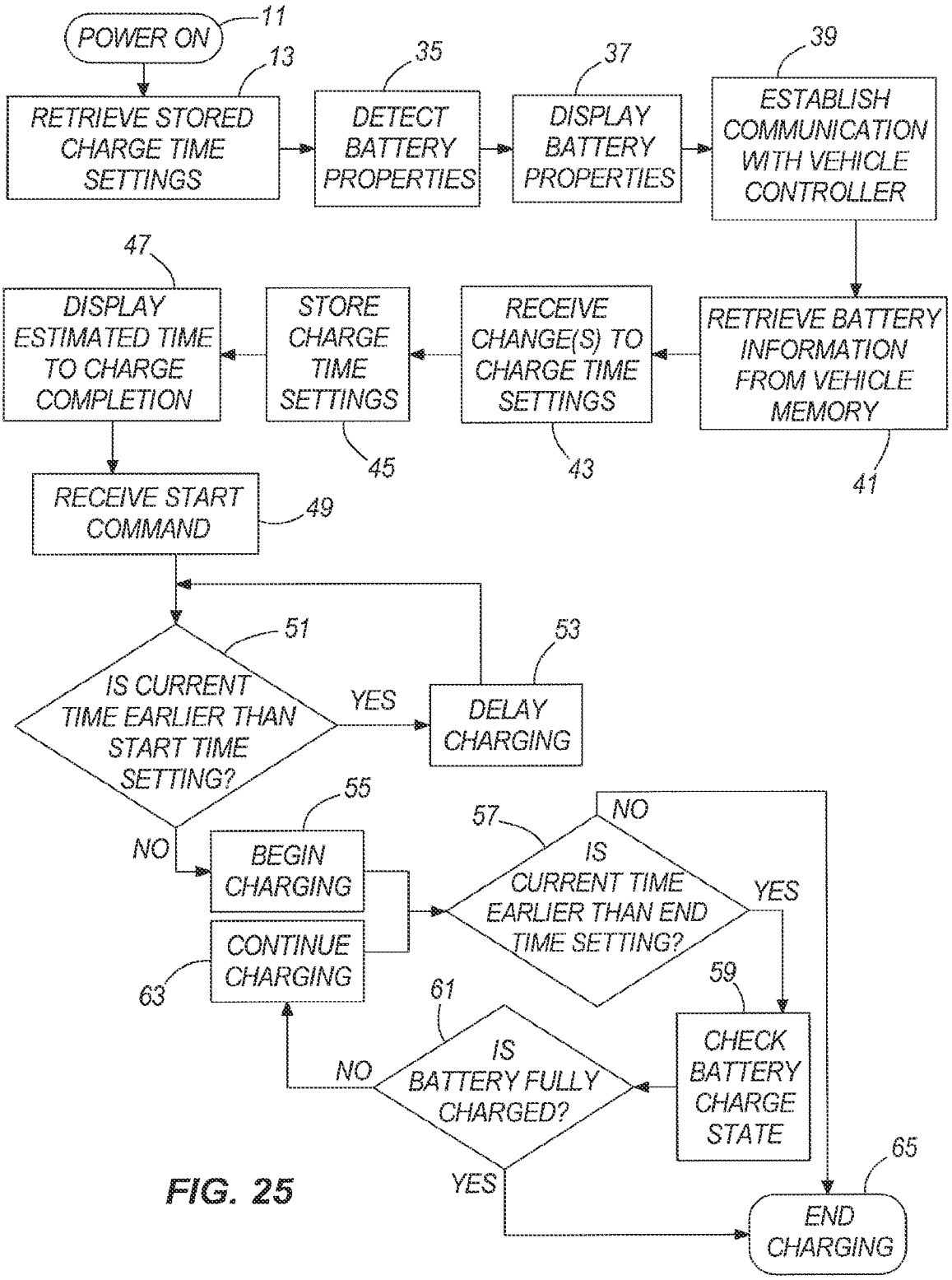
POWER ON
11
RETRIEVE STORED CHARGE TIME SETTINGS
13
DETECT BATTERY PROPERTIES
35
DISPLAY BATTERY PROPERTIES
37
ESTABLISH COMMUNICATION WITH VEHICLE CONTROLLER
39
RETRIEVE BATTERY INFORMATION FROM VEHICLE MEMORY
41
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
43
STORE CHARGE TIME SETTINGS
45
DISPLAY ESTIMATED 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

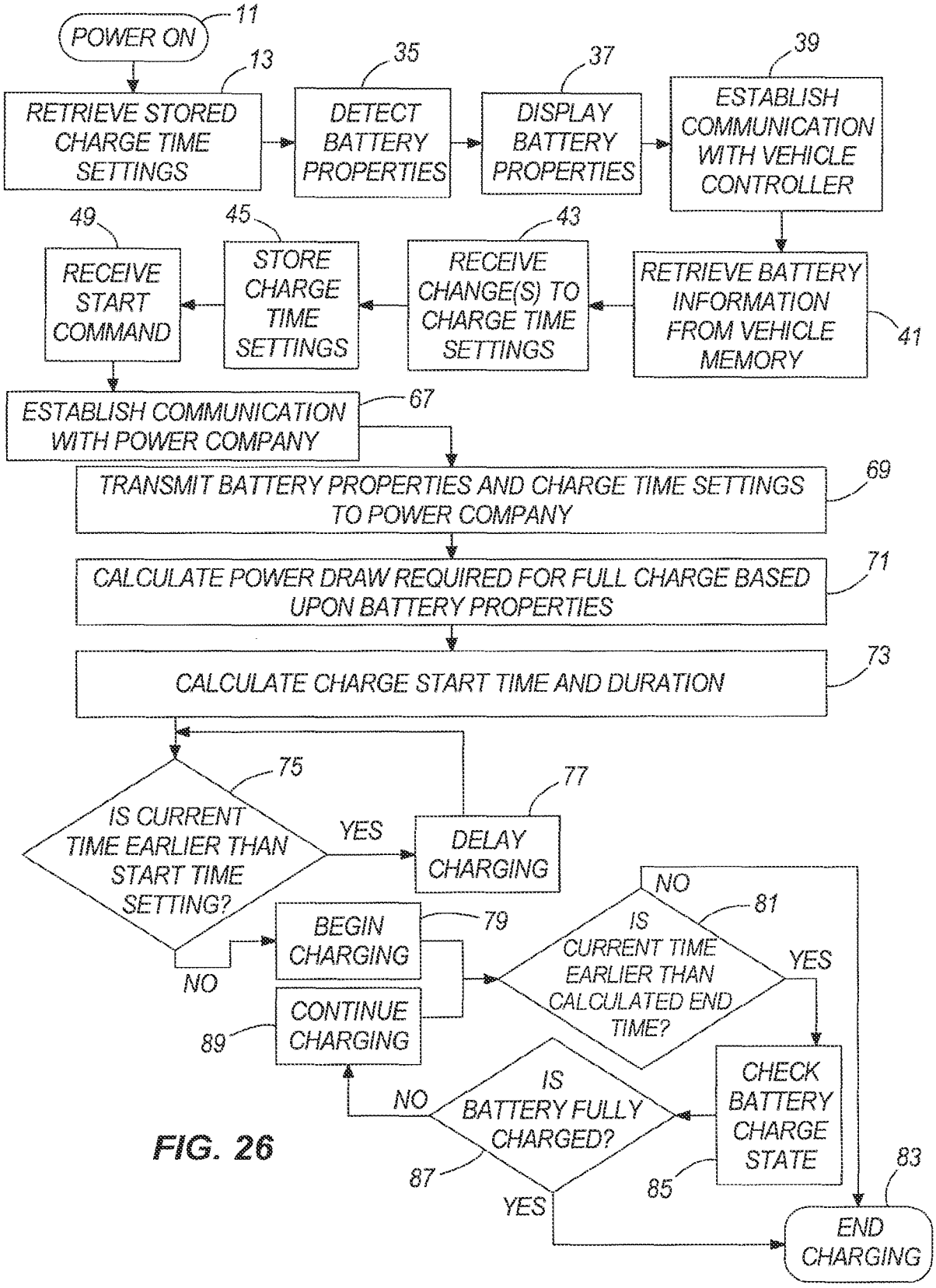
POWER ON
11
RETRIEVE STORED CHARGE TIME SETTINGS
13
DETECT BATTERY PROPERTIES
35
DISPLAY BATTERY PROPERTIES
37
ESTABLISH COMMUNICATION WITH VEHICLE CONTROLLER
39
RETRIEVE BATTERY INFORMATION FROM VEHICLE MEMORY
41
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
43
STORE CHARGE TIME SETTINGS
45
RECEIVE START 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

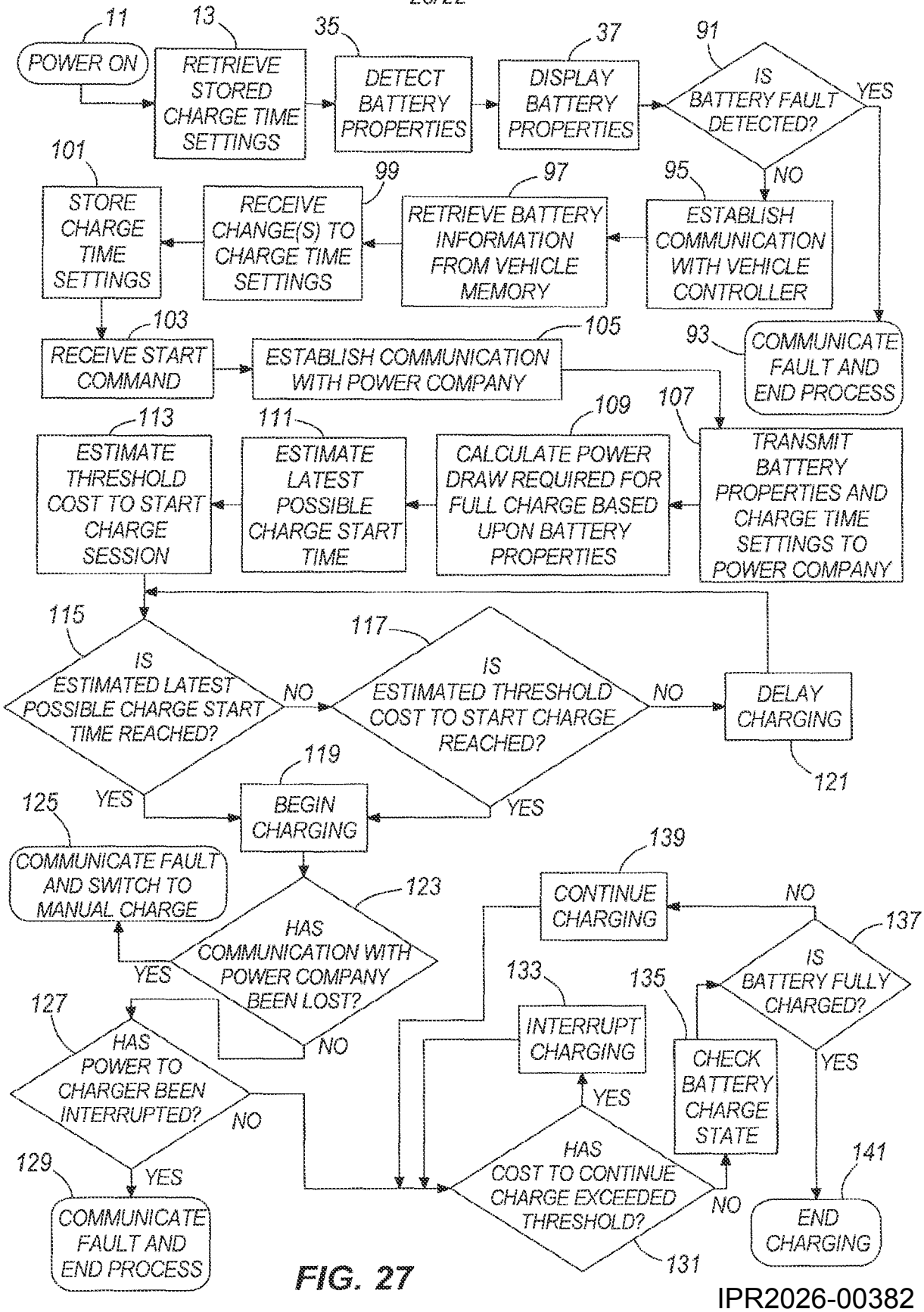
11
POWER ON
13
RETRIEVE STORED CHARGE TIME SETTINGS
35
DETECT BATTERY PROPERTIES
37
DISPLAY BATTERY PROPERTIES
91
IS BATTERY FAULT DETECTED?
YES
NO
95
ESTABLISH COMMUNICATION WITH VEHICLE CONTROLLER
97
RETRIEVE BATTERY INFORMATION FROM VEHICLE MEMORY
99
RECEIVE CHANGE(S) TO CHARGE TIME SETTINGS
101
STORE 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

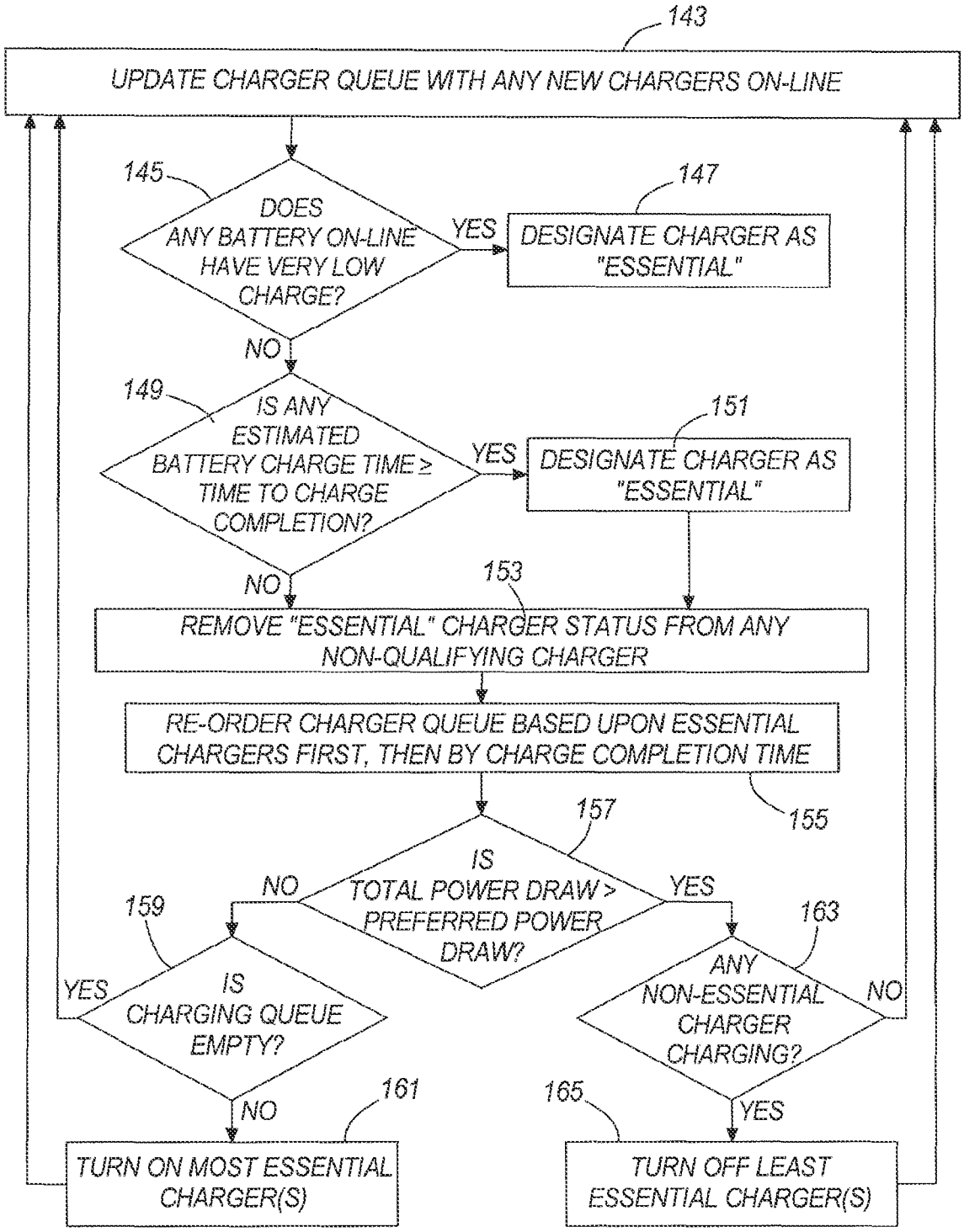
143
UPDATE CHARGER QUEUE WITH ANY NEW CHARGERS ON-LINE
145
DOES ANY BATTERY ON-LINE HAVE VERY LOW CHARGE?
YES
147
DESIGNATE CHARGER AS "ESSENTIAL"
NO
149
IS ANY ESTIMATED BATTERY CHARGE TIME ≥ TIME TO CHARGE COMPLETION?
YES
151
DESIGNATE CHARGER AS "ESSENTIAL"
NO
153
REMOVE "ESSENTIAL" CHARGER STATUS 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

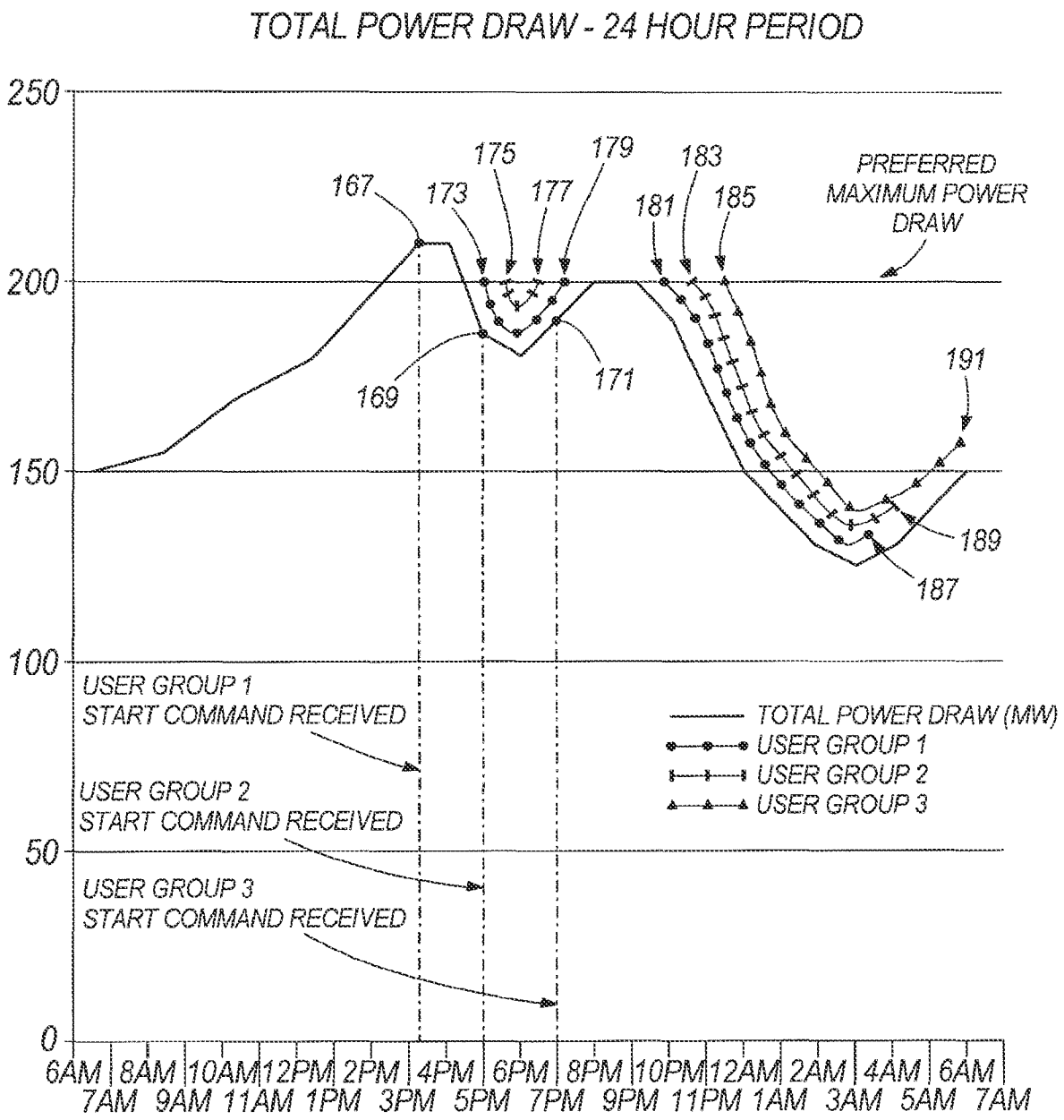
TOTAL POWER DRAW - 24 HOUR PERIOD
250
200
150
100
50
0
167
173
175
177
179
181
183
185
PREFERRED MAXIMUM POWER DRAW
169
171
191
189
187
USER GROUP 1 START COMMAND RECEIVED
USER GROUP 2 START COMMAND RECEIVED
USER GROUP 3 START COMMAND RECEIVED
TOTAL POWER DRAW (MW)
USER GROUP 1
USER GROUP 2
USER GROUP 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

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Filer:	Molly S. Lawson/Dorothy Hauser
Attorney Docket Number:	013350-9003-US57

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	80	80
UTILITY SEARCH FEE	2111	1	350	350
UTILITY EXAMINATION FEE	2311	1	400	400
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**830**

Electronic Acknowledgement Receipt

EFS ID:	46666231
Application Number:	17949911
International Application Number:	
Confirmation Number:	6463
Title of Invention:	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION
First Named Inventor/Applicant Name:	Christopher B. Austin
Customer Number:	23409
Filer:	Molly S. Lawson/Dorothy Hauser
Filer Authorized By:	Molly S. Lawson
Attorney Docket Number:	013350-9003-US57
Receipt Date:	21-SEP-2022
Filing Date:	
Time Stamp:	18:03:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$830
RAM confirmation Number	E20229KI04462287
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	Application Data Sheet	013350-9003-US57_As_Filed_ADS.pdf	1256422 9aa3641d62addd2da2bbdf6dcc9e6978e5950ce3	no	9
Warnings:					
Information:					
2	Oath or Declaration filed	013350-9003-US57_As_Filed_Declaration.pdf	79378 3e62dac928c18ddf3fa93b320b91753744611274	no	1
Warnings:					
Information:					
3		013350-9003-US57_As_Filed_Preliminary_Amendment.pdf	143125 64580cae95952505117d0b80926b20e2a4044050	yes	7

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Preliminary Amendment	1	1
Specification	2	2
Claims	3	6
Abstract	7	7

Warnings:					
Information:					
4		013350-9003-US57_As_Filed_Application.pdf	16072752 31fcd6ed26ec2ee96c4c8d03d5631a1bd7358a48	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:					
5	Fee Worksheet (SB06)	fee-info.pdf	44295 f67f5bdb79a35d3a415d5c23c5177f02d902c376	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	17595972		

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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

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	Grafton	State/Province	WI	Country of Residence	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.**

Customer Number	23409		
Email Address	mkeipdocket@michaelbest.com	Add Email	Remove Email

Application Information:

Title of the Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION		
Attorney Docket Number	013350-9003-US57	**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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

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)
Customer Number	23409		

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	16/249028	2019-01-16

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/249028	Continuation of	16/056041	2018-08-06
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/056041	Continuation of	12/737803	2011-02-17	10090567	2018-10-02

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[j] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

☐ 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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

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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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

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-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

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	/molly s. lawson/			Date (YYYY-MM-DD)	2022-09-21
First Name	Molly	Last Name	Lawson	Registration Number	58890

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

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Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	013350-9003-US57
	Application Number	
Title of Invention	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

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.**

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 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.

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 DISPLAYING CHARGE INFORMATION

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 16/249,028 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): September 20, 2022

Signature: /christopher b. 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.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/949,911

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	80		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	350		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	400		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	* 0	x =	0	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x =	0			
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			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	830		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	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/949,911	09/21/2022	2859	830	013350-9003-US57	20	2

CONFIRMATION NO. 6463

FILING RECEIPT

23409
MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

Date Mailed: 10/05/2022

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 16/249,028 01/16/2019
which is a CON of 16/056,041 08/06/2018 ABN
which is a CON of 12/737,803 02/17/2011 PAT 10,090,567
which is a 371 of PCT/US2009/054174 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

IPR2026-00382
Tesla EX1002 Page 115

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

Projected Publication Date: 01/12/2023

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE 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 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57

CONFIRMATION NO. 6463

NEW OR REVISED PPD NOTICE

23409
MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

OC00000136527695

NOTICE OF NEW OR REVISED PROJECTED PUBLICATION DATE

The above-identified application has a new or revised projected publication date. The current projected publication date for this application is 01/12/2023. If this is a new projected publication date (there was no previous projected publication date), the application has been cleared by Licensing & Review or a secrecy order has been rescinded and the application is now in the publication queue.

If this is a revised projected publication date (one that is different from a previously communicated projected publication date), the publication date has been revised due to processing delays in the USPTO or the abandonment and subsequent revival of an application. The application is anticipated to be published on a date that is more than six weeks different from the originally-projected publication date.

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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	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	
Attorney Docket Number	013350-9003-US57

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	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.	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	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.	
	13	6963186		2005-11-08	Hobbs, Raymond	
	14	7243746		2007-07-17	Vasant, Abraham	
	15	7881957		2011-02-01	Cohen et al.	
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	18	7782021		2010-08-24	Kelty et al.	
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	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.	
	4	20030209375		2003-11-13	Suzuki, Furmio, et al.	
	5	20050046387		2005-03-03	Aker, John F., et al.	
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	7	20070080827		2007-04-12	Huang, Ching Tiem	
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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	9	20070164704		2007-07-19	Mcginley, James W., et al.	
	10	20080007202		2008-01-10	Pryor, Bryan K.	
	11	20080040223		2008-02-14	Bridges, Seth W., et al.	
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	13	20080052017		2008-02-28	Smith, Wendell M., et al.	
	14	20080052145		2008-02-28	Kaplan, David L., et al.	
	15	20080054845		2008-03-06	Wang, Jeen-shuh	
	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	

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	Art Unit	2859
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	Attorney Docket Number	013350-9003-US57

	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	
	24	20090063193		2009-03-05	Barton, Mike, et al.	
	25	20090139781		2009-06-04	Straubel, Jeffrey Brian	
	26	20090237034		2009-09-24	Lindemann, Robert, et al.	
	27	20090243538		2009-10-01	Kelty, Kurt Russell, et al.	
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	29	20090278492		2009-11-12	Shimizu, Tomomi, et al.	
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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	31	20090313103		2009-12-17	Ambrosio, Ronald, et al.	
	32	20090313174		2009-12-17	Hafner, James Lee, et al.	
	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	
	36	20100169008		2010-07-01	Niwa, Toshiaki, et al.	
	37	20100228405		2010-09-09	Morgal, Richard, et al.	
	38	20100281183		2010-11-04	Van Bebber, Achim	
	39	20110266996		2011-11-03	Sugano, Tomio	
	40	20090063183		2009-03-05	McNeely et al.	
	41	20100106631		2010-04-29	Kurayama et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	42	20080039989		2008-02-14	Pollack et al.	
	43	20090312903		2009-12-17	Hafner et al.	
	44	20090047991		2009-02-19	ELG	

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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)	☒
	3	WO2001018899	WO		2001-03-15	Tokyo R & D Co., Ltd.		☒
	4	JP2004142661	JP		2004-05-20	Kawakami et al.		☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	1	Search Report issued in corresponding PCT/US2009/054174; December 3, 2009
	2	Written Opinion issued in corresponding PCT/US2009/054174; December 3, 2009
	3	Search Report issued in corresponding EP09808718.2; September 21, 2017
	4	English Translation of relevant text for WO 0118899, 3 pages (Year: 2001).

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Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

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)	2022-10-10
Name/Print	Christopher B. Austin	Registration Number	41,592

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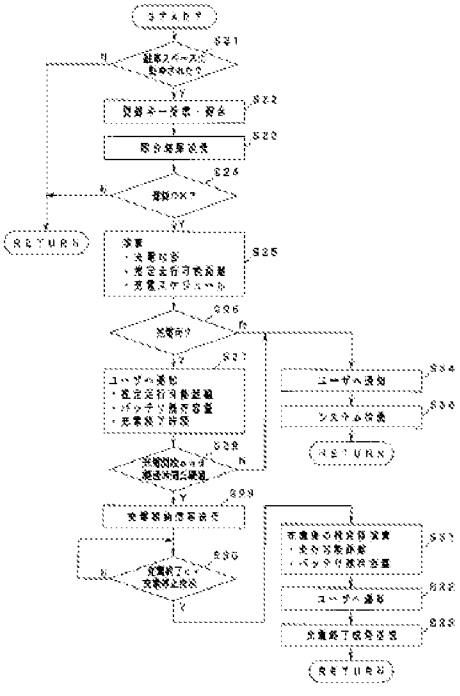
(54)【発明の名称】電気自動車のバッテリ充電システム

(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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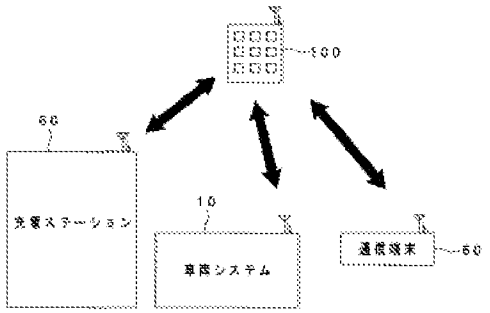
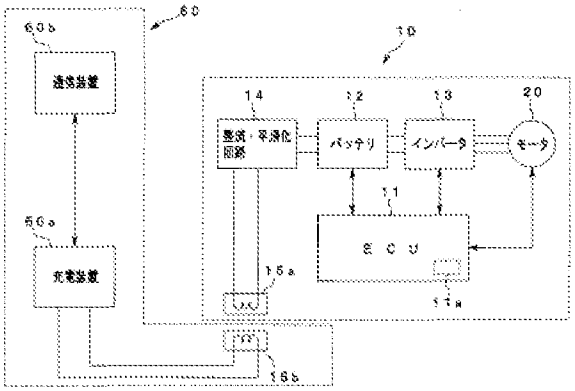
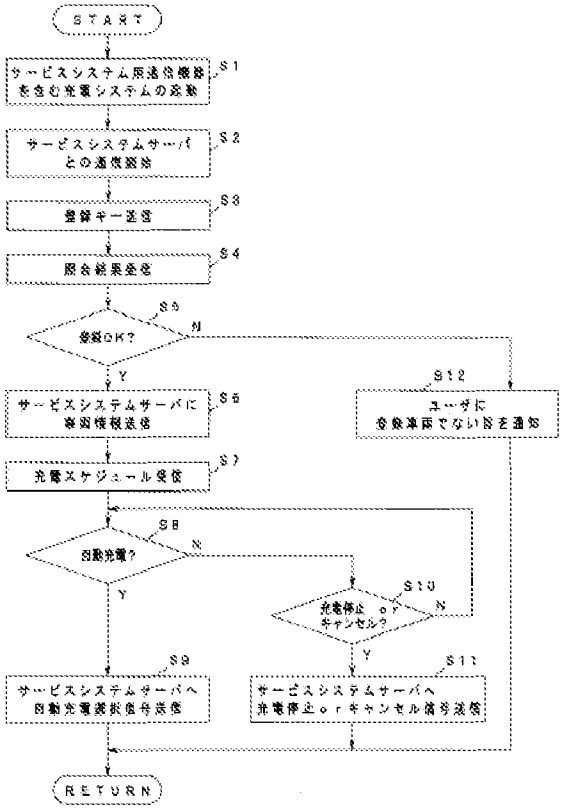
【図１】


100
50
充電ステーション
10
車両システム
通信端末
60

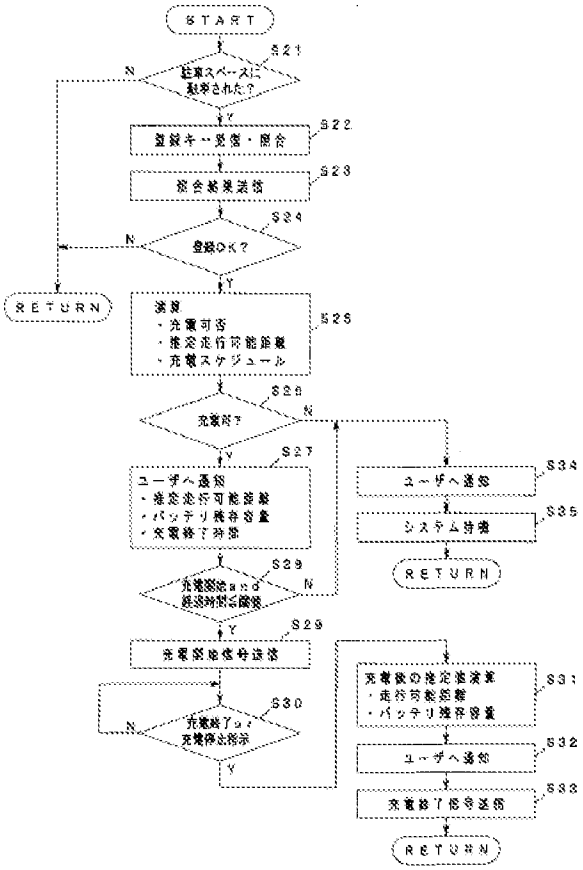
【図２】


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

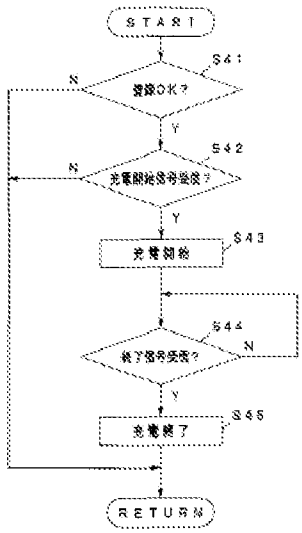
【図３】


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開始
S2
登録キー送信
S3
照合結果受信
S4
S5
登録OK?
N
Y
S12
ユーザに登録車両でないことを通知
サービスシステムサーバに車両情報送信
S6
充電スケジュール受信
S7
S8
自動充電?
N
Y
S10
充電停止 or キャンセル?
N
Y
S9
サービスシステムサーバへ自動充電実施信号送信
S11
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
RETURN

【図４】


START
S21
駐車スペースに駐車された?
N
Y
S22
登録キー受信・照合
S23
照合結果送信
S24
登録OK?
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
S26
充電可?
N
Y
S27
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
S34
ユーザへ通知
S35
システム待機
RETURN
S29
充電開始and経過時間≦閾値
N
Y
S29
充電開始信号送信
S30
充電終了or充電停止指示
N
Y
S31
充電後の推定走行距離
・走行可能距離
・バッテリ残存容量
S32
ユーザへ通知
S33
充電終了信号送信
RETURN

【図５】


START
S41
登録OK?
N
Y
S42
充電開始信号受信?
N
Y
S43
充電開始
S44
終了信号受信?
N
Y
S45
充電終了
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

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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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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).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2009/054174

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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In case the space in any of the preceding boxes is not sufficient.
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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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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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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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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).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2009/054174

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

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.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

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Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

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.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2009/054174

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

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.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 00000-0977WO	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2009/054174	International filing date *(day/month/year)* 18 August 2009	(Earliest) Priority Date *(day/month/year)* 18 August 2008
Applicant AUSTIN, CHRISTOPHER		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out 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)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☒ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 22

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/054174

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

1-139, 142, 146-147

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/054174

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H01M 10/44 (2009.01)
USPC - 320/128
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)
IPC(8) - H01J 7/00; H01M 10/44 (2009.01)
USPC - 180/6.5; 320/114, 128; 439/34; 705/1, 8

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
MicroPatent, GooglePatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,963,186 B2 (HOBBS) 08 November 2005 (08.11.2005) entire document	1-3, 6, 10-14, 18, 20-21, 30-33, 38, 40-41, 44-45 ---------- 4-5, 7-9, 15-17, 19, 22-29, 34-37, 39, 42-43, 46-139, 142, 146-147
Y	US 2007/0164704 A2 (MCGINLEY et al) 19 July 2007 (19.07.2007) entire document	4, 53
Y	US 2008/0052145 A1 (KAPLAN et al) 28 February 2008 (28.02.2008) entire document	5, 7-9, 22-25, 36-37, 42-43, 54, 56-58, 70-72, 82-83, 87-90, 99, 101-103, 115-117, 127-128, 132-135
Y	US 5,462,439 A (KEITH) 31 October 1995 (31.10.1995) entire document	15-17, 19, 63-65, 67, 108-110, 112, 142
Y	US 7,243,746 B1 (VASANT) 17 July 2007 (17.07.2007) entire document	34-35, 39, 48-50, 80-81, 85, 96-97, 125-126, 130
Y	US 5,548,200 A (NOR et al) 20 August 1996 (20.08.1996) entire document	26-29, 46-139, 142, 146-147

☐ Further documents are listed in the continuation of Box C. ☐

* 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
27 November 2009	03 DEC 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/054174

Continuation of Box III.

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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(19) 世界知的所有権機関
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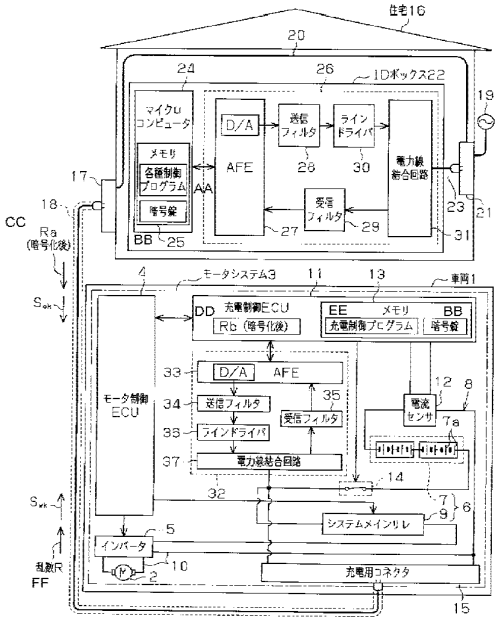
(54) **Title:** CHARGING SYSTEM

(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。

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— **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

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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、

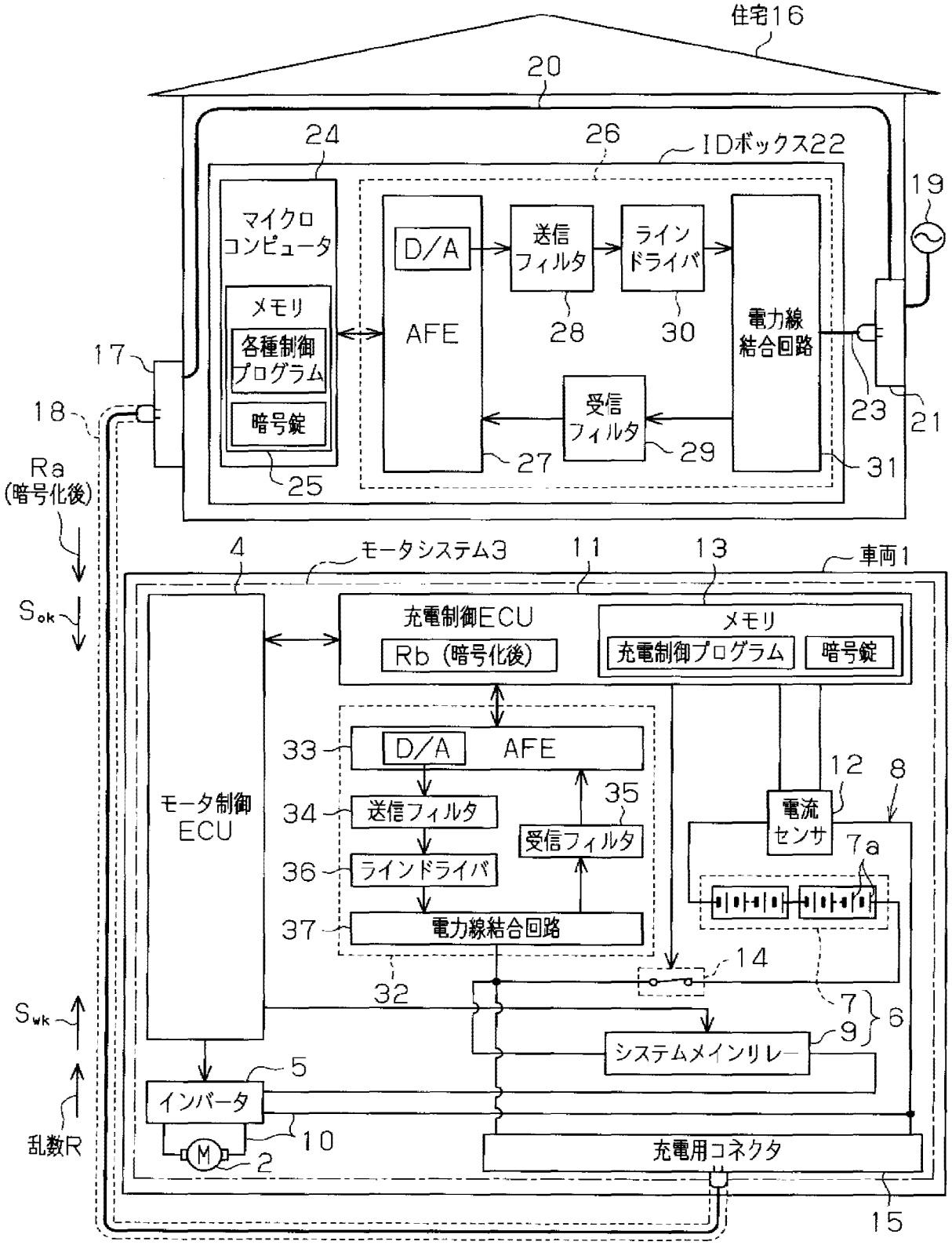
固有の識別子を有する通信端末と、

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、

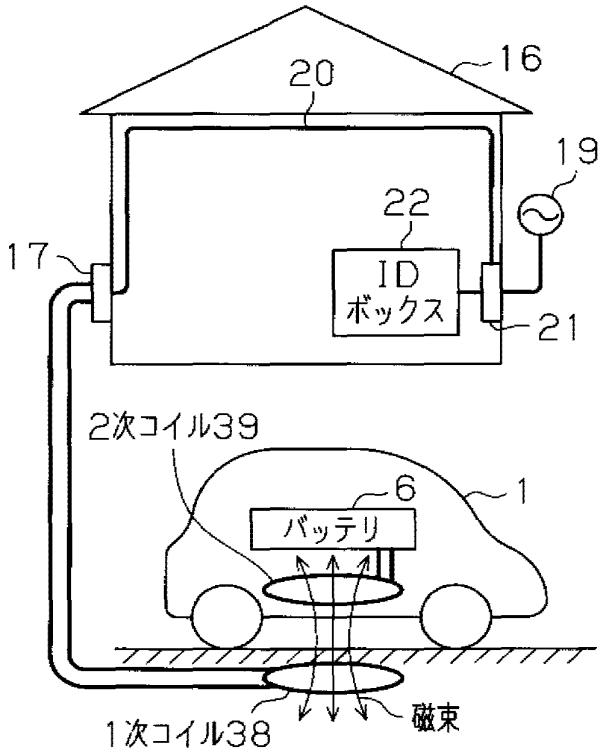
を含むことを特徴とする請求項1～8のうちいずれか一項に記載の充電システム。

[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。

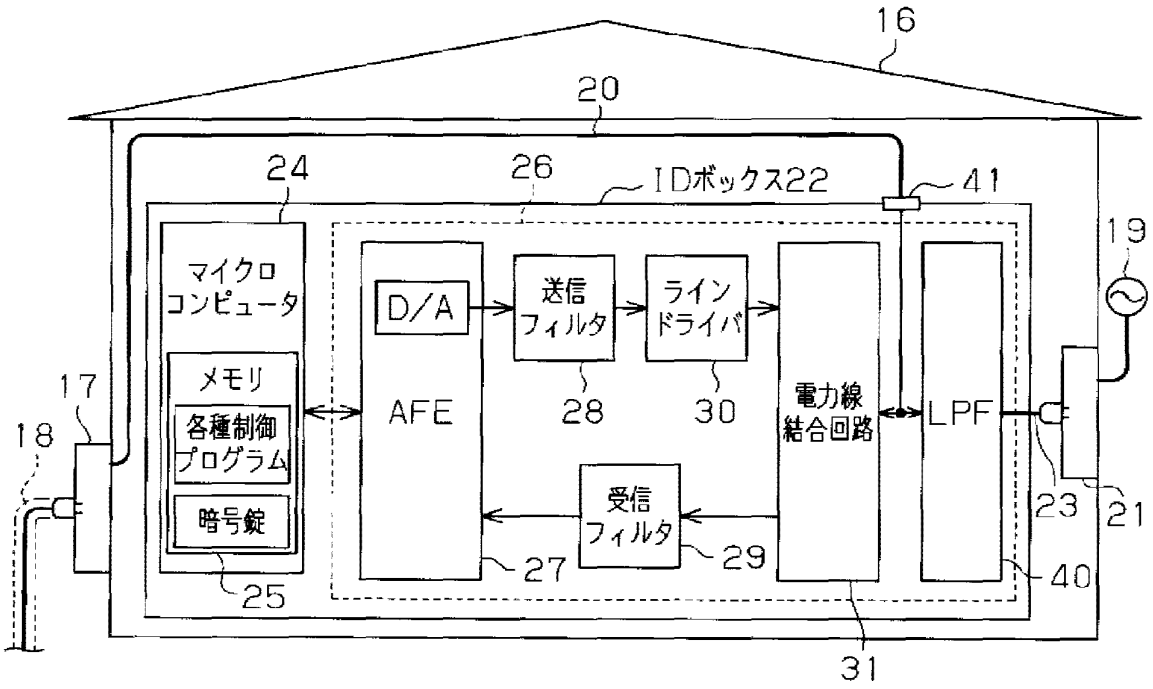
[図1]


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
受信フィルタ
電力線結合回路
17
18
23
21
28
30
27
29
31
25
Ra
(暗号化後)
4
モータシステム3
11
13
車両1
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
33
D/A
AFE
12
8
35
34
送信フィルタ
受信フィルタ
電流センサ
7a
36
ラインドライバ
37
電力線結合回路
14
32
モータ制御ECU
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

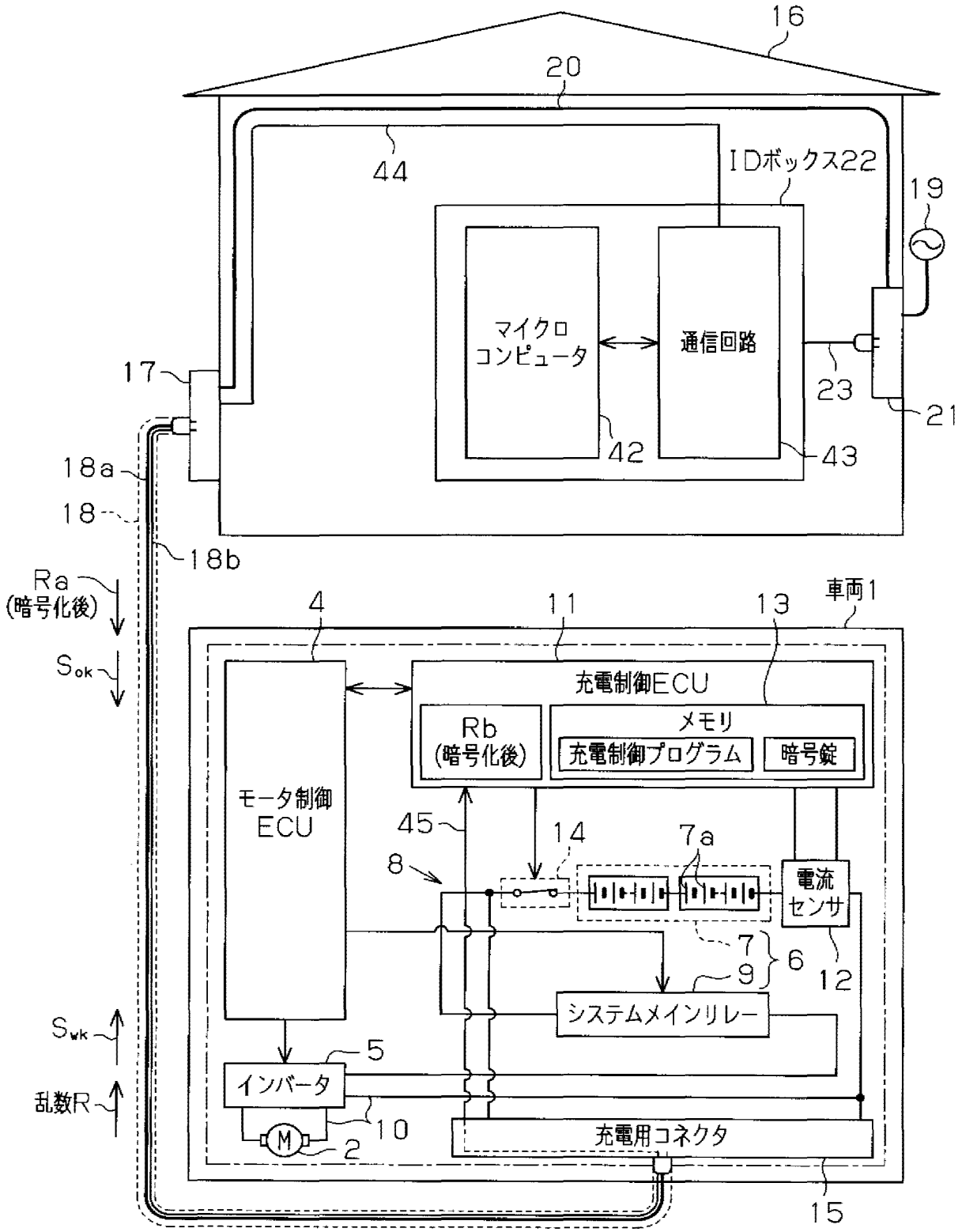
[図2]


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

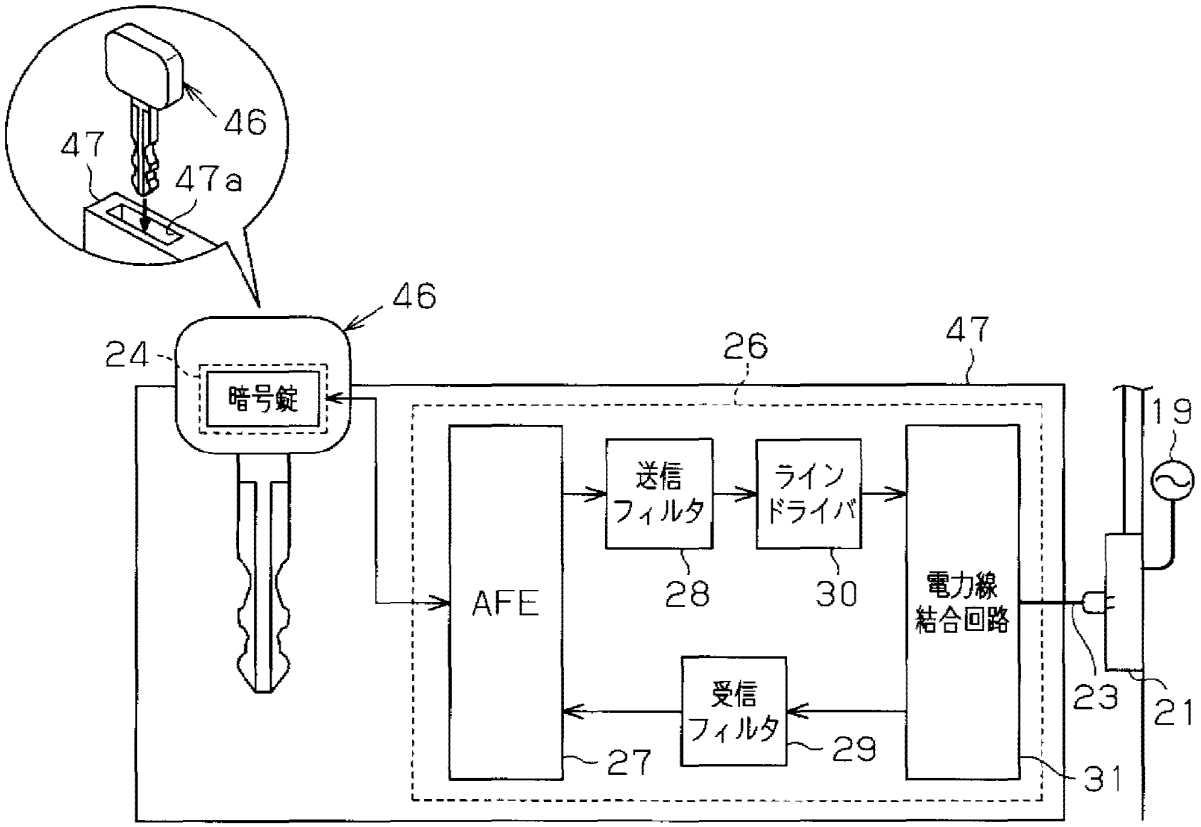
[図3]


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
29
27
40
23
21
25
31

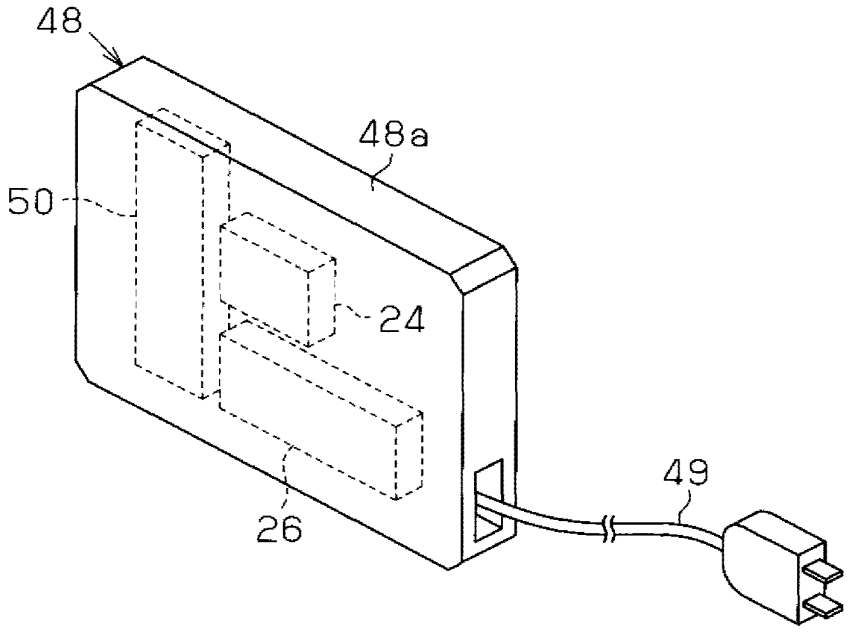
[図4]


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
9
6
12
システムメインリレー
Swk
5
インバータ
乱数R
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
27
29
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:
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"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.

Form PCT/ISA/210 (second sheet) (April 2005)

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
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「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
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

特許庁審査官（権限のある職員）　５Ｔ　３３５７
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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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**10/10/2022 02:48:13 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Eliana Carter
PATENT CENTER #	61049634	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 9

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57_IDS_Filed_10-10-22.pdf	10	Information Disclosure Statement (IDS) Form (SB08)	986 KB
JP2004142661-FOR.pdf	21	Foreign Reference	2129 KB
JP2006074868_w_English_Translation-FOR.pdf	20	Foreign Reference	4497 KB
NPL_EP_Search_Report_issued_in_corresponding_EP09808718-2_September_21_2017.pdf	7	Non Patent Literature	206 KB

NPL_Search_Report_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	4	Non Patent Literature	224 KB
NPL_WO0118899_English_Translation.pdf	3	Non Patent Literature	1272 KB
NPL_Written_Opinion_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	14	Non Patent Literature	966 KB
WO2001018899-FOR.pdf	36	Foreign Reference	1267 KB
WO2008026390-FOR.pdf	28	Foreign Reference	1315 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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JP2006074868_w_English_Translation-FOR.pdf	16BEB47E986BB524FB949BDC9706B4434EF95D61ACA2012105E53EFB3A7CCB3C2182831946803 2F071FBAD17E7EC909649BD97D53195245451C9B27485D6FC0E
NPL_EP_Search_Report_issued_in_corresponding_EP09808718-2_September_21_2017.pdf	DAF0040FADE1CAB281AEDF2A50D968128033478EACA0E954C86A7DA857512EFDA2D7BD777FB44097F98EE61756161DBA34C08D327378C7C5993CC97E25A57A90

NPL_Search_Report_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	0254856B8A6E5D906165D4023652E1F7A1CB2650A5896A20A28621152A079905A010FF3B1C3052D350FEDA1CB2450BF3E5788350915317A4109FA8214A199AE1
NPL_WO0118899_English_Translation.pdf	E07CD4731EF975D42038DB71A92C1E968BA3949C182A9F418AA3BF53BB2B5D8C4122DE98B3F50D1BBEB2F574D7BA63431985694AE75088915 5B6A5D81C8D63FC
NPL_Written_Opinion_issued_in_corresponding_PCT-US2009-054174_December_3_2009.pdf	293D5785962E8EC231DEC51AF981BC2BB2F6A1855BA52DC1EB30891C9101F56CF234639ACD33B1C59AD150EBB33ACB50053DA3368E7A9079B2CC74489B650A36
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WO2008026390-FOR.pdf	88D3F4A571D687D88E3AA4302688243FFF926B20CEC8D6F25C61B0D9D494F6141E7A40F1EF10BB72681C864317E3DB1404D9C43FEAC1FE79EA9FE7598D0CD7BD

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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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(19) 世界知的所有権機関
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PCT

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WO 01/18899 A1

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特願平11/253389 1999 年9 月7 日 (07.09.1999) JP

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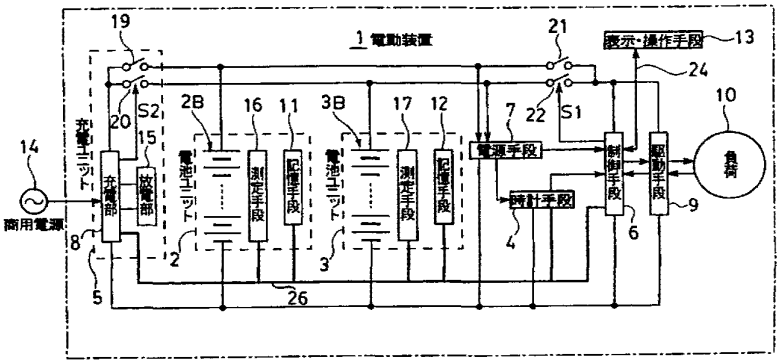
添付公開書類:
— 国際調査報告書

２文字コード及び他の略語については、定期発行される各PCTガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

(54) Title: ELECTRIC DEVICE WITH TIMER MEANS

(54) 発明の名称: 時計手段を有する電動装置



1...ELECTRIC DEVICE
2...BATTERY UNIT
3...BATTERY UNIT
4...TIMER MEANS
5...CHARGER UNIT
6...CONTROL MEANS
7...POWER SUPPLY MEANS
8...CHARGER
9...DRIVE MEANS
10...LOAD
11...STORAGE MEANS
12...STORAGE MEANS
13...DISPLAY AND CONTROL MEANS
14...LINE POWER
15...DISCHARGER
16...MEASURING MEANS
17...MEASURING MEANS

(57) Abstract: An electric device comprises rechargeable batteries (2B, 3B); measuring means (16, 17) for measuring the states of the batteries; storage means (11, 12) for storing measured data and the characteristic data of the batteries; control means (6) for controlling load (10); timer means (4); display and control means (13) capable of setting the timer means (4) and indicating time; and a charger unit (5). The rechargeable batteries (2B, 3B) are charged under control based on the data in the storage means (11, 12) and/or the data from the measuring means (16, 17) and on the time data from the timer means (4).

[続葉有]

WO 01/18899 A1

(57) 要約:

電動装置に、二次電池（２Ｂ，３Ｂ）と、その状態を測定する測定手段（１６，１７）及びその測定情報及び二次電池の特性に関する情報を記憶する記憶手段（１１，１２）と、負荷（１０）の駆動を制御する制御手段（６）と、時計手段（４）と、その時計手段（４）に対する時刻設定機能及び時刻表示機能を持つ表示・操作手段（１３）と、充電ユニット（５）とを備え、測定手段（１６，１７）及び／又は記憶手段（１１，１２）の情報と時計手段（４）による時刻情報とに基づいて二次電池（２Ｂ，３Ｂ）の管理及び充電を行う。

明　細　書

時計手段を有する電動装置

技術分野

この発明は、二次電池を搭載してその電力によって走行する小型電気自動車，電動二輪車，電動スクータ，電動車椅子などの電動装置に関するものである。

背景技術

小型電気自動車，電動二輪車，電動スクータ，電動車椅子などのように、複数の二次電池である蓄電池からなる組電池を電力源として搭載した電動車両等の電動装置がある。これらには、組電池の電力で電動機（モータ）を駆動し、そのモータの駆動のみで走行する車両、人力とモータの駆動力との合力で走行する車両、あるいは通常のガソリンエンジンの駆動力と組電池の電力によるモータの駆動力とを切り替えて使用する車両等がある。

これらの電動装置に使用される電力源である組電池は、頻繁に充電する必要がある。その充電方法としては、その組電池を搭載している電動装置から取り外して充電する方法、あるいは電動装置に搭載したままで充電するいわゆる車載充電方法などが日常行われている。

ところで、このような従来の電動装置においては、充電前の二次電池の残存容量の把握が不充分であり、勘や経験等によって、電動車両が遊休している時間帯に充電時間を設定して充電する方法が採られている。

さらに、二次電池の残存容量の把握が不充分であるため、実際に使用するときに残存容量がなかったり、稼働後に残存容量が不足していたため目的地まで走行できなかったりすることが生じていた。また、充電の終了時間を正確に予測したり、指定時間に充電したり、指定時間までに最大の充電を行ったりすることもできなかった。

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これらの欠陥を補う手段として、例えば充電後の見かけ上高く出る二次電池の出力電圧を落ち着かせるために、充電完了後予め定めた時間だけ計時した後に二次電池の出力電圧を計って残容量を決めるようにしたもの（特開平８－１０６９２７号公報）、あるいは、電動装置起動時の電圧変動の多いときを避け、起動後予め定めた時間経過してから二次電池の出力電圧を測定して残存容量を判定するようにしたもの（特開平１１－３２４０１号公報）等が提案されている。

しかし、これらの従来技術は、上記したような勘や経験等による充電時間管理の域を脱せず、時刻（経過時間ではなく何時何分等）管理を行っていないため、使用者の生活に密着した時刻管理は不可能であった。

この発明は、上述したような従来技術の不具合を改善するためになされたものであり、二次電池の残存容量の把握精度を向上し、二次電池の充電を適時に行えるようにすることを目的とする。さらに、時刻指定による充電の開始や、充電終了時刻指定による充電、あるいは充電終了時刻の算出と表示、二次電池の自動リフレッシュ及び自動充電なども行えるようにし、特に電動車両における二次電池の管理精度及び取扱い性を向上することを目的とする。

発 明 の 開 示

この発明は上記の目的を達成するため、充電可能な二次電池と、その二次電池の状態を測定する測定手段及びその測定情報及び二次電池の特性に関する情報を記憶する記憶手段と、上記二次電池によって供給される電力によって駆動される電動機等の負荷と、その負荷の駆動を制御する制御手段と、計時機能を持つ時計手段と、その時計手段に対する時刻設定機能及び時刻表示機能を持つ表示・操作手段と、上記測定手段及び／又は記憶手段の情報と上記時計手段による時刻情報とに基づいて上記二次電池の管理を行う電池管理手段とを備えた時計手段を有する電動装置を提供する。

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上記制御手段が上記電池管理手段の機能も持つようにすることができる。

また、上記電池管理手段に代えて、好ましくは上記電池管理手段に加えて、上記測定手段及び／又は記憶手段の情報と前記時計手段による時刻情報とに基づいて前記二次電池の充電を行う充電手段とを備えるとよい。

あるいは、上記充電手段に代えて、上記二次電池の充電を行うための充電手段を接続可能なインタフェイスを設けるようにしてもよい。

上記二次電池と測定手段及び記憶手段を一体の電池ユニットとして構成し、その電池ユニットを電動装置本体に対して着脱可能に搭載するようにしてもよい。

また、上記充電手段を、商用電源又はそれに代わる電源から給電されて上記二次電池の充電を行う充電部を内蔵する充電ユニットとして構成し、その充電ユニットを電動装置本体に対して着脱可能に搭載するようにしてもよい。

上記充電手段を設けた電動装置においては、上記表示・操作手段に充電開始時刻を指定する手段を設け、上記充電手段にその指定された時刻に二次電池の充電を開始する手段を設けることができる。

あるいは、上記表示・操作手段に充電終了時刻を指定する手段を設け、上記充電手段に、その指定された時刻に二次電池の充電を終了するように該充電を開始する手段を設けることもできる。

さらに、上記充電手段に、上記二次電池がメモリ効果を有するとき、その二次電池を充電する前に残存電荷を放電させてリフレッシュするための放電部を設けるとよい。

また、これらの電動装置において、上記時計手段によって指定された時刻に起動して上記測定手段及び記憶手段を動作させ、上記二次電池の特性に応じた自己放電量及び消費容量により該二次電池の残存容量を管理する手段を設けることができる。

上記充電手段を設けた電動装置においては、上記時計手段によって指定された時刻に起動して上記測定手段及び記憶手段を動作させ、上記二次電池の特性に応じた

自己放電量及び消費容量により該二次電池の残存容量を管理し、その二次電池の充電が必要なときに上記充電手段に充電させる手段を設けるとよい。

図面の簡単な説明

第１図は、この発明の一実施形態を示す電動装置のブロック回路図である。

第２図は、第１図における電池ユニット内の測定手段の具体例を示すブロック回路図である。

第３図は、第１図に示した電動装置における時刻指定充電の設定動作を示すフローチャートである。

第４図は、同じく時刻指定充電の動作を示すフローチャートである。

第５図は、同じく二次電池のリフレッシュ後に時刻指定充電を行う動作を示すフローチャートである。

第６図は、同じく充電終了時刻指定充電の設定動作を示すフローチャートである。

第７図は、同じく充電終了時刻指定充電の動作を示すフローチャートである。

第８図は、第１図に示した電動装置の非稼働時の二次電池の残存容量補正動作を示すフローチャートである。

第９図は、同じく二次電池の残存容量補正後に充電が必要な場合には自動充電を行う動作を示すフローチャートである。

発明を実施するための最良の形態

以下、この発明の実施形態を図面に基づいて具体的に説明する。

第１図は、この発明による電動装置の一実施形態例を示すブロック回路図である。

この電動装置１は、電池ユニット２，３（この実施形態では２つの電池ユニットで構成する例を示すが、１つ以上であればよい）、時計手段４、充電ユニット５、制御手段６、電源手段７、表示・操作手段１３、駆動手段９、および負荷１０によって構成される。

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充電ユニット５は、マイクロコンピュータ等による制御機能を備え、商用電源１４或いはそれに代わる電源から電力の供給を受け、電池ユニット２，３への充電を行う充電部８と、充電部８からのスイッチ制御信号Ｓ２に制御されて、電池ユニット２，３のいずれに充電するかを切り替えるスイッチ１９，２０と、メモリ効果が生ずるニッケル・カドミウム（Ｎｉ－Ｃｄ）二次電池あるいはニッケル水素（Ｎｉ－ＭＨ)二次電池のリフレッシュのため、電池ユニット２，３を充電部８の制御機能による制御の下に放電させる放電部１５と、システムバス２６とのインタフェイス（図示せず）により構成されている。

電池ユニット２，３は、それぞれ充電可能な二次電池（複数の蓄電池からなる組電池またはそれに変わるエネルギー蓄積体を含む）２Ｂ，３Ｂと、その二次電池２Ｂ，３Ｂの必要な部分（電池の特性、電動装置が必要とするセル単位、複数セル、全体等）の電圧検知や充放電電流検知と、その必要な部分の温度および周囲温度等の温度検知を行う測定回路およびその測定データをシステムバス２６に出力するためのインタフェイスからなる測定手段１６，１７と、電池の特性及び電動装置が必要とする少なくとも二次電池２Ｂ，３Ｂの残存容量を含む電池情報を記憶するＥＥＰＲＯＭ等の不揮発性メモリ及びそのデータをシステムバス２６を介して読み書き可能にするためのインタフェイスとからなる記憶手段１１，１２とにより構成されている。

制御手段６は、マイクロコンピュータ等による制御機能を備えており、後述する表示・操作手段１３からの稼働情報と電池ユニット２，３の記憶手段１１，１２に記憶されている電池情報等により、どの電池ユニットを使用するかを決め、スイッチ制御信号Ｓ１によりスイッチ２１，２２を切り替えて電池ユニット２，３のどちらを使用するかを選択したり、駆動手段９をどのように動作させるか等の電動装置の稼働の主制御を行う機能を持つ。さらに、この発明による電池管理手段の機能も有する。

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また、表示・操作手段１３及びシステムバス２６とのインタフェイスと、非稼働時に電動装置を省電力状態に移行させる機能と、時計手段４からのウエイクアップ信号ＷＵにより省電力状態から復帰する機能も有する。

電源手段７は、電池ユニット２，３及び充電ユニット５からの電力供給により制御手段６及び後述する時計手段４に必要な電力を供給する。

時計手段４は、電源手段７からの電力供給により常時動作しており、決められた時刻及び／又は決められた時間経過後にウエイクアップ信号ＷＵを出力する機能を持つ。

また、表示・操作手段１３の表示部へ制御手段６を経由して時刻を表示することが可能であると共に、その操作部の操作により時刻設定が可能に構成されている。

表示・操作手段１３は、電動装置１の状態、充電ユニット５の充電部８の状態及び時刻の表示等、必要な状態および情報を表示するＬＣＤ表示器等による表示部と、電動装置１の稼働指示、時計手段４の時刻設定（後述する充電開始時刻、充電終了時刻の指定を含む）、その他の必要な指示操作が可能な複数のキーあるいはボタンやタッチパネルなどによる操作部とから構成されている。そして、オペレーションバス２４を介して、表示は制御手段６からの信号により行われ、操作情報は制御手段６に送られる。また、必要に応じて制御手段６からの指示に応じて鳴動するブザーなども含む。

システムバス２６は、充電ユニット５の充電部８、電池ユニット２，３の測定手段１６，１７と記憶手段１１，１２、時計手段４、制御手段６の間での情報授受に用いられるバスであり、一般にデータバスとアドレスバスとコントロールバスからなるが、各部間の情報の授受が行えればシリアルバス、パラレルバスあるいは他のどのような構成を取ってもよい。

駆動手段９は、電池ユニット２，３からの電力を受け、制御手段６からの信号により負荷１０の制御及び駆動を行う。

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負荷１０は、電動装置１の目的を果たすための電動機（モータ）、アクチュエータ、ランプ類等である。その電動機は車輪等の走行部を駆動して電動装置１を走行させる。アクチュエータはブレーキなどを作動する。ランプ類はヘッドライト、テールライト、ウインカなどのランプである。

なお、電池ユニット２，３及び充電ユニット５は、電動装置本体（車体）に固定して設けてもよいが、着脱可能なユニットとして設けると便利である。

その場合は、電池ユニット２，３及び充電ユニット５内の電源線およびバスと、電動装置本体側の電源線およびシステムバス２６とを、電池ユニット２，３及び充電ユニット５の着脱に応じてそれぞれ接続／切断するコネクタや、搭載したユニットを容易に離脱しないようにロックするロック機構などを設けるとよい。

そのようにすれば、電池ユニット２，３のうち一方の二次電池の残存容量が少なくなって充電する必要が生じたとき、その電池ユニット（２又は３）と充電ユニット５を電動装置から取り外して、商用電源１４のある場所で充電を行い、その間はもう１個の電池ユニットから負荷１０等への給電を行って、電動装置１を稼働することができるので便利である。

また、この実施形態では、電動装置１に充電手段である充電ユニット５を搭載しているので、電動装置に電池ユニット２，３を搭載したままで充電することもできるが、電動装置に充電手段を設けずに、電動装置外の商用電源１４あるいはそれに代わる電源がある場所に充電装置を設置しておいて、電池ユニット２，３を電動装置１から取り外してその充電装置に接続して充電するようにしてもよい。　したがって、電動装置としては、充電手段を搭載することは必須ではない。

ここで、電池ユニット２に設けられる測定手段１６の具体例を第２図に示す。なお、電池ユニット３に設けられる測定手段１７もこれと同じ構成である。

この測定手段１６は、二次電池２Ｂに直列に接続した電流測定用の抵抗値の小さい抵抗１６１と、二次電池２Ｂに密着するかその近傍に配設した温度測定用のセン

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サであるサーミスタ１６２と、温度測定回路１６３、電圧測定回路１６４、電流測定回路１６５と、Ａ／Ｄ変換回路１６６，１６７，１６８と、システムバス２６とのインタフェイス１６９とからなる。

温度測定回路１６３は、サーミスタ１６２の温度による抵抗値変化を電圧に変換して二次電池２Ｂあるいはその周囲の温度を測定し、その測定値をＡ／Ｄ変換回路１６６でデジタル値に変換し、インタフェイス１６９を介してシステムバス２６へ出力する。なお、このサーミスタ１６２，温度測定回路１６３，及びＡ／Ｄ変換回路１６６を、二次電池２Ｂの各セル毎、あるいは複数のセル群毎に設けるようにすれば、より細かく温度測定を行うことができる。

電圧測定回路１６４は、二次電池２Ｂの端子電圧を測定し、その測定値をＡ／Ｄ変換回路１６７でデジタル値に変換し、インタフェイス１６９を介してシステムバス２６へ出力する。なお、電圧測定回路１６４及びＡ／Ｄ変換回路１６７を、二次電池２Ｂの各セル毎、あるいは複数のセル群毎に設けるようにすれば、より細かく電圧測定を行うことができる。

電流測定回路１６５は、抵抗１６１による電圧降下の測定によって二次電池２Ｂの放電電流あるいは充電電流の値を測定し、その測定値をＡ／Ｄ変換回路１６８でデジタル値に変換し、インタフェイス１６９を介してシステムバス２６へ出力する。なお、抵抗１６１に代えて、ホール素子やカレントトランス等を用いて二次電池２Ｂに流れる電流を測定することもできる。

次に、この実施形態における充電ユニット５による電池ユニット２，３の充電動作について説明する。

この実施形態において、充電は、充電ユニット５が商用電源１４あるいはそれに代わる電源に接続されて、充電部８に電力が供給されると開始される。充電部８は供給される交流入力を充電に適した直流電圧にして出力する。

また、この充電部８はマイクロコンピュータ等による制御機能を備えており、充

電モードとして、時刻指定充電、即時充電、充電終了時刻設定充電等を実行できるが、これらの充電モードは、電動装置１の稼働時あるいは充電時に、表示・操作手段１３による予め定められた操作により設定可能である。また、充電部８は充電モードの設定内容を保持し、充電毎にそれを参照してその保持した充電モードで充電を開始する。

また、電池ユニット２，３の各二次電池２Ｂ，３Ｂの使用回数、周囲温度、充電効率等の電池特性及び放電電流積算値あるいは検出電圧等による残存容量管理を行うため、その精度やシステム特性等による影響はあるが、この発明には直接関係しないものは無視している。電池容量は電池の持つ基本的容量である。

まず、第３図のフローチャートによって、充電開始時刻を指定して充電する充電時刻指定充電の設定方法について説明する。

その時刻指定充電の設定は、表示・操作手段１３からの指示により、制御手段６を介して充電ユニット５の充電部８によって、第３図のステップＡ１～Ａ６の手順で行われる。

Ａ１：表示・操作手段１３の予め定められた操作により充電モードの設定に入る。

Ａ２：そこで、時刻指定充電モードの指定（操作部のキー等により指定）がなされると、充電開始時刻の入力を要求する。

Ａ３：そこで、表示・操作手段１３のキー操作によって充電開始時刻が入力されると、それを設定（充電部８のメモリに記憶）する。

Ａ４：そして、充電部８はシステムバスを介して電池ユニット２，３の各記憶手段１１，１２から残存容量情報を、時計手段４から現在時刻情報を得て、その残存容量から充電時間（充電所要時間）を算出する。

充電時間は、定電流充電電池の場合は次式によって算出する。

充電時間＝(電池容量－残存容量)÷充電電流

定電流定電圧充電の場合は、予め定電流充電終了時の残存容量(充電容量)を調べ

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ておくとともに、定電圧充電時の時間対残存容量(充電容量)を調べてテーブル化しておき、次のように算出する。

定電流期間がある時：(電池容量－残存容量)÷充電電流＝Ｔ１

定電圧充電時間＝Ｔ２　として、充電時間＝Ｔ１＋Ｔ２

定電流期間がない時：充電時間＝(電池容量－残存容量)にて

テーブルより算出する。

上記により算出した充電時間と現在時刻により、予め定められた表示、例えば充電所要時間及び／又は入力された充電開始時刻か充電所要時間後の時刻、すなわち充電終了時刻の表示を、表示・操作手段１３に表示させる。

Ａ５，Ａ６：このあと、設定操作の終了を確認（確認キーの押下を検知する）すると、時刻指定充電の設定を終了する。

次に、第４図のフローチャートによって、時刻指定充電が設定されているときの充電動作について説明する。

その時刻指定充電は、充電ユニット５の充電部８によって、第４図のステップＢ１～Ｂ７の手順で行われる。

Ｂ１：商用電源１４あるいはそれに代わる電源から電力が充電部８に供給されると、充電部８は充電モードになる。

Ｂ２：時刻指定充電かどうかをチェックし、他の充電モードの場合には直ちにＢ４へ進んで充電開始する。時刻指定充電の時はＢ３へ進む。

Ｂ３：時計手段４から現在時刻情報を得て、記憶している充電開始指定時刻を比較し、指定時刻になるのを待つ。現在時刻が充電開始時刻と一致するとＢ４へ進む。

Ｂ４：充電を開始する。すなわち、充電部８はスイッチ制御信号Ｓ２によってスイッチ１９，２０のいずれかをＯＮにして、充電する電池ユニット２又は３を選択し、その選択した電池ユニットの二次電池２Ｂ又は３Ｂに充電電力を供給して充電を開始する。

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Ｂ５：この充電開始時に、充電時刻指定充電の設定時に求めた充電所要時間及び／又は充電終了時刻を表示し、充電が進むにつれ残存容量に充電容量を加えた値として充電時間を算出して、逐次充電終了までの時間及び／又は充電終了時刻を表示する。

Ｂ６，Ｂ７：その後、充電の終了をチェックし、未終了の場合はＢ５で充電を続け、充電終了を確認すると充電処理を終了する。

この例では、電池ユニット２，３のうちの一方を選択してその二次電池を充電することとしたが、二つの電池ユニット２，３に充電が必要な場合には、一方の二次電池を充電した後に、他方の二次電池を選択して充電することになる。このときは当然のことであるが、充電所要時間は各二次電池の充電所要時間を加えたものとなる。

次に、第５図によって、ニッケル・カドミウム二次電池やニッケル水素二次電池等のメモリ効果があるためリフレッシュが必要な電池について、リフレッシュ動作を行った後に時刻指定充電する動作について説明する。

このメモリ効果は、充電深度が浅い状態で充電と放電を繰り返して使用すると、電池の容量が減少することをいう。

この場合の動作は、充電部８によって第５図のステップＣ１～Ｃ１０の手順で行われる。

Ｃ１：商用電源あるいはそれに代わる電源から電力が充電部８に供給されると、充電部８はリフレッシュ・時刻指定充電モードに入る。

Ｃ２，Ｃ３：そしてまず、時刻指定充電かどうかがチェックし、違う充電モードの場合には直ちにＣ４へ進んでリフレッシュを開始する。時刻指定充電の時は、Ｃ３で時計手段４から現在時刻情報を得て記憶している充電開始指定時刻と比較する。現在時刻が充電開始時刻と一致すると、Ｃ４へ進んでリフレッシュを開始する。

Ｃ４：リフレッシュを開始する。すなわち、充電部８はスイッチ制御信号Ｓ２に

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よってスイッチ１９，２０のいずれかをＯＮにして、電池ユニット２，３のいずれかを選択し、その二次電池２Ｂ又は３Ｂを放電部１５に接続して放電させることにより行う。

Ｃ５：リフレッシュ開始後、後述のように算出するリフレッシュ時間と、時刻指定充電が設定されているときの充電動作で説明したのと同様にして求めた充電所要時間とを加えた時間を基に、表示・操作手段１３にリフレッシュと充電の合計所要時間及び／又はリフレッシュ後の充電の終了時刻の表示を行う。

リフレッシュ時間の算出は、次の式によって行う。

リフレッシュ時間＝残存容量÷放電電流

ただし、放電部１５の放電として、定電流放電、定電力放電、定抵抗放電等が考えられるが、この説明においては定電流放電とする。

放電が進むにつれて残存容量から放電容量を減じた値としてリフレッシュ時間を算出して、逐次時間表示及び／又は時刻表示を更新する。

Ｃ６：　リフレッシュの実行中、充電部８はシステムバス２６を介して測定手段１６又は１７からの情報を得て、電池特性により予め定められた条件によりリフレッシュ動作の終了をチェックする。リフレッシュが終わるまでＣ５で放電を続け、リフレッシュが終了すると、Ｃ７へ進む。

Ｃ７：リフレッシュした二次電池２Ｂ又は３Ｂに充電電力を供給して充電を開始する。

Ｃ８：充電開始時には、求めた充電所要時間及び／又は充電終了時刻をまず表示し、充電が進むにつれ残存容量に充電容量を加えた値として充電所要時間を算出して、逐次充電時間及び／又は充電終了時刻の表示を更新する。

Ｃ９，Ｃ１０：そして、充電の終了をチェックし、未終了の場合は充電を続け、充電終了を確認するとこの充電処理を終了する。

この例では、電池ユニット２，３の一方を選択してその二次電池２Ｂ又は３Ｂを

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リフレッシュ後に充電することとしたが、二つの電池ユニット２，３の二次電池２Ｂ，３Ｂの両方にリフレッシュ後の充電が必要な場合には、一方の二次電池をリフレッシュ後に充電した後に、残りの電池ユニットを選択してその二次電池をリフレッシュ後に充電をすることになる。このときは当然のことであるが、リフレッシュ時間と充電所要時間は二つの二次電池のリフレッシュ時間と充電時間を加えたものとなる。

次に、第６図のフローチャートによって、充電終了時刻指定充電の設定動作について説明する。この設定動作は第６図のステップＤ１～Ｄ６の手順で行なわれる。

Ｄ１：表示・操作手段１３の予め定められた操作によりこの充電モードの設定に入る。

Ｄ２：そして、充電終了時刻指定充電モードの指定がなされると、充電終了時刻の入力を要求する。

Ｄ３：要求した充電終了時刻が入力されると、充電部８はそれをメモリに記憶する。

Ｄ４：システムバス２６を介して電池ユニット２又は３の記憶手段１１又は１２から残存容量情報を、時計手段４から現在時刻情報を得る。そして、その現在時刻から充電可能時間を算出し、終了時間での残存容量を求める。

残存容量の算出は、以下のように行う。

定電流充電電池の場合、

残存容量＝残存容量＋充電電流×充電可能時間

（電池容量が最大で、これを超える場合は充電が終了する。）

定電流定電圧充電の場合、

予め定電流充電終了時の残存容量(充電容量)を調べておくと共に、定電圧充電時の時間対残存容量(充電容量)を調べてテーブル化しておく。そして、

定電流期間がある時；

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残存容量（Ｔ１）＝充電開始時残存容量＋充電電流×Ｔ１

充電容量＝(充電可能時間－Ｔ１）の充電容量をテーブルより算出

残存容量＝残存容量（Ｔ１）＋充電容量

（電池容量が最大で、これを超える場合は充電が終了する。）

定電流期間がない時；

残存容量＝充電開始時残存容量＋（充電可能時間にてテーブルより算出した充電容量）

（電池容量が最大値で、これを超える場合は充電が終了する。）

このようにして算出した残存容量を表示・操作手段１３に表示する。

Ｄ５，Ｄ６：その後、設定操作の終了を確認すると、この動作を終了する。

次に、第７図のフローチャートによって、充電終了時刻指定充電が設定されているときの充電動作について説明する。この充電動作は第７図のステップＥ１～Ｅ６の手順で行われる。

Ｅ１：商用電源１４あるいはそれに代わる電源から電力が充電部８に供給されると、充電動作に入る。

Ｅ２：充電を開始する。すなわち、充電部８はスイッチ制御信号によってスイッチ１９，２０のいずれかをＯＮにし、電池ユニット２，３のいずれかを選択して、その二次電池２Ｂ又は３Ｂを接続して充電を開始する。

Ｅ３：充電中は、指定された終了時刻と現在時刻により求めた充電の残り時間及び／又は充電経過時間により変化した残存容量(経過時間を基に、充電終了時刻設定について説明したのと同様な方法で求める)を表示する。

Ｅ４，Ｅ５，Ｅ６：充電部８は、Ｅ４で充電の終了をチェックし、充電が終了するとＥ６へ進んで充電を終了する。未終了の場合は充電をＥ５で指定された充電終了時刻と現在時刻を比較し、充電終了時刻（指定時刻）になるとＥ６へ進んで充電を終了する。充電終了時刻（指定時刻）でなければＥ３へ戻って充電を続ける。

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この例では、電池ユニット２，３の一方を選択してその二次電池２Ｂ又は３Ｂを充電することとしたが、二つの電池ユニット２，３の二次電池２Ｂ，３Ｂの両方に充電が必要な場合には、一方の二次電池を充電した後に、残りの電池ユニットを選択してその二次電池を充電をすることになる。このときは、残存容量表示を電池部毎にすることで対応する。

図示しないが、リフレッシュが必要な場合は、リフレッシュ時間を除いた時間を充電可能時間とすればよい。

次に、第８図のフローチャートによって、電動装置１の非稼働時の二次電池の残存容量補正について説明する。この動作は、第１図における時計手段４と制御手段６によって、第８図のステップＦ１～Ｆ７の手順で行われる。

この実施形態では、充電動作及び稼働状態と時計機能の動作を除いて省電力状態となり、二次電池２Ｂ，３Ｂの残存容量の低減を極力減らすようにしている。

Ｆ１：この電動装置１が非稼働状態で充電動作も行われない状態が所定時間継続すると、制御手段６が電動装置１を最低限必要な部分（時計手段４と制御手段６など）以外への給電を停止して省電力状態とし、この残容量補正の動作に入る。

Ｆ２：時計手段４が指定時刻（指定経過時間でも可）になったか否かの判断を行い、指定時刻になるとウエイクアップ信号ＷＵを出力する。

Ｆ３：そのウエイクアップ信号ＷＵにより制御手段６が動作を開始し、関連部分例えば測定手段１６，１７を動作状態にする。

Ｆ４：続いて、制御手段６はシステムバス２６を介して測定手段１６，１７および記憶手段１１，１２等から、温度等の二次電池の特性に応じた残存容量補正に必要な情報を取得する。

Ｆ５：そして、前回からの経過時間及び取得情報から補正容量を算出して、二次電池２Ｂ，３Ｂの残容量を補正する。例えば、二次電池２Ｂ，３Ｂの自己放電が時間と温度により決まるとすると、前回温度と取得温度の平均値を取り、予め記憶手

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段１１，１２等に記憶された情報を基に時間との関係で自己放電容量を求める等により補正情報を得る。

また、省電力状態での使用電力と経過時間により、省電力状態での二次電池の使用容量を求め、上記の自己放電量とこの動作での使用容量を含めて、記憶手段１１，１２に記憶している残存容量の値を補正する。

Ｆ６，Ｆ７：補正後、再び電動装置を省電力状態に設定してこの動作を終了する。

次に、第９図のフローチャートによって、残存容量補正時に予め決められた残存容量となったときに、充電を行い予め設定された残存容量を維持するための動作について説明する。この動作は第１図における時計手段４、制御手段６、および充電部８によって、第９図のステップＧ１～Ｇ９の手順で行われる。

この動作を実行するには、充電ユニット５の充電部８が商用電源１４あるいはそれに変わる電源から電力の供給を受けている必要がある。

ステップＧ１～Ｇ５は、第８図で説明したステップＦ１～Ｆ５と同じである。

Ｇ６～Ｇ９：Ｇ５で残存容量を補正した後、Ｇ６でその残存容量が予め設定された容量以下であるかの判断によって、充電の要否を判断する。そして、設定された容量を越える場合は、充電不要と判断してＧ８へ進み、再び電動装置を省電力状態に設定し、Ｇ９でこの動作を終了する。

設定された容量以下の場合は、充電要と判断し、Ｇ７で予め決められた残存容量まで充電動作を行い、充電が終了した時点でその残存容量を電池の残存容量として記憶手段１１又は１２記憶させてから、Ｇ８で電動装置１を省電力状態に設定し、Ｇ９でこの動作を終了する。

この実施形態の電動装置によれば、以下に列挙する効果を得ることができる。

①時刻指定充電により、例えば深夜電力を使用して電池ユニットの二次電池の充電を行うことができ、充電コストの低減や電力設備の平均化使用が行える。

②二次電池の残存容量記憶と充電開始時刻の設定により、充電終了時刻の算出と

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表示が可能になる。二次電池のリフレッシュを行うときには、残存容量からリフレッシュ時間を算出してその時間が加味される。

③二次電池の残存容量の記憶と充電終了時刻の設定により、設定時刻までに充電が終了するか否かの判定，表示，警報（充電が完了しない場合）などが行えると共に、充電を行った場合の充電量の算出および表示が可能になる。また、複数の二次電池を搭載している場合には、決められた時間内に最も多く充電できる電池を選択して充電を行うことも可能になる。

定電流定電圧充電方式で充電する場合、残存容量が少なく定電流充電領域にある電池の方が充電量が多くなる。二次電池のリフレッシュを行う場合には、残存容量から算出したリフレッシュ時間が加味される。

④非稼働時に時計機能部のみを動作させておき、予め定められた時間にその時計機能により、必要な部分を稼働させて電池の周囲環境を検知し、非稼働時の消費電流、その検知データ、二次電池の特性、時計手段による時刻情報等を基に二次電池の残存容量の補正を行うことにより、残存容量の把握精度の向上を図ることが出来る。

また、充電が必要な場合には表示や警報を行うことが出来、電動装置を有効に使用可能な状態に保つことが出来る。このとき、商用電源あるいはそれに代わる電源が充電手段に接続されている場合は、表示や警報に代えて二次電池を自動充電することも可能であり、さらに電動装置の使い勝手が向上する。

産業上の利用可能性

以上説明してきたように、この発明による電動車両等の電動装置は、二次電池の残存容量の把握精度を向上し、二次電池の充電を適時に行うことが可能になる。さらに、時刻指定による充電の開始や、充電終了時刻指定による充電、あるいは充電終了時刻の算出と表示、二次電池の自動リフレッシュ及び自動充電なども行うこ

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とができ、特に電動車両における二次電池の管理精度及び取扱い性を向上することができる。

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請 求 の 範 囲

1．充電可能な二次電池と、

その二次電池の状態を測定する測定手段及びその測定情報及び前記二次電池の特性に関する情報を記憶する記憶手段と、

前記二次電池によって供給される電力によって駆動される電動機等の負荷と、

該負荷の駆動を制御する制御手段と、

計時機能を持つ時計手段と、

その時計手段に対する時刻設定機能及び時刻表示機能を持つ表示・操作手段と、

前記測定手段及び／又は記憶手段の情報と前記時計手段による時刻情報とに基づいて前記二次電池の管理を行う電池管理手段と

を備えたことを特徴とする時計手段を有する電動装置。

2．請求の範囲第1項記載の時計手段を有する電動装置において、

前記制御手段が前記電池管理手段の機能も持っていることを特徴とする時計手段を有する電動装置。

3．充電可能な二次電池と、

その二次電池の状態を測定する測定手段及びその測定情報及び前記二次電池の特性に関する情報を記憶する記憶手段と、

前記二次電池によって供給される電力によって駆動される電動機等の負荷と、

該負荷の駆動を制御する制御手段と、

計時機能を持つ時計手段と、

その時計手段に対する時刻設定機能及び時刻表示機能を持つ表示・操作手段と、

前記測定手段及び／又は記憶手段の情報と前記時計手段による時刻情報とに基づいて前記二次電池の充電を行う充電手段と

を備えたことを特徴とする時計手段を有する電動装置。

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４．請求の範囲第３項記載の時計手段を有する電動装置において、

前記制御手段が、前記測定手段及び／又は記憶手段の情報と前記時計手段による時刻情報とに基づいて前記二次電池の管理を行う電池管理手段の機能も持っていることを特徴とする時計手段を有する電動装置。

５．請求の範囲第１項記載の時計手段を有する電動装置において、

前記測定手段及び／又は記憶手段の情報と前記時計手段による時刻情報とに基づいて前記二次電池の充電を行うための充電手段を接続可能なインタフェイスを設けたことを特徴とする時計手段を有する電動装置。

６．請求の範囲第２項記載の時計手段を有する電動装置において、

前記測定手段及び／又は記憶手段の情報と前記時計手段による時刻情報とに基づいて前記二次電池の充電を行うための充電手段を接続可能なインタフェイスを設けたことを特徴とする時計手段を有する電動装置。

７．請求の範囲第１項記載の時計手段を有する電動装置において、

前記二次電池と前記測定手段及び記憶手段を一体の電池ユニットとして構成し、該電池ユニットを電動装置本体に対して着脱可能に搭載したことを特徴とする時計手段を有する電動装置。

８．請求の範囲第３項記載の時計手段を有する電動装置において、

前記二次電池と前記測定手段及び記憶手段を一体の電池ユニットとして構成し、該電池ユニットを電動装置本体に対して着脱可能に搭載したことを特徴とする時計手段を有する電動装置。

９．請求の範囲第３項記載の時計手段を有する電動装置において、

前記充電手段を、商用電源又はそれに代わる電源から給電されて前記二次電池の充電を行う充電部を内蔵する充電ユニットとして構成し、該充電ユニットを電動装置本体に対して着脱可能に搭載したことを特徴とする時計手段を有する電動装置。

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１０．請求の範囲第４項記載の時計手段を有する電動装置において、

前記充電手段を、商用電源又はそれに代わる電源から給電されて前記二次電池の充電を行う充電部を内蔵する充電ユニットとして構成し、該充電ユニットを電動装置本体に対して着脱可能に搭載したことを特徴とする時計手段を有する電動装置。

１１．請求の範囲第３項記載の時計手段を有する電動装置において、

前記表示・操作手段に充電開始時刻を指定する時刻指定手段を設け、前記充電手段に該時刻指定手段によって指定された時刻に前記二次電池の充電を開始する手段を設けたことを特徴とする時計手段を有する電動装置。

１２．請求の範囲第４項記載の時計手段を有する電動装置において、

前記表示・操作手段に充電開始時刻を指定する時刻指定手段を設け、前記充電手段に該時刻指定手段によって指定された時刻に前記二次電池の充電を開始する手段を設けたことを特徴とする時計手段を有する電動装置。

１３．請求の範囲第３項記載の時計手段を有する電動装置において、

前記表示・操作手段に充電終了時刻を指定する時刻指定手段を設け、前記充電手段に該時刻指定手段によって指定された時刻に前記二次電池の充電を終了するように該充電を開始する手段を設けたことを特徴とする時計手段を有する電動装置。

１４．請求の範囲第４項記載の時計手段を有する電動装置において、

前記表示・操作手段に充電終了時刻を指定する時刻指定手段を設け、前記充電手段に該時刻指定手段によって指定された時刻に前記二次電池の充電を終了するように該充電を開始する手段を設けたことを特徴とする時計手段を有する電動装置。

１５．請求の範囲第３項記載の時計手段を有する電動装置において、

前記充電手段に、前記二次電池がメモリ効果を有するとき、該二次電池を充電する前に残存電荷を放電させてリフレッシュするための放電部を設けたことを特徴とする時計手段を有する電動装置。

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１６．請求の範囲第４項記載の時計手段を有する電動装置において、

前記充電手段に、前記二次電池がメモリ効果を有するとき、該二次電池を充電する前に残存電荷を放電させてリフレッシュするための放電部を設けたことを特徴とする時計手段を有する電動装置。

１７．請求の範囲第１項記載の時計を有する電動装置において、

前記時計手段によって指定された時刻に起動して前記測定手段及び記憶手段を動作させ、前記二次電池の特性に応じた自己放電量及び消費容量により該二次電池の残存容量を管理する手段を設けたことを特徴とする時計を有する電動装置。

１８．請求の範囲第３項記載の時計を有する電動装置において、

前記時計手段によって指定された時刻に起動して前記測定手段及び記憶手段を動作させ、前記二次電池の特性に応じた自己放電量及び消費容量により該二次電池の残存容量を管理する手段を設けたことを特徴とする時計を有する電動装置。

１９．請求の範囲第３項記載の時計を有する電動装置において、

前記時計手段によって指定された時刻に起動して前記測定手段及び記憶手段を動作させ、前記二次電池の特性に応じた自己放電量及び消費容量により該二次電池の残存容量を管理し、該二次電池の充電が必要なときに前記充電手段に充電させる手段を設けたことを特徴とする時計を有する電動装置。

２０．請求の範囲第４項記載の時計を有する電動装置において、

前記時計手段によって指定された時刻に起動して前記測定手段及び記憶手段を動作させ、前記二次電池の特性に応じた自己放電量及び消費容量により該二次電池の残存容量を管理し、該二次電池の充電が必要なときに前記充電手段に充電させる手段を設けたことを特徴とする時計を有する電動装置。

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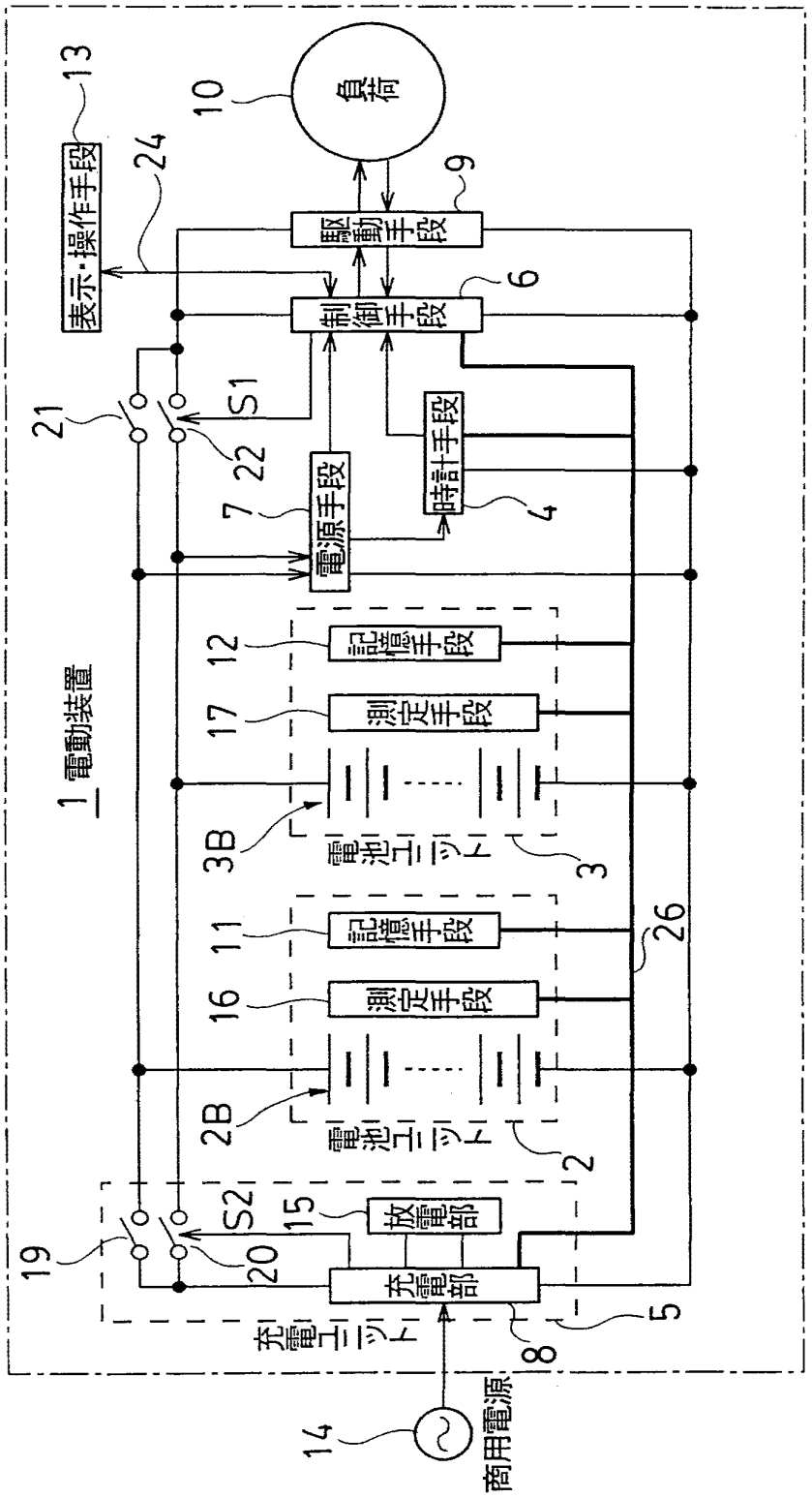
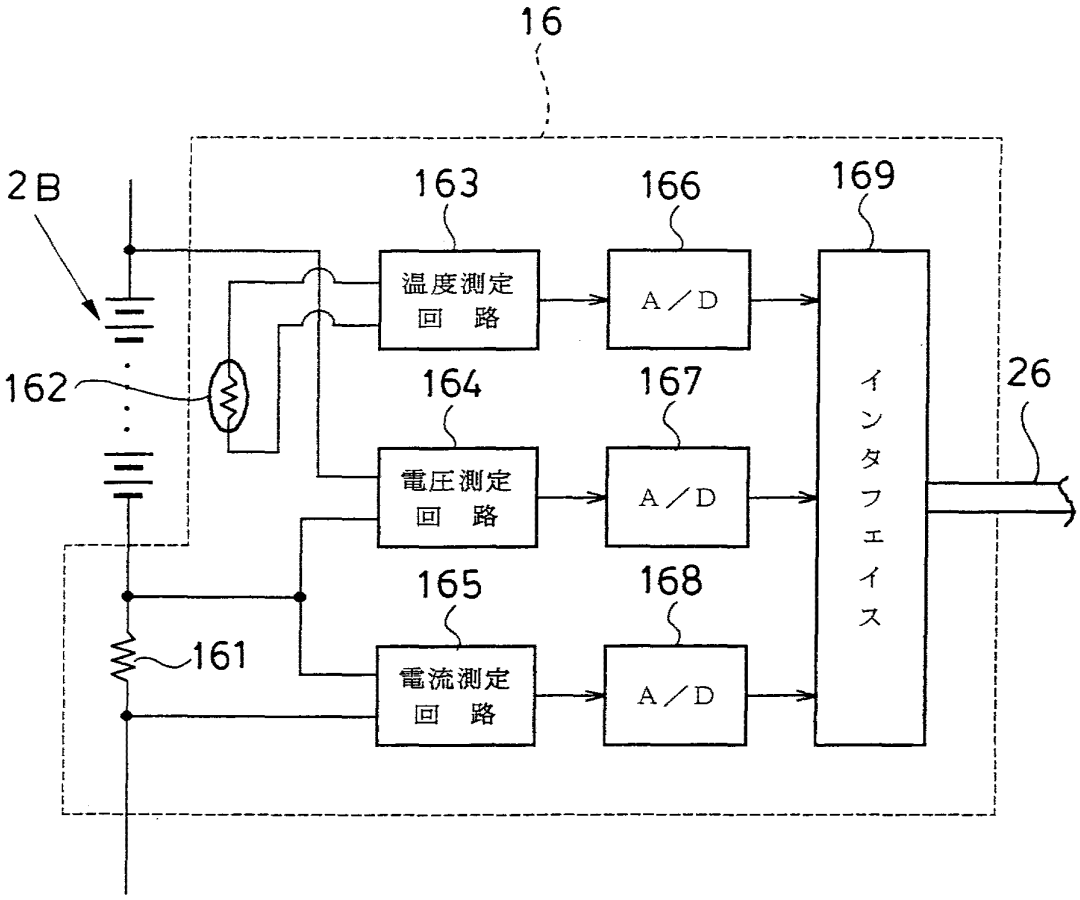
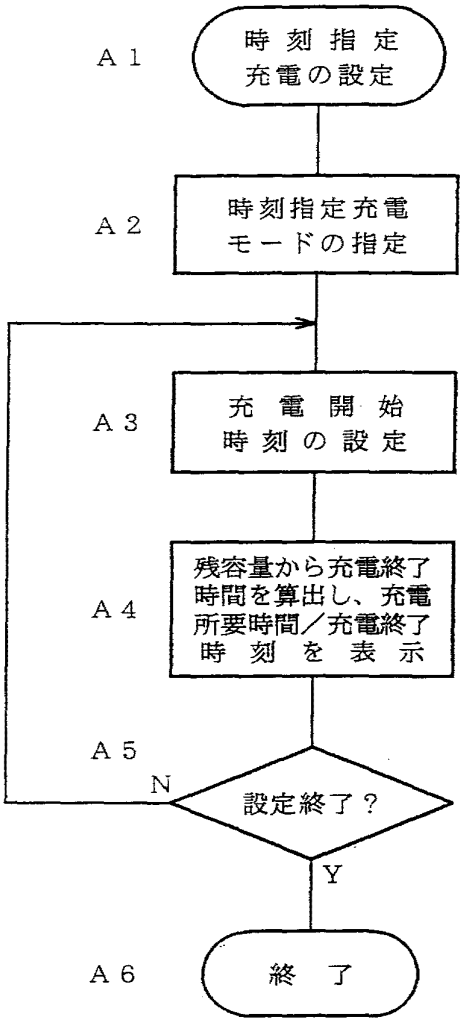
第1図


1 電動装置
負荷
10
駆動手段
9
制御手段
6
表示・操作手段
13
24
S1
21
22
電源手段
7
時計手段
4
記憶手段
12
測定手段
17
3B
電池ユニット
3
記憶手段
11
測定手段
16
2B
電池ユニット
2
26
S2
19
20
放電部
15
充電部
5
充電ユニット
8
14
商用電源

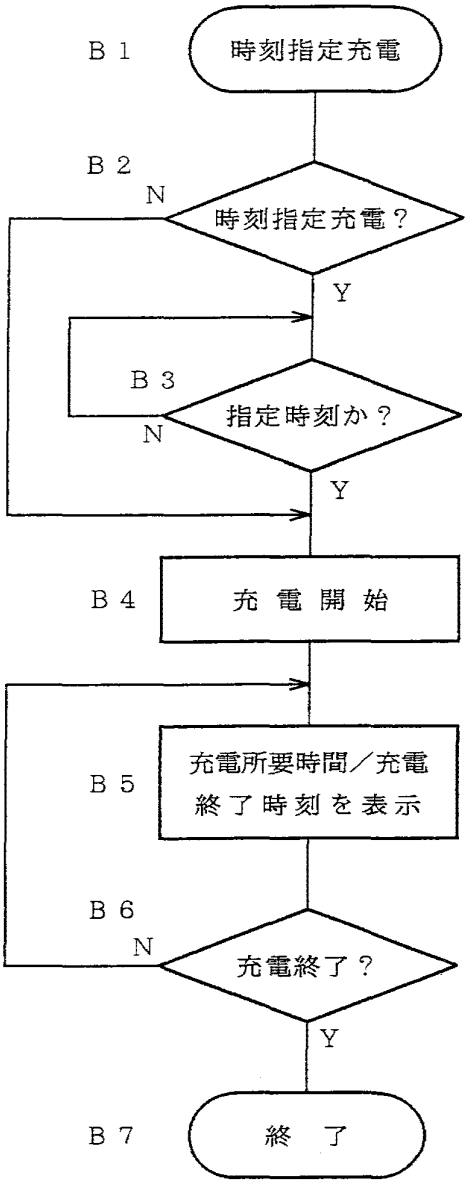
第2図


16
2B
162
161
163
温度測定回路
164
電圧測定回路
165
電流測定回路
166
A/D
167
A/D
168
A/D
169
インタフェイス
26

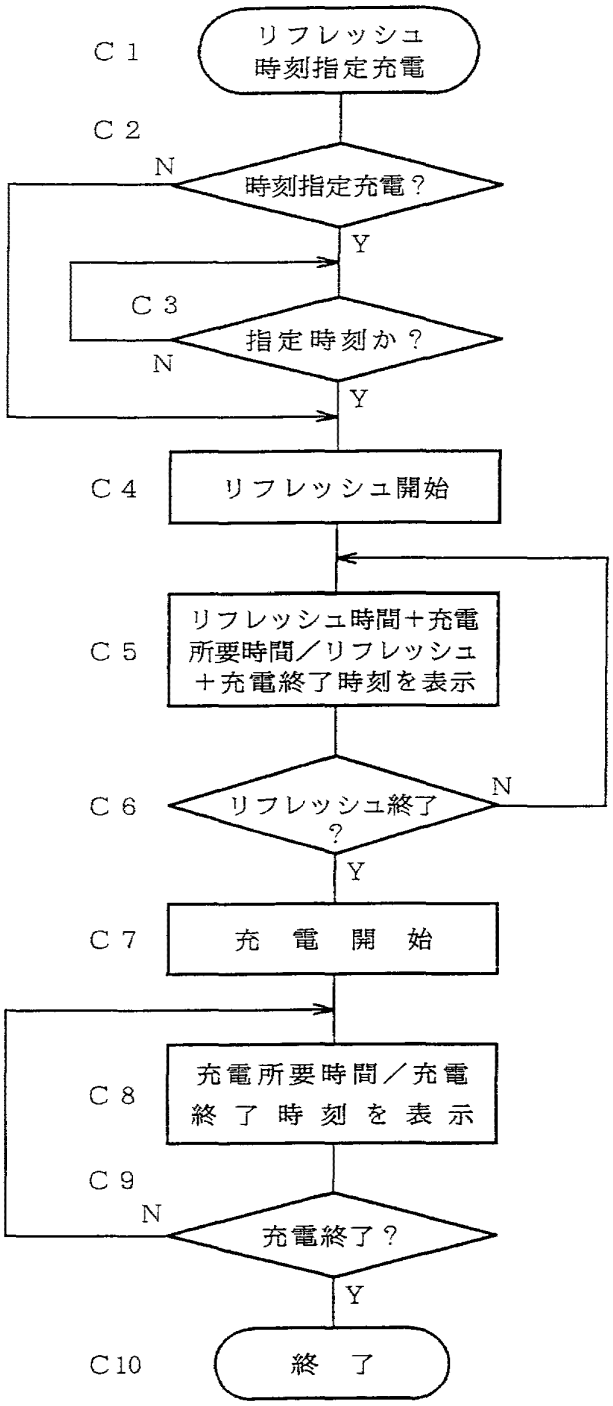
第3図


A1
時刻指定充電の設定
A2
時刻指定充電モードの指定
A3
充電開始時刻の設定
A4
残容量から充電終了時間を算出し、充電所要時間／充電終了時刻を表示
A5
N
設定終了？
Y
A6
終了

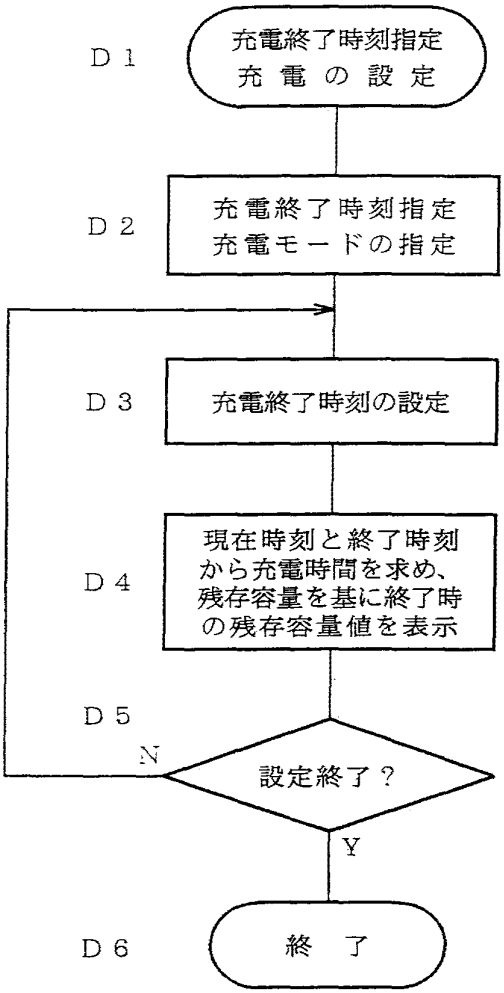
第4図


B 1
時刻指定充電
B 2
N
時刻指定充電？
Y
B 3
指定時刻か？
N
Y
B 4
充 電 開 始
B 5
充電所要時間／充電
終了時刻を表示
B 6
N
充電終了？
Y
B 7
終 了

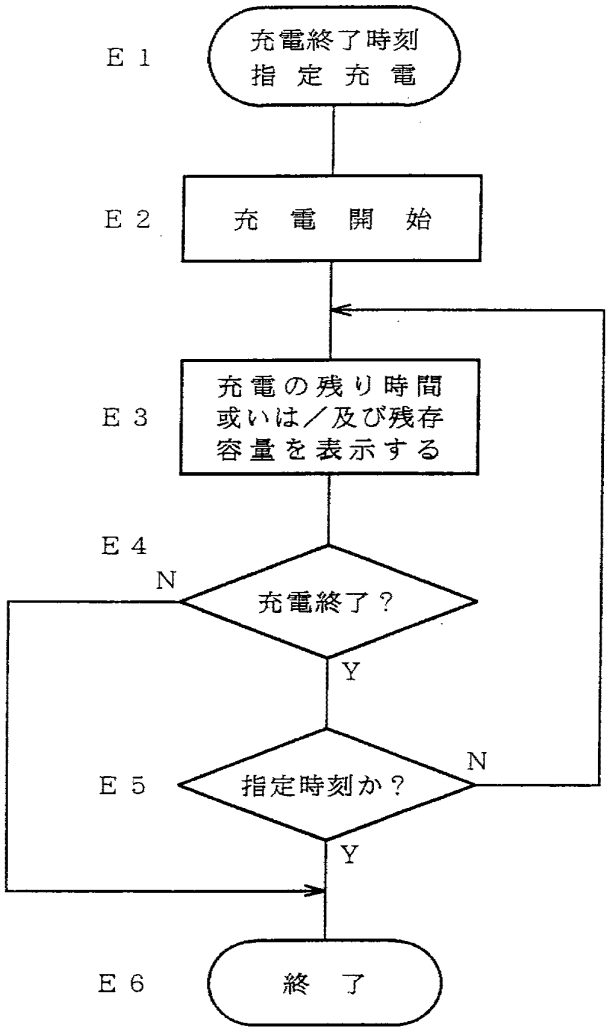
第5図


C1
リフレッシュ
時刻指定充電
C2
N
時刻指定充電？
Y
C3
指定時刻か？
N
Y
C4
リフレッシュ開始
C5
リフレッシュ時間＋充電
所要時間／リフレッシュ
＋充電終了時刻を表示
C6
リフレッシュ終了
？
N
Y
C7
充　電　開　始
C8
充電所要時間／充電
終了時刻を表示
C9
N
充電終了？
Y
C10
終　了

第6図


D1
充電終了時刻指定
充電の設定
D2
充電終了時刻指定
充電モードの指定
D3
充電終了時刻の設定
D4
現在時刻と終了時刻
から充電時間を求め、
残存容量を基に終了時
の残存容量値を表示
D5
N
設定終了？
Y
D6
終了

第7図



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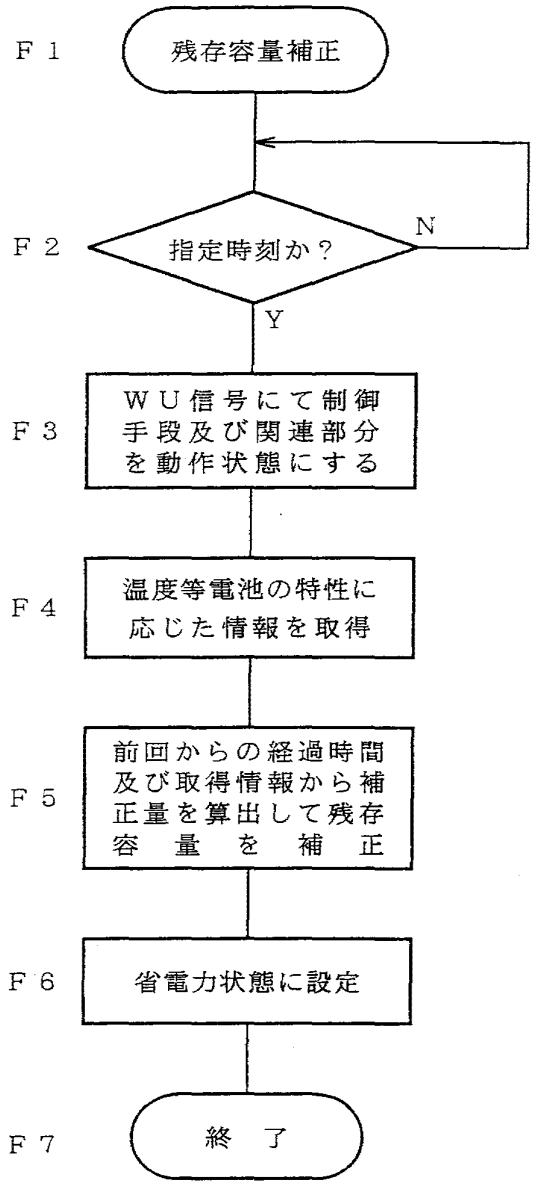
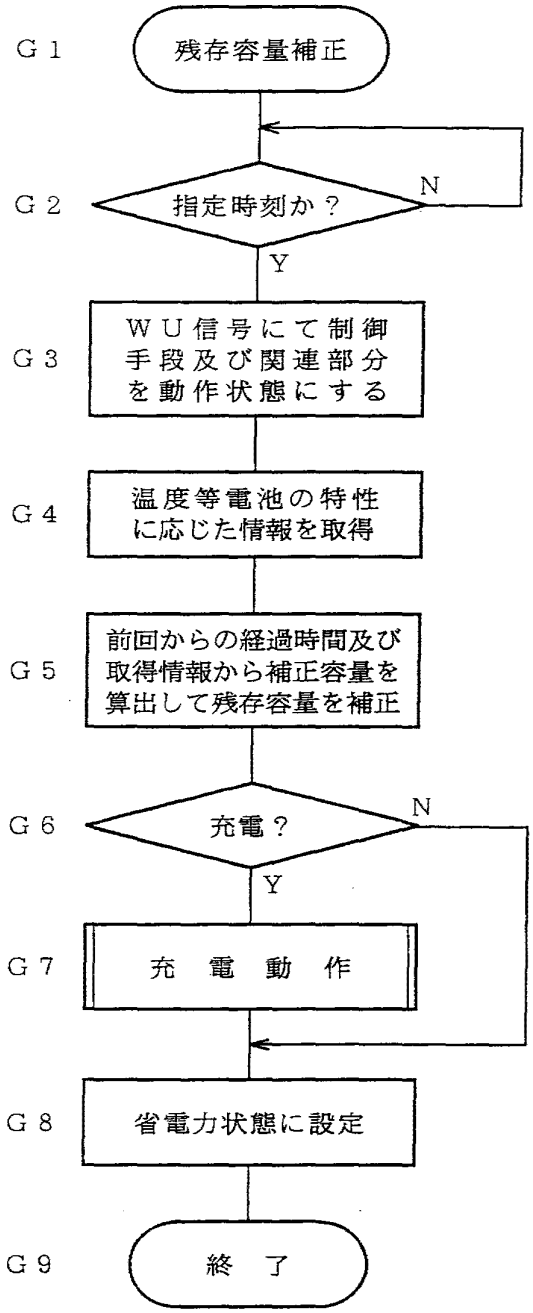
第8図


F1
残存容量補正
F2
指定時刻か？
N
Y
F3
WU信号にて制御手段及び関連部分を動作状態にする
F4
温度等電池の特性に応じた情報を取得
F5
前回からの経過時間及び取得情報から補正量を算出して残存容量を補正
F6
省電力状態に設定
F7
終了

第9図


G1
残存容量補正
G2
指定時刻か？
N
Y
G3
WU信号にて制御手段及び関連部分を動作状態にする
G4
温度等電池の特性に応じた情報を取得
G5
前回からの経過時間及び取得情報から補正容量を算出して残存容量を補正
G6
充電？
N
Y
G7
充電動作
G8
省電力状態に設定
G9
終了

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/05925

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] H01M 10/42

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)
Int.Cl[7] H01M 10/42-48, H02J 7/00-7/36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1994-2000

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.
Y	JP, 11-136870, A (Sharp Corporation), 21 May, 1999 (21.05.99), Claims 1 to 3; Par. Nos. [0009], [0012], [0014], [0017] to [0022] (Family: none)	1-2
X	JP, 5-153733, A (Hitachi, Ltd.),	3-4
Y	18 June, 1993 (18.06.93), Claims 1, 3 (Family: none)	1-2, 15-16
Y	JP, 8-138748, A (Canon Inc.), 31 May, 1996 (31.05.96), Claim 1; Par. No. [0018] (Family: none)	15-16
A	JP, 7-194017, A (Canon Inc.), 28 July, 1995 (28.07.95) (Family: none)	1-20

☐ 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 document 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
28 November, 2000 (28.11.00)	05 December, 2000 (05.12.00)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

国際調査報告

国際出願番号　ＰＣＴ／ＪＰ００／０５９２５

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Ｉｎｔ．Ｃｌ⁷　Ｈ０１Ｍ　１０／４２

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．Ｃｌ⁷　Ｈ０１Ｍ　１０／４２－４８、　Ｈ０２Ｊ　７／００－７／３６

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　　１９２６－１９９６年
日本国公開実用新案公報　１９７１－２０００年
日本国登録実用新案公報　１９９４－２０００年
日本国実用新案登録公報　１９９４－２０００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
Ｙ	ＪＰ，１１－１３６８７０，Ａ（シャープ株式会社），２１．５月．１９９９（２１．０５．９９），【請求項１】～【請求項３】，【０００９】，【００１２】，【００１４】，【００１７】～【００２２】（ファミリーなし）	１－２
Ｘ Ｙ	ＪＰ，５－１５３７３３，Ａ（株式会社日立製作所），１８．６月．１９９３（１８．０６．９３），【請求項１】、【請求項３】（ファミリーなし）	３－４ １－２ １５－１６
Ｙ	ＪＰ，８－１３８７４８，Ａ（キャノン株式会社），３１．５月．１９９	１５－１６

☒　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
２８．１１．００	05.12.00

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）		
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	三宅　正之	４Ｘ	８９３９
	電話番号　０３－３５８１－１１０１　内線　３４３５		

様式ＰＣＴ／ＩＳＡ／２１０（第２ページ）（１９９８年７月）

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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
	６（３１．０５．９６），【請求項１】及び【００１８】（ファミリーなし）	
Ａ	ＪＰ，７－１９４０１７，Ａ（キャノン株式会社），２８．７月．１９９５（２８．０７．９５）（ファミリーなし）	１－２０

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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2004-142661
(P2004-142661A)
(43)公開日　平成16年5月20日(2004.5.20)

(51)Int.Cl.[7]	F I		テーマコード（参考）
B60R 16/04	B60R 16/04	W	2G016
B60R 16/02	B60R 16/04	S	5G003
G01R 31/36	B60R 16/02	670P	5H030
H01M 10/48	G01R 31/36	A	
H02J 7/00	H01M 10/48	P	

審査請求 未請求　請求項の数 9　ＯＬ　（全 21 頁）　最終頁に続く

(21)出願番号　特願2002-311388(P2002-311388)
(22)出願日　平成14年10月25日(2002.10.25)

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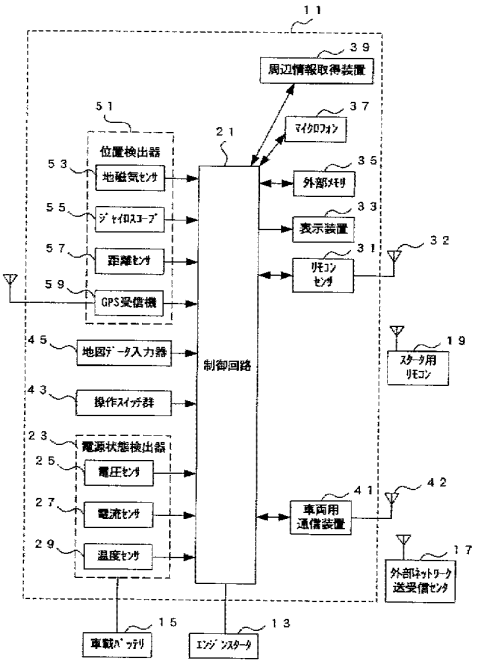
愛知県刈谷市昭和町１丁目１番地　株式会社デンソー内
(72)発明者　大林　和良
愛知県刈谷市昭和町１丁目１番地　株式会社デンソー内

最終頁に続く

(54)【発明の名称】車両用電源管理装置

(57)【要約】
【課題】車両利用者が車両から離れていても、車載バッテリの充電残容量低下を警告できる車両用電源管理装置を提供する。
【解決手段】車両用電源管理装置１１は、車載バッテリ１５が残容量不足状態であると判定されると、車載バッテリ１５が残容量不足状態であることを表す警告通知信号を、無線通信により、車両側通信装置４１から外部ネットワーク送受信センタ１７を経由して利用者側通信装置２０に対して出力する。無線通信により警告通知情報を出力することで、車両から離れた場所に居る車両利用者に対して、車載バッテリ１５が残容量不足状態に陥ったことを通知できる。これにより、長期間にわたり駐車状態となる場合においても、車両利用者は、バッテリ充電残容量の減少を知ることができ、車載バッテリ１５がバッテリ上がり状態に至る前に車載バッテリ１５の交換或いは充電などの対策を施すことが可能となる。
【選択図】　図２



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【特許請求の範囲】
【請求項１】
車両に備えられる電源装置の充電残容量を検出する電源状態検出手段と、
前記電源状態検出手段による検出結果に基づき、前記電源装置の充電残容量が適正容量下限値を下回る場合に、前記電源装置が残容量不足状態であると判定する電源残容量不足判定手段と、
を備えて、前記電源装置の充電状態を管理する車両用電源管理装置であって、前記電源残容量不足判定手段により前記電源装置が残容量不足状態であると判定されると、前記電源装置が残容量不足状態であることを表す警告通知情報を、無線通信により、前記車両から離れた場所で車両利用者により使用される利用者側通信装置に対して出力する残容量不足通知手段を備えること、
を特徴とする車両用電源管理装置。
【請求項２】
前記車両に搭載される電気機器のうち稼働中の電気機器を表す稼働機器情報を、無線通信により、前記利用者側通信装置に対して出力する稼働機器情報出力手段を備えること、
を特徴とする請求項１に記載の車両用電源管理装置。
【請求項３】
前記電源装置の充電残容量を増加させるために前記車両のエンジンを始動するエンジン始動手段を備えること、
を特徴とする請求項１または請求項２に記載の車両用電源管理装置。
【請求項４】
前記エンジン始動手段は、前記電源残容量不足判定手段により前記電源装置が残容量不足状態であると判定されると、前記車両のエンジンを始動すること、
を特徴とする請求項３に記載の車両用電源管理装置。
【請求項５】
前記エンジン始動手段は、無線通信により前記利用者側通信装置からエンジン始動指令を受信すると、前記車両のエンジンを始動すること、
を特徴とする請求項３に記載の車両用電源管理装置。
【請求項６】
前記電源装置の充電残容量を増加させるために前記車両のエンジンが始動された後に、前記電源装置の充電完了を判断する充電完了判断手段と、
前記充電完了判断手段により前記電源装置の充電が完了したと判断されると、前記エンジンを停止させるエンジン停止手段と、
を備えることを特徴とする請求項１から請求項５のいずれかに記載の車両用電源管理装置。
【請求項７】
前記エンジン停止手段により前記エンジンが停止されると、前記電源装置の充電完了を表す充電完了通知情報を、無線通信により前記利用者側通信装置に対して出力する充電完了通知手段を備えること、
を特徴とする請求項６に記載の車両用電源管理装置。
【請求項８】
少なくとも前記車両の周辺の映像または前記車両の周辺の音のいずれかを含む車両周辺情報を取得する周辺情報取得手段と、
前記周辺情報取得手段により取得された前記車両周辺情報を、無線通信により前記利用者側通信装置に対して出力する周辺情報出力手段と、
を備えることを特徴とする請求項１から請求項７のいずれかに記載の車両用電源管理装置。
【請求項９】
請求項１から請求項８のいずれかに記載の車両用電源管理装置であって、
前記車両の走行経路を案内する走行経路案内装置と共に前記車両に搭載されること、

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を特徴とする車両用電源管理装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】
本発明は、車両に備えられる電源装置の充電状態を管理する車両用電源管理装置に関する。
【０００２】
【従来の技術】
従来より、車両には所定の駆動電圧（例えば１２［Ｖ］）を出力できるように充電された電源装置（バッテリ）が備えられており、電源装置は、車載電気機器などの車両各部に対して電力供給を行っている。
【０００３】
そして、電源装置は、充電残容量が適正容量範囲内に設定されることで車両各部に十分な電力を供給でき、電力供給を受ける車載電気機器は、正常動作することができる。
しかし、車載電気機器の電力消費量が過剰に増加することや、駐車期間が長期化することなどの要因により、電源装置に蓄積されている電気エネルギが過剰に消費されると、電源装置の充電残容量が減少する場合がある。
【０００４】
なお、電源装置における充電残容量の適正容量範囲は、少なくとも車載電気機器への電力供給が可能な最小容量である容量下限値と、電源装置として蓄積可能な最大容量である容量上限値とが境界となる容量範囲に設定される。また、充電残容量の適正容量範囲は、電圧変動の影響などを考慮して、一定の余裕を含んで設定されることから、充電残容量が適正容量下限値（適正容量範囲の下限値）よりも僅かに下回る状態の電源装置は、一部の車載電気機器の稼働に必要な電力を供給することは可能である。
【０００５】
しかし、充電残容量が適正容量下限値（適正容量範囲の下限値）よりもさらに低下して、電源装置の出力電圧レベルが許容電圧下限値（車載電気機器の駆動に必要な電圧の下限値）を下回る場合には、電源装置が供給する電力が不足するため、車載電気機器の正常動作が不可能となる。なお、このように電源装置の出力電圧レベルが許容電圧下限値を下回り、必要最低限の電力供給が不可能な状態となる電源装置は、いわゆるバッテリ上がり状態の電源装置である。
【０００６】
この問題に対して、主たる電源装置（車載バッテリ）とは別に、補助電源装置（補助バッテリ）を備えておき、車載バッテリの充電残容量が低下した場合には、補助バッテリが車両各部に電力供給を行うよう構成された電源管理装置（電源電圧監視システム）が提案されている（特許文献１参照）。
【０００７】
また、この電源管理装置は、車載バッテリの出力電圧レベルが悪化した場合には、警告表示を行うことで、運転者（車両利用者）に対して車載バッテリの出力電圧レベル悪化を通知するよう構成されている。
【０００８】
【特許文献１】
特開２００１－１６６０１７号公報（図１、段落番号［００１８］、［００２３］参照）
【０００９】
【発明が解決しようとする課題】
しかし、上記特許文献に記載された電源管理装置（以下、従来電源管理装置ともいう）では、車載バッテリの出力電圧レベル低下に加えて、補助バッテリの出力電圧レベルまでもが許容電圧下限値を下回る状態まで低下した場合には、車両各部への電力供給が不可能となる虞がある。
【００１０】

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これに対しては、補助バッテリとして大容量電源装置（大容量バッテリ）を備えて、補助バッテリの出力電圧レベルが低下するまでの時間を長くすることで、車両各部への電力供給が不可能となるのを回避する対策方法が考えられる。しかし、大容量バッテリは体積が大きくなるために、車両での設置スペースの確保が難しいという問題がある。また、大容量バッテリであっても、充電容量は有限であることから、出力電圧レベルの低下を完全に解消することは難しい。

【００１１】

なお、従来電源管理装置は、上記のように警告表示を行う構成であることから、警告表示を見た車両利用者が、補助バッテリによる電力供給が可能な期間内に車載バッテリを交換することで、車両各部への電力供給が不可能となるのを防ぐことができる。

【００１２】

しかし、車両において従来電源管理装置による警告表示が行われたとしても、車両利用者が車両から離れている場合には、車両利用者は、警告表示を見ることが出来ないため、車載バッテリの出力電圧レベルが悪化していることを知ることができない。とりわけ、長期間にわたり車両が駐車状態となる場合には、車両利用者への通知ができず、また、駐車中に稼働する車載電気機器（例えば、イモビライザなど）での電力消費量が累積されるために、車載バッテリおよび補助バッテリのそれぞれの出力電圧レベルが許容電圧下限値を下回る状態に陥る可能性が高くなる。

【００１３】

本発明は、こうした問題に鑑みなされたものであり、車両利用者が車両から離れていても、車載バッテリの充電残容量低下を警告できる車両用電源管理装置を提供することを目的とする。

【００１４】

【課題を解決するための手段】

上記目的を達成するためになされた請求項１に記載の発明は、車両に備えられる電源装置の充電状態を管理する車両用電源管理装置であって、電源装置の充電残容量が適正容量下限値を下回り、電源装置が残容量不足状態であると判定されると、電源装置が残容量不足状態であることを表す警告通知情報を、無線通信により、利用者側通信装置に対して出力することを特徴とする。

【００１５】

このように、無線通信によって警告通知情報を出力することで、車両から離れた場所にいる車両利用者に対して、電源装置が残容量不足状態に陥ったことを通知することができる。これにより、長期間にわたり駐車状態となる場合においても、電源装置（バッテリ）がバッテリ上がり状態に至る前までに、車載バッテリの交換或いは充電などの対策を施す等の対策を施すことが可能となり、車載電気機器を正常動作させることができる。

【００１６】

なお、上述（請求項１）の車両用電源管理装置は、請求項２に記載のように、稼働機器情報出力手段が、車両に搭載される電気機器のうち稼働中の電気機器を表す稼働機器情報を、無線通信により利用者側通信装置に対して出力するとよい。これにより、車両利用者は、車両から離れていても、稼働機器情報を取得（受信）することで、充電残容量の低下原因である電気機器を容易に特定することができ、車両利用者がその電気機器を停止することで、電源装置の充電残容量が更に低下するのを抑制することができる。

【００１７】

そして、上述（請求項１または請求項２）の車両用電源管理装置は、請求項３に記載のように、エンジン始動手段が、車両のエンジンを始動して電源装置の充電残容量を増加させるとよく、これにより、電源装置がバッテリ上がり状態に至るのを防止できる。

【００１８】

なお、エンジン始動手段は、例えば、請求項４に記載のように、電源装置が残容量不足状態と判定された場合に車両のエンジンを始動することで、充電残容量が適正容量下限値を大幅に下回る前に、電源装置の充電残容量を増加させることができ、バッテリ上がり状態

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に至るのを防ぐことができる。

【００１９】

また、エンジン始動手段は、例えば、請求項５に記載のように、無線通信により、利用者側通信装置からエンジン始動指令を受信した場合に、車両のエンジンを始動するとよい。これにより、車両利用者が車両まで移動することなく、バッテリの充電残容量を増加させることができ、車両まで移動するという煩雑さを解消できる。

【００２０】

次に、上述（請求項１から請求項５のいずれか）の車両用電源管理装置は、請求項６に記載のように、バッテリ充電残容量を増加させるためのエンジン始動後に、充電完了判断手段により電源装置の充電が完了したと判断されると、エンジン停止手段がエンジンを停止させるとよい。これにより、エンジンの動作時間のうち、電源装置の充電に貢献しない無駄な時間を短縮でき、無駄な燃料の消費を抑えることができる。

【００２１】

なお、充電完了判断手段およびエンジン停止手段を備える車両用電源管理装置は、請求項７に記載のように、エンジンが停止された場合に、充電完了通知手段が、電源装置の充電完了を表す充電完了通知情報を無線通信により利用者側通信装置に対して出力するとよい。これにより、車両利用者は、車両から離れていても、利用者側通信装置を用いて充電完了通知情報を取得（受信）することで、電源装置の充電残容量が適正容量範囲内まで増加したことを確認できる。

【００２２】

次に、上述（請求項１から請求項７のいずれか）の車両用電源管理装置は、請求項８に記載のように、周辺情報取得手段が、少なくとも車両の周辺の映像または車両の周辺の音のいずれかを含む車両周辺情報を取得した後、周辺情報出力手段が、無線通信により、車両周辺情報を利用者側通信装置に対して出力するように構成すると良い。

【００２３】

これにより、車両利用者は、車両から離れた場所であっても、車両周辺情報を取得（受信）することにより、車両周辺の状況に基づき、電源装置の充電残容量の低下原因を推測することができる。また、エンジン始動手段を備える場合には、車両利用者が、車両周辺に人が存在していないことを確認することで、エンジン始動による危険性が無いことを確認することができる。

【００２４】

そして、上述（請求項１から請求項８のいずれか）の車両用電源管理装置は、請求項９に記載のように、車両の走行経路を案内する走行経路案内装置と共に車両に搭載されるとよく、これにより、電源装置の充電残容量の低下に伴う走行経路案内装置の動作不良を防止でき、走行経路案内装置の正常動作を維持することができる。

【００２５】

【発明の実施の形態】

以下に、本発明が適用された実施例について図面を用いて説明する。なお、本発明の実施の形態は、下記の実施例に何ら限定されることなく、本発明の技術的範囲に属する限り、種々の形態を採り得ることは言うまでもない。

【００２６】

図１に、本発明の実施例である車両用電源管理装置１１を有する車両３を備えて構成される電源管理システム１の概略構成図を示す。なお、電源管理システム１は、車両用電源管理装置１１を有する車両３と、無線通信により車両用電源管理装置１１との間で各種データの送受信を行う外部ネットワーク送受信センタ１７と、無線通信により車両用電源管理装置１１との間で各種データ（エンジン始動に関するデータなど）の送受信を行うスタータ用リモコン１９と、外部ネットワーク送受信センタ１７との間で各種データの送受信を行うために車両利用者により使用される利用者側通信装置２０と、を備えて構成されている。

【００２７】

外部ネットワーク送受信センタ１７は、インターネットや各種情報センタなどの外部情報源と接続されており、外部情報源から取り込んだ各種情報を車両用電源管理装置１１に対して出力（送信）することができる。
スタータ用リモコン１９は、車両利用者による操作に応じて、無線通信により車両用電源管理装置１１に対して各種指令信号（エンジン始動指令など）を出力（送信）でき、また、車両用電源管理装置１１から各種情報（エンジン運転状態、エンジン回転速度など）を受信できるよう構成されている。そして、スタータ用リモコン１９は、小型の液晶パネルからなる表示部を備えており、受信した各種情報の内容や送信した各種指令信号の内容などを表示部に表示するよう構成されている。

【００２８】

利用者側通信装置２０は、携帯電話あるいは無線通信が可能なパソコンなどで構成されており、外部ネットワーク送受信センタ１７との間で各種情報の送受信を行うことが可能であり、さらに、外部ネットワーク送受信センタ１７を介して車両用電源管理装置１１との間で各種情報を送受信することができる。

【００２９】

車両３は、車両用電源管理装置１１と、エンジンスタータ１３（ハイブリッド車の場合には、モータジェネレータがエンジンスタータと同様の機能を有する）と、車載バッテリ１５（車載電源装置１５）とを備えている。
エンジンスタータ１３は、セルモータを有しており、車両用電源管理装置１１からの始動指令信号が入力されると、セルモータを駆動してクランク軸を回転させることにより、エンジンを始動させる。

【００３０】

車載バッテリ１５は、車両３に備えられる発電機（オルタネータ。ハイブリッド車の場合にはモータジェネレータが同様の機能を有する（図示省略））からの電力供給を受けて、充電残容量が適正容量範囲内となるように充電されることで、車両３に備えられる各種電気機器（車両用電源管理装置、エンジンスタータ、エアコン、カーステレオなど）に電力供給を行うことができる。なお、車載バッテリ１５における充電残容量の適正容量範囲は、少なくとも車載電気機器への電力供給が可能な最小容量である容量下限値、および電源装置として蓄積可能な最大容量である容量上限値が、境界値となる容量範囲に設定される。つまり、適正容量範囲は、容量下限値が下限境界値として、容量上限値が上限境界値として規定される容量範囲に設定される。

【００３１】

なお、充電残容量の適正容量範囲は、電圧変動などの影響を考慮して、一定の余裕を含むように設定されることから、充電残容量が適正容量下限値（適正容量範囲の下限値）よりも僅かに下回る状態の車載バッテリ１５は、一部の車載電気機器（例えば、エンジンスタータなど）の稼働に必要な電力を供給することは可能である。つまり、充電残容量が適正容量下限値よりも僅かに下回る状態の車載バッテリ１５は、車両３のエンジンを始動するために、エンジンスタータを駆動することができる。

【００３２】

しかし、充電残容量が適正容量範囲の下限値（適正容量下限値）よりも更に低下して、車載バッテリ１５の出力電圧レベルが許容電圧下限値（車載電気機器の駆動に必要な電圧の下限値）を下回る場合には、車載バッテリ１５からの供給電力が不足するため、車載電気機器の正常動作が不可能となる。このため、車載バッテリ１５は、充電残容量が適正容量範囲内となるように充電されることで、車両３に備えられる各種電気機器への電力供給が可能となる。

【００３３】

次に、車両用電源管理装置１１について説明する。
車両用電源管理装置１１は、車載バッテリ１５の出力電圧レベルが許容電圧下限値を下回らないよう車載バッテリ１５の充電状態を管理する機能を有すると共に、目的地までの走行経路の案内を行う走行経路案内機能（カーナビゲーション機能（以下、カーナビ機能と

もいう））を有するように構成された装置である。つまり、車両用電源管理装置１１は、車両用経路案内装置（カーナビゲーション装置）と共に一体に構成された装置である。

【００８４】

図２に、車両用電源管理装置１１の構成図を示す。なお、図２では、車両用電源管理装置１１に接続される車載バッテリ１５、エンジンスタータ１３、外部ネットワーク送受信センタ１７およびスタータ用リモコン１９についても記載している。

【００８５】

図２に示すように、車両用電源管理装置１１は、コンピュータを主体として構成される制御回路２１と、車載バッテリ１５の状態を検出する電源状態検出器２３と、スタータ用リモコン１９との間でデータ送受信を行うリモコンセンサ３１と、各種情報を表示する表示装置３３と、各種データを記憶する外部メモリ３５と、車両３の周辺で発生する音を取り込むマイクロフォン３７と、車両３の周辺状況に関する情報（映像や障害物の有無など）を取得する周辺情報取得装置３９と、外部ネットワーク送受信センタ１７との間でデータ送受信を行う車両側通信装置４１と、車両利用者が各種操作を行うための操作スイッチ群４３と、カーナビ機能に用いる地図データを入力するための地図データ入力器４５と、車両３の現在位置を検出するための位置検出器５１と、を備えて構成されている。

【００８６】

制御回路２１は、通常のコンピュータと同様に、公知のＣＰＵ、ＲＯＭ、ＲＡＭ、Ｉ／Ｏおよびこれらを接続するバスラインを備えて構成されており、後述する各種制御処理を実行することで、車載バッテリ１５の充電状態を管理するための制御処理や、走行経路を案内するための制御処理などを実行する。

【００８７】

電源状態検出器２３は、車載バッテリ１５の出力電圧レベルを検出する電圧センサ２５と、車載バッテリ１５の出力電流レベルを検出する電流センサ２７と、車載バッテリ１５の温度を検出する温度センサ２９と、を備えており、検出結果（検出電圧値、検出電流値、検出温度）を制御回路２１に出力するよう構成されている。

【００８８】

位置検出器５１は、公知の地磁気センサ５３と、公知のジャイロスコープ５５と、公知の距離センサ５７（車速センサ５７）と、ＧＰＳ（Ｇｌｏｂａｌ Ｐｏｓｉｔｉｏｎｉｎｇ Ｓｙｓｔｅｍ ）衛星からの電波に基づいて車両３の現在位置を検出する公知のＧＰＳ受信機５９と、を有しており、これら４個の検出部によるそれぞれの検出結果（車両３の現在位置）を制御回路２１に出力するよう構成されている。

【００８９】

なお、４個の検出部（地磁気センサ５３、ジャイロスコープ５５、距離センサ５７、ＧＰＳ受信機５９）は、様々な要因により検出結果に誤差が生じる場合があるが、それぞれ検出特性が違うため誤差の性質が異なっている。このことから、制御回路２１は、位置検出器５１から入力される４個の検出結果について、それぞれの検出特性を考慮して相互に誤差を補完することで、車両３の現在位置の検出精度を向上させている。

【００４０】

表示装置３３は、カラー表示が可能な液晶パネルで構成されており、制御回路２１を介して位置検出器５１から入力される車両現在位置マークと、地図データ入力器４５より入力された地図データと、地図上に表示する誘導経路（案内経路）などの付加データと、を含むカーナビ画面を表示することができる。なお、表示装置３３は、カーナビ画面の他に、テレビ映像画面や車両各部の動作状態（例えば、ハイブリッド車の発電状態など）表示画面などの各種情報を表示することができる。

【００４１】

操作スイッチ群４３は、車両利用者が車両用電源管理装置１１に対して各種指令を入力するための各種操作スイッチが備えられて構成されている。なお、操作スイッチ群４３は、機械式スイッチに限ることはなく、表示装置３３がタッチ操作パネルを有する場合には、タッチ操作パネルを操作スイッチ群４３として用いることができる。

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【００４２】
地図データ入力器４５は、位置検出の精度向上のための各種データ（いわゆるマップマッチング用データ、地図データおよび目印データなど）を記録媒体から読込み、制御回路２１に入力するための装置である。記録媒体としては、ＣＤ－ＲＯＭ、ＤＶＤ－ＲＯＭ、メモリカードなどを用いることができる。
【００４３】
リモコンセンサ３１は、リモコン用アンテナ３２を備えており、無線通信によりスタータ用リモコン１９との間で電波の送受信を行うと共に、制御回路２１との間で各種データの送受信を行う。つまり、リモコンセンサ３１は、制御回路２１とスタータ用リモコン１９との間で送受信される各種情報（各種データ）を中継するよう構成されている。
【００４４】
外部メモリ３５は、制御回路２１の内部で実行される各種制御処理の書き込み要求に応じて各種情報（変数値など）を記憶すると共に、記憶した各種情報を各種制御処理の読み出し要求に応じて制御回路２１に対して出力する。
マイクロフォン３７は、車両３の周辺で発生する音を取り込み、取り込んだ音に応じた周辺音声信号を制御回路２１に対して出力する。
【００４５】
周辺情報取得装置３９は、車両３の周辺映像を撮影する外部カメラと、超音波などの反射状況に基づき車両３の周辺に存在する障害物を検出する全方位センサとを備えており、車両３の周辺状況に関する情報（映像信号および障害物検出信号など）を制御回路２１に出力する。なお、外部カメラは、例えば、車両後退時に車両後方の映像を撮影するために用いるバックモニタカメラや、車両前方の映像を撮影するための交差点モニタカメラを用いて構成することができる。
【００４６】
車両側通信装置４１は、通信用アンテナ４２を備えており、無線通信により外部ネットワーク送受信センタ１７との間で電波の送受信を行うと共に、制御回路２１との間で各種データの送受信を行うことで、制御回路２１と外部ネットワーク送受信センタ１７との間で送受信される各種情報（データ）を中継する。なお、外部ネットワーク送受信センタ１７は、前述のように、外部情報源から取り込んだ各種情報を車両用電源管理装置１１に対して無線通信によって出力（送信）する。
【００４７】
次に、制御回路２１で実行される各種制御処理について説明する。
まず、カーナビ機能を実現するために、制御回路２１の内部で実行される経路案内処理について簡単に説明する。
経路案内処理は、車両利用者が操作スイッチ群４３を操作するなどして目的地が設定されると起動される処理であり、車両３の現在位置から目的地までの最適な走行経路を自動的に選択して誘導経路を決定する処理を行う。
【００４８】
なお、最適な走行経路を自動的に設定する手法としては、例えば、ダイクストラ法などを用いることができる。また、目的地の設定方法は、操作スイッチ群４３を用いる場合に限られず、スタータ用リモコン１９に目的地設定用スイッチを備えて、スタータ用リモコン１９を用いて目的地を設定してもよい。
【００４９】
また、カーナビ機能に関しては、外部ネットワーク送受信センタ１７が常に最新の情報を格納することができるため、車両用電源管理装置１１が、カーナビ機能に必要な各種情報を外部ネットワーク送受信センタ１７から取得することで、車両に搭載されるＤＶＤなどに記録された情報よりも新しい情報に基づいた正確な経路案内が可能となる。
【００５０】
次に、車載バッテリ１５の充電状態を管理するために、制御回路２１の内部で実行される電源マネジメント処理について説明する。図３に、電源マネジメント処理の処理内容を表

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すフローチャートを示す。なお、電源マネジメント処理は、一定周期（例えば、３０分周期）毎に繰り返し実行される。

【００５１】

電源マネジメント処理が開始されると、まず、Ｓ２１０（Ｓはステップを表す。以下同様。）では、車両が駐車状態であるか否かを判定しており、肯定判定されると（駐車状態であると）Ｓ２２０に移行し、否定判定されると（駐車状態ではないと）電源マネジメント処理を終了する。Ｓ２１０では、車両３の現在位置を用いた判定方法を用いており、カーナビ機能で目的地が設定されている場合には、車両３の現在位置が目的地になると肯定判定し、車両３の現在位置が出発地から目的地までの案内経路の途中である場合には否定判定する。なお、目的地が設定されていない場合には、過去の走行履歴情報に基づき目的地を推定し、推定した目的地に到達したか否かで判断することができる。

【００５２】

Ｓ２１０で肯定判定されてＳ２２０に移行すると、Ｓ２２０では、外部ネットワーク送受信センタ１７との間で、無線通信を用いた通信経路を確立する接続確立処理を行う。通信経路が確立されることで、車両用電源管理装置１１と外部ネットワーク送受信センタ１７との間でのデータ送受信が可能となる。

【００５３】

次のＳ２３０では、外部ネットワーク送受信センタ１７から車両３の現在地における最新の環境情報を受信し、また、外部メモリ３５から駐車時電力消費量を読み込み、さらに、環境情報および駐車時電力消費量に応じて車載バッテリ１５のバッテリ充電残容量における適正容量下限値を設定する処理を行う。

【００５４】

なお、環境情報には、少なくとも予想温度（予想気温）、予想湿度、天気予報が含まれており、また、駐車時電力消費量は、後述するＳ３００で算出されており、Ｓ２３０では、過去にＳ３００が実行された際に外部メモリ３５に記憶された値を用いて処理を実行することになる。

【００５５】

また、適正容量下限値の設定方法としては、例えば、予め基準値を定めておき、受信した環境情報および駐車時電力消費量に基づき、基準値を補正して、適正容量下限値として設定する方法がある。なお、基準値は、車載バッテリ１５の仕様（スペック）で定められた定格容量に基づいて、決定することができる。

【００５６】

そして、補正は、例えば、車載バッテリの出力電圧レベルが低下する環境になるほど、適正容量下限値が大きい値となるように、反対に、車載バッテリの出力電圧レベルが上昇する環境になるほど、適正容量下限値が小さい値となるように実行する。具体的には、予想温度が低くなるほど適正容量下限値が大きい値となるように、反対に、予想温度が高くなるほど適正容量下限値が小さい値となるように、補正を行う。また、駐車時電力消費量が大きくなるほど適正容量下限値が大きい値となるように、反対に、駐車時電力消費量が小さくなるほど適正容量下限値が小さい値となるように、補正を行う。

【００５７】

続くＳ２４０では、電源判断準備が完了したか否か、換言すれば、電源状態検出器２３による車載バッテリ１５の電源状態検出が可能であるか否かを判断しており、肯定判定されるとＳ２５０に移行し、否定判定されると電源マネジメント処理を終了する。なお、Ｓ２４０では、電源状態検出器２３に備えられる各センサ（電圧センサ２５、電流センサ２７、温度センサ２９）による検出結果を取り込み可能な状態で、かつ、車載バッテリ１５の充電残容量の算出が可能な状態である場合に、電源判断準備が完了したと判断する。

【００５８】

Ｓ２４０で肯定判定されてＳ２５０に移行すると、Ｓ２５０では、車両３のエンジンが停止しているか否かを判断しており、肯定判定される（エンジン停止中である）場合はＳ２６０に移行し、否定判定される（エンジン運転中である）場合は電源マネジメント処理を

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終了する。エンジンが停止状態であるか否かは、例えば、エンジン回転速度（エンジン回転数）に基づいて判断することができる。

【００５９】

Ｓ２５０で肯定判定されてＳ２６０に移行すると、Ｓ２６０では、車載バッテリ１５の充電残容量を算出する処理を行う。なお、制御回路２１では、別途、電源状態検出器２３に備えられる各センサ（電圧センサ２５、電流センサ２７、温度センサ２９）の検出結果を履歴データとして蓄積する履歴データ蓄積処理を実行している。Ｓ２６０では、蓄積された履歴データに基づいて、車載バッテリ１５から出力された出力電力量、および車載バッテリ１５に蓄積された蓄積電力量を算出し、出力電力量と蓄積電力量との差に基づいて、車載バッテリ１５の充電残容量を算出する処理を行う。

【００６０】

次のＳ２７０では、Ｓ２６０で算出した充電残容量とＳ２３０で設定された適正容量下限値とを比較し、両者の差を算出する処理を行う。

続くＳ２８０では、Ｓ２７０での比較結果に基づき、車載バッテリ１５の充電残容量が不足しているか否かの判断を行い、肯定判定（充電残容量が不足と判定）される場合にはＳ２９０に移行し、否定判定（充電残容量が足りていると判定）される場合にはＳ３００に移行する。Ｓ２８０では、充電残容量が適正容量下限値以下である場合に肯定判定し、充電残容量が適正容量下限値より大きい場合に否定判定する。

【００６１】

Ｓ２８０で肯定判定されてＳ２９０に移行すると、Ｓ２９０では、サブルーチンとしてのエンジン始動処理を起動することで、車両３のエンジンを始動する処理を行う。なお、エンジン始動処理の処理内容を表すフローチャートを、図４（ａ）に示す。

【００６２】

エンジン始動処理が開始されると、Ｓ４１０では、エンジンスタータ１３に対して始動指令信号を出力し、エンジンスタータ１３により車両３のエンジンを始動させる処理を行う。

次のＳ４２０では、エンジンが運転状態（ＯＮ状態）に移行したことを確認した後、無線通信を通じて、車載バッテリ１５が残容量不足状態であること、およびエンジンがＯＮ状態に移行したこと、を車両利用者に通知する処理を行う。なお、Ｓ４２０では、エンジン回転速度が所定の運転状態判断基準値（例えば２００［ｒＰｍ］）より大きい場合に、エンジンが運転状態に移行したと判断する。

【００６３】

また、Ｓ４２０では、通知処理に関しては、車載バッテリ１５が残容量不足状態であることを表す警告通知信号と、エンジンが運転状態であることを表すエンジンＯＮ通知信号（エンジン始動通知信号）とを、車両側通信装置４１から外部ネットワーク送受信センタ１７に向けて出力するための処理を行う。つまり、Ｓ４２０では、車両側通信装置４１から外部ネットワーク送受信センタ１７を経由して、車両利用者が使用する利用者側通信装置２０に対して警告通知信号とエンジンＯＮ通知信号とを出力（送信）する処理を行う。これにより、車両３から離れた場所に居る車両利用者に対して、車載バッテリ１５が残容量不足状態であること、および車載バッテリ１５の充電残容量を増加させるためにエンジンが運転状態（ＯＮ状態）に移行したことを通知する。

【００６４】

また、Ｓ４２０では、駐車中には稼働状態となる必要のない電気機器（例えば、ヘッドランなど）の中に、稼働中（動作中）の電気機器があるか否かを判断し、稼働中の電気機器が存在する場合には、その電気機器が稼働中であることを、無線通信を通じて車両利用者に通知する。具体的には、車両側通信装置４１が、稼働中の電気機器を表す稼働機器情報信号を出力し、外部ネットワーク送受信センタ１７を経由して車両の利用者が使用する利用者側通信装置２０に稼働機器情報信号を出力（送信）することで、車両利用者に対して、稼働中の電気機器が存在することを通知する。

【００６５】

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さらに、Ｓ４２０では、駐車中に稼働状態となるべき電気機器（例えば、イモビライザ（盗難防止装置）など）の中に、停止中の電気機器があるか否かを判断し、停止中の電気機器が存在する場合には、その電気機器が停止中であることを、無線通信を通じて車両利用者に通知する。具体的には、車両側通信装置４１が、停止中の電気機器を表す停止機器情報信号を、利用者側通信装置２０に対して出力（送信）することで、車両利用者に対して、停止中の電気機器が存在することを通知する。

【００６６】

なお、Ｓ４２０では、例えば、ドアがアンロック状態（施錠忘れ状態）であるか、また、窓がオープン状態であるかを判断し、ドアがアンロック状態である場合にはアンロック状態であることを、窓がオープン状態である場合にはオープン状態であることを、それぞれ無線通信を通じて車両利用者に通知する処理を実行してもよい。これにより、盗難などに対するセキュリティの強化を図ることが出来る。

【００６７】

Ｓ４２０での処理が終了すると、エンジン始動処理が終了し、再び電源マネジメント処理に移行する。

電源マネジメント処理のＳ２８０で否定判定されてＳ３００に移行すると、Ｓ３００では、車両駐車時の電気機器で消費される総消費量である駐車時電力消費量（暗電流による電力消費量）を算出し、算出結果を外部メモリ３５に記憶させる処理を行う。なお、駐車時電力量は、稼働中の電気機器を特定し、各消費電力量を合計することで算出できる。また、エンジン停止状態の車両での電力供給源は、車載バッテリ１５のみであることから、駐車時電力量は、電源状態検出器２３にて検出される車載バッテリ１５の出力電流値および出力電圧値に基づいて算出することも可能である。

【００６８】

なお、電源マネジメント処理は一定周期で繰り返し実行されることから、Ｓ３００では、外部メモリ３５に記憶される駐車時電力量を上書き更新することで、最新の算出結果を外部メモリ３５に記憶させるよう処理を行う。これにより、前述のＳ２８０において車両３の最新状態に応じた駐車時電力消費量を用いることができ、適正容量下限値を、車両３の最新状態に応じた適切な値に設定することができる。

【００６９】

続くＳ３１０では、駐車中には稼働状態となる必要のない電気機器（例えば、ヘッドランプなど）の中に、稼働中（動作中）の電気機器があるか否かを判断し、稼働中の電気機器が存在する場合には、その電気機器が稼働中であることを、無線通信を通じて車両利用者に通知する。具体的には、車両側通信装置４１が、稼働中の電気機器を表す稼働機器情報信号を出力し、外部ネットワーク送受信センタ１７を経由して車両の利用者が使用する利用者側通信装置２０に稼働機器情報信号を出力（送信）することで、車両利用者に対して、稼働中の電気機器が存在することを通知する。

【００７０】

さらに、Ｓ３１０では、駐車中に稼働状態となるべき電気機器（例えば、イモビライザ（盗難防止装置）など）の中に、停止中の電気機器があるか否かを判断し、停止中の電気機器が存在する場合には、その電気機器が停止中であることを、無線通信を通じて車両利用者に通知する。具体的には、車両側通信装置４１が、停止中の電気機器を表す停止機器情報信号を、利用者側通信装置２０に対して出力（送信）することで、車両利用者に対して、停止中の電気機器が存在することを通知する。

【００７１】

なお、Ｓ３１０では、例えば、ドアがアンロック状態（施錠忘れ状態）であるか、また、窓がオープン状態であるかを判断し、ドアがアンロック状態である場合にはアンロック状態であることを、窓がオープン状態である場合にはオープン状態であることを、それぞれ無線通信を通じて車両利用者に通知する処理を実行しても良い。これにより、盗難などに対するセキュリティの強化を図ることが出来る。

【００７２】

Ｓ２４０で否定判定されるか、Ｓ２５０で否定判定されるか、Ｓ２９０またはＳ３１０の処理が終了すると、電源マネジメント処理が終了する。
次に、電源マネジメント処理によりエンジンが始動された後、車載バッテリ１５が充電完了状態に移行したことを判断するために、制御回路２１の内部で実行される充電完了判断処理について説明する。
【００７３】
図５に、充電完了判断処理の処理内容を表すフローチャートを示す。なお、充電完了判断処理は、電源マネジメント処理によるエンジン始動後、一定周期（例えば、１分周期）毎に繰り返し実行される。
充電完了判断処理が開始されると、まず、Ｓ６１０では、車両３のエンジンが運転状態であるか否かを判断しており、肯定判定される（エンジン運転中である）とＳ６２０に移行し、否定判定される（エンジン停止中である）と充電完了判断処理を終了する。エンジンが運転状態であるか否かは、例えば、エンジン回転速度（エンジン回転数）に基づいて判断することができる。
【００７４】
Ｓ６１０で肯定判定されてＳ６２０に移行すると、Ｓ６２０では、車載バッテリ１５の充電残容量を算出する処理を行う。なお、Ｓ６２０での処理内容は、前述の電源マネジメント処理のＳ２６０での処理内容と同様である。
次のＳ６３０では、Ｓ６２０で算出した充電残容量と充電完了基準値とを比較し、両者の差を算出する処理を行う。なお、充電完了基準値は、電源マネジメント処理のＳ２３０で設定された適正容量下限値よりも大きい値が設定されており、例えば、車載バッテリ１５における充電残容量の適正容量範囲のうち、上限値と下限値との中間値（平均値）に設定されている。
【００７５】
続くＳ６４０では、Ｓ６３０での比較結果に基づき、車載バッテリ１５の充電残容量が充電完了基準値を満足しているか（上回っているか）否かの判断を行い、肯定判定（充電残容量が充電完了基準値を上回っていると判定）される場合にはＳ６５０に移行し、否定判定（充電残容量が充電完了基準値を上回っていないと判定）される場合にはＳ６８０に移行する。
【００７６】
Ｓ６４０で肯定判定されてＳ６５０に移行すると、Ｓ６５０では、車載バッテリ１５の充電が完了したと判断し、今回の動作状況（日時など）を外部メモリ３５に記憶させる処理を行う。
続くＳ６６０では、エンジンを停止させる処理を行う。具体的には、点火系統や燃料系統などの制御を行う制御装置の動作を停止させることで、エンジンを停止させる。
【００７７】
次のＳ６７０では、エンジンが停止状態（ＯＦＦ状態）であることを確認した後、無線通信を通じて、エンジンが停止状態となったこと、および車載バッテリ１５の充電状態が正常状態になったことを、車両利用者に通知する処理を行う。なお、Ｓ６７０では、エンジン回転速度が所定の停止状態判断基準値（例えば０［ｒＰｍ］）以下である場合に、エンジンが停止状態に移行したと判断する。
【００７８】
また、Ｓ６７０では、通知処理に関しては、車両側通信装置４１が充電完了通知信号およびエンジンＯＦＦ通知信号（エンジン停止通知信号）を出力し、外部ネットワーク送受信センタ１７を経由して車両利用者が使用する利用者側通信装置２０に対して、充電完了通知信号およびエンジンＯＦＦ通知信号を出力（送信）する処理を行う。これにより、車両３から離れた場所に居る車両利用者に対して、エンジンが停止状態に移行したこと、および車載バッテリ１５の充電状態が残容量不足状態から正常状態に移行したことを通知する。
【００７９】

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Ｓ６４０で否定判定されてＳ６８０に移行すると、Ｓ６８０では、発電機から車載バッテリ１５に対して供給される単位時間当たりの供給電力量（充電量）を算出する処理を行う。そして、算出した供給電力量に基づき、Ｓ６３０で算出した充電残容量と充電完了基準値との差分電力量（差分充電容量）を供給するために必要な時間（充電完了予測所要時間）を算出し、算出した充電完了予測所要時間を、無線通信を通じて車両利用者に通知する処理を行う。これにより、車両利用者は、充電完了までの概略時間を把握することが出来る。

【００８０】

Ｓ６１０で否定判定されるか、Ｓ６７０またはＳ６８０の処理が終了すると、充電完了判断処理が終了する。なお、Ｓ６７０が実行されると、それ以降は、充電完了判断処理の周期的な実行は停止される。なお、その後、電源マネジメント処理により再度エンジンが始動されると、改めて充電完了判断処理の周期的な実行が開始される。

【００８１】

なお、本実施例においては、車両用電源管理装置１１が特許請求の範囲に記載の車両用電源管理装置に相当し、車載バッテリ１５が電源装置に相当し、電源状態検出器２３およびＳ２６０が電源状態検出手段に相当し、電源マネジメント処理のＳ２８０が電源残容量不足判定手段に相当し、エンジン始動処理のＳ４２０および車両側通信装置４１が残容量不足通知手段に相当し、警告通知信号が警告通知情報に相当し、利用者側通信装置２０が利用者側通信装置に相当する。

【００８２】

また、電源マネジメント処理のＳ３１０、エンジン始動処理のＳ４２０および車両側通信装置４１が稼働機器情報出力手段に相当し、エンジン始動処理のＳ４１０およびエンジンスタータ１３がエンジン始動手段に相当し、充電完了判断処理のＳ６４０が充電完了判断手段に相当し、充電完了判断処理のＳ６６０がエンジン停止手段に相当し、充電完了判断処理のＳ６７０および車両側通信装置４１が充電完了通知手段に相当する。さらに、マイクロフォン３７および周辺情報取得装置３９が周辺情報取得手段に相当し、車両側通信装置４１が周辺情報出力手段に相当する。

【００８３】

以上説明したように、本実施例の電源管理システム１に備えられる車両用電源管理装置１１は、電源状態検出器２３および電源マネジメント処理のＳ２６０が、車両３に備えられる車載バッテリ１５（電源装置）の充電残容量を検出し、電源マネジメント処理のＳ２８０が、電源状態検出器２３およびＳ２６０による検出結果に基づき、車載バッテリ１５の充電残容量が適正容量下限値を下回る場合に、車載バッテリ１５が残容量不足状態であると判定するよう構成されている。

【００８４】

そして、車両用電源管理装置１１は、Ｓ２８０により車載バッテリ１５が残容量不足状態であると判定されると、エンジン始動処理のＳ４２０および車両側通信装置４１が、車載バッテリ１５が残容量不足状態であることを表す警告通知信号を、無線通信により、車両３から離れた場所で車両利用者により使用される利用者側通信装置２０に対して出力することで、車載バッテリ１５の充電状態を管理するよう構成されている。

【００８５】

つまり、車両用電源管理装置１１は、車載バッテリ１５が残容量不足状態であることを車両利用者に通知するにあたり、車両内に備えられる表示装置などにより通知する構成ではなく、無線通信によって利用者側通信装置に対して警告通知信号（警告通知情報）を出力する構成である。

【００８６】

このように、無線通信によって警告通知情報を出力することで、車両から離れた場所に居る車両利用者に対して、車載バッテリ１５が残容量不足状態に陥ったことを通知できる。これにより、長期間にわたり駐車状態となる場合においても、車両利用者は、警告通知情報によってバッテリ充電残容量の減少を知ることができるため、車載バッテリ１５がバッ

テリ上がり状態に至る前に車載バッテリ１５の交換或いは充電などの対策を施すことが可能となり、車載電気機器を正常動作させることができる。

【００８７】

また、車両用電源管理装置１１は、電源マネジメント処理のＳ３１０、エンジン始動処理のＳ４２０および車両側通信装置４１が、車両３に搭載される電気機器のうち稼働中の電気機器を表す稼働機器情報信号を、無線通信によって利用者側通信装置２０に対して出力（送信）するよう構成されている。

【００８８】

つまり、車両利用者は、稼働機器情報信号を受信した利用者側通信装置２０を用いることで、どの電気機器が稼働中であるかを知ることが出来るため、充電残容量の低下原因である電気機器を容易に特定することができる。そして、車両利用者が、充電残容量の低下原因である電気機器を停止することで、車載バッテリ１５の充電残容量が更に低下するのを抑制することができる。

【００８９】

さらに、車両用電源管理装置１１は、エンジン始動処理のＳ４１０およびエンジンスタータ１３が、車載バッテリ１５の充電残容量を増加させるために車両３のエンジンを始動するよう構成されている。

このように、エンジンを始動して運転状態にすることで、発電機（オルタネータ）で発電される電力を車載バッテリ１５に充電することができ、車載バッテリ１５の充電残容量を増加させることが出来るため、車載バッテリ１５がバッテリ上がり状態に至るのを防止できる。

【００９０】

なお、Ｓ４１０は、Ｓ２８０で肯定判定される場合、つまり、車載バッテリ１５の充電残容量が不足状態（残容量不足状態）と判断される場合に、車両利用者による操作を待つことなく、車両３のエンジンを始動する処理を実行する。つまり、車両用電源管理装置１１は、車載バッテリ１５が残容量不足状態に陥った際に、車両利用者による操作を経ることなく、自動的にエンジンを始動して充電残容量を増加させることが出来る。

【００９１】

よって、車両用電源管理装置１１によれば、車両利用者がエンジン始動する作業を省略できるため、始動作業の煩雑さを解消することができる。また、車載バッテリ１５が残容量不足状態になると、即座にエンジン運転による車載バッテリ１５の充電作業が行われるため、残容量不足状態に陥った時点から充電開始までの充電待機時間が長期化するのを避けることができる。このため、充電待機時間の長期化による充電残容量のさらなる低下を防止でき、バッテリ上がり状態に陥るのを防ぐことが出来る。

【００９２】

また、車両用電源管理装置１１では、車載バッテリ１５の充電残容量を増加させるためにエンジン始動処理により車両３のエンジンが始動された後、充電完了判断処理のＳ６４０にて、車載バッテリ１５の充電が完了したか否かを判断しており、Ｓ６４０により車載バッテリ１５の充電が完了したと判断されると、充電完了判断処理のＳ６６０がエンジンを停止させる処理を行う。つまり、車両用電源管理装置１１は、車載バッテリ１５の充電が完了した際に、車両利用者による操作を待つことなく、自動的にエンジンを停止させることが出来る。

【００９３】

このように構成された車両用電源管理装置１１によれば、車両利用者がエンジン停止する作業を省略できるため、停止作業の煩雑さを解消することができる。また、車載バッテリ１５が充電完了状態になると、即座にエンジンを停止することが出来るため、充電完了状態になった時点からエンジン停止までの停止待機時間が長期化するのを避けることが出来る。このため、停止待機時間の長期化による燃料消費量の増大を防止でき、燃費の低下を防ぐことが出来る。

【００９４】

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そして、Ｓ６６０での処理により車両３のエンジンが停止されると、Ｓ６７０が、車載バッテリ１５の充電完了を表す充電完了通知信号を、無線通信によって利用者側通信装置２０に対して出力する処理を行う。つまり、車両利用者は、充電完了通知信号を受信した利用者側通信機器を用いることで、バッテリ充電残容量が適正値まで増加したこと（換言すれば、充電完了状態になったこと）を知ることができる。

【００９５】

また、車両用電源管理装置１１は、マイクロフォン３７および周辺情報取得装置３９が車両周辺情報（少なくとも、車両周辺の音および車両周辺の映像を含む情報）を取得し、マイクロフォン３７および周辺情報取得装置３９により取得された車両周辺情報を、車両側通信装置４１が、無線通信により出力（送信）するよう構成されている。

【００９６】

これにより、車両利用者は、車両３から離れていても、無線通信を介して車両周辺情報を取得（受信）することで車両周辺の状況を知ることができ、車両周辺の状況に基づき、電源装置の充電残容量の低下原因を推測することができる。

さらに、車両用電源管理装置１１は、車両の走行経路を案内するカーナビゲーション機能（走行経路案内機能）を有しており、カーナビゲーション装置（走行経路案内装置）としても動作する。つまり、本実施例の車両用電源管理装置１１は、カーナビゲーション装置と共に車両３に搭載される構成であり、このように構成される車両用電源管理装置１１は、車載バッテリ１５の充電残容量の低下に伴う走行経路案内装置としての動作不良を防止でき、走行経路案内装置としての正常動作を維持することができる。

【００９７】

以上、本発明の実施例について説明したが、本発明は、上記実施例に限定されることはなく、種々の態様をとることができる。

例えば、エンジン始動処理は、車両利用者の操作を介することなく自動的にエンジンを始動するものに限ることはなく、車両利用者からエンジン始動指令を受けた場合に、車両のエンジンを始動するように構成しても良い。

【００９８】

そこで、上記実施例の車両用電源管理装置１１に対して、エンジン始動処理に代えて第２エンジン始動処理を実行するよう構成変更された第２車両用電源管理装置について説明する。なお、第２エンジン始動処理は、車両利用者からエンジン始動指令を受けた場合に車両のエンジンを始動するよう構成されており、第２エンジン始動処理の処理内容を表すフローチャートを、図４（ｂ）に示す。

【００９９】

第２エンジン始動処理が開始されると、まず、Ｓ４５０では、無線通信により、車載バッテリ１５が残容量不足状態であることを車両利用者に通知する処理と共に、エンジン始動を行うか否かを車両利用者に問い合わせる処理を行う。具体的には、無線通信により、車両側通信装置４１から外部ネットワーク送受信センタ１７を経由して利用者側通信装置２０に対して、車載バッテリ１５が残容量不足状態であることを表す警告通知信号と、エンジン始動を問い合わせるための始動問合せ信号を出力する処理を行う。

【０１００】

また、Ｓ４５０では、車両の駐車中には稼働状態となる必要のない電気機器（例えば、ヘッドランプなど）の中に、稼働中（動作中）の電気機器があるか否かを判断し、稼働中の電気機器が存在する場合には、その電気機器が稼働中であることを、無線通信を通じて車両利用者に通知する。具体的には、車両側通信装置４１が、稼働中の電気機器を表す稼働機器情報信号を出力し、外部ネットワーク送受信センタ１７を経由して利用者側通信装置２０に稼働機器情報信号を出力（送信）することで、車両利用者に対して、稼働中の電気機器が存在することを通知する。

【０１０１】

これにより、車両利用者は、車両３から離れていても、無線通信を介して稼働機器情報を取得（受信）することで車両３で稼働している電気機器をリアルタイムで知ることができ

る。この結果、車両利用者は、稼働する必要の無い電気機器が稼働しているか否かを確認することができ、車載バッテリ１５に蓄積されている電力が無駄に消費されているか否かを判断することが出来る。

【０１０２】

さらに、Ｓ４５０では、マイクロフォン３７および周辺情報取得装置３９により取得した車両周辺情報を、無線通信により車両利用者に送信する処理を行う。具体的には、車両側通信装置４１が、車両周辺情報信号を出力し、外部ネットワーク送受信センタ１７を経由して利用者側通信装置２０に車両周辺情報信号を出力（送信）することで、車両利用者に対して車両周辺情報を送信する。

【０１０３】

これにより、車両利用者は、車両３から離れていても、無線通信を介して車両周辺情報を取得（受信）することで車両３の周辺状況をリアルタイムで知ることができる。この結果、車両利用者は、車両周辺に人が存在しないことを確認できると共に、エンジン始動による危険性が無いことを確認することができる。

【０１０４】

続くＳ４６０では、車両利用者からエンジン始動指令が入力されたか否かを判断しており、肯定判定される（エンジン始動指令が入力される）とＳ４７０に移行し、否定判定される（エンジン始動指令が入力されない）と同ステップを繰り返し実行することで、エンジン始動指令が入力されるまで待機する。なお、車両利用者は、利用者側通信装置２０で受信した稼働機器情報信号や車両周辺情報信号の内容に基づいて、エンジン始動の必要性があると判断した場合には、車両に移動し、操作スイッチ群４３を用いて車両用電源管理装置に対してエンジン始動指令を入力することにより、エンジン始動を許可する。

【０１０５】

Ｓ４６０で肯定判定されてＳ４７０に移行すると、Ｓ４７０では、前述のＳ４１０と同様に、エンジンスタータ１３に対して始動指令信号を出力し、エンジンスタータ１３により車両３のエンジンを始動させる処理を行う。

次のＳ４８０では、エンジンが運転状態（ＯＮ状態）に移行したことを確認した後、無線通信を通じて、エンジンがＯＮ状態に移行したことを車両利用者に通知する処理を行う。なお、Ｓ４８０では、エンジン回転速度が所定の運転状態判断基準値（例えば２００［ｒＰｍ］）より大きい場合に、エンジンが運転状態に移行したと判断する。

【０１０６】

Ｓ４８０での処理が終了すると、第２エンジン始動処理が終了する。

つまり、第２エンジン始動処理は、車両のエンジンを始動するにあたり、車両周辺情報および稼働機器情報を車両利用者に対して無線通信により送信して、車両利用者にエンジン始動をするか否かの判断を促し、車両利用者からエンジン始動指令が入力されると、車両のエンジンを始動する処理を行う。

【０１０７】

よって、第２車両用電源管理装置によれば、車両利用者が、稼働機器情報や車両周辺情報に基づき、車両周囲に人が存在するなどの危険の有無を判断した上でエンジン始動が必要と判断した場合に、エンジン始動を行うことから、エンジン始動に伴う危険を確実に回避することが出来る。

【０１０８】

なお、第２エンジン始動処理においては、Ｓ４７０が、特許請求の範囲に記載のエンジン始動手段に相当し、Ｓ４５０が、稼働機器情報出力手段および周辺情報出力手段に相当する。また、第２車両用電源管理装置を用いる場合には、車両利用者はエンジン始動のために車両まで移動することから、エンジン始動が行われたことを直接確認できるため、無線通信によりエンジンがＯＮ状態に移行したことを通知する処理（Ｓ４８０での処理）を省略しても良い。

【０１０９】

また、車両のエンジンを始動するにあたり、車両利用者が車両まで移動してエンジン始動

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指令を入力するのではなく、無線通信によりエンジン始動指令信号を受信した場合に車両のエンジンを始動するよう車両用電源管理装置を構成しても良い。具体的には、エンジン始動処理として、第３エンジン始動処理を実行するのである。図４（ｃ）に、第３エンジン始動処理の処理内容を表すフローチャートを示す。

【０１１０】

なお、第３エンジン始動処理は、Ｓ５１０、Ｓ５２０、Ｓ５３０およびＳ５４０の各ステップを備えて構成されており、Ｓ５１０、Ｓ５３０およびＳ５４０での処理内容は、それぞれ第２エンジン始動処理におけるＳ４５０、Ｓ４７０およびＳ４８０での処理内容と同様である。そこで、処理内容が異なるＳ５２０について説明する。

【０１１１】

Ｓ５２０では、無線通信により車両利用者からエンジン始動指令信号を受信したか否かを判断しており、肯定判定される（エンジン始動指令信号を受信する）とＳ５３０に移行し、否定判定される（エンジン始動指令信号が受信されない）と同ステップを繰り返し実行することで、エンジン始動指令信号を受信するまで待機する。なお、車両利用者は、利用者側通信装置２０で受信した稼働機器情報信号や車両周辺情報信号の内容に基づいて、エンジン始動の必要性があると判断した場合には、利用者側通信装置２０を用いて、エンジン始動指令信号を車両用電源管理装置に対して送信（出力）することにより、エンジン始動を許可する。

【０１１２】

つまり、第３エンジン始動処理は、車両のエンジンを始動するにあたり、車両周辺情報および稼働機器情報を車両利用者に送信して、車両利用者にエンジン始動をするか否かの判断を促し、無線通信により利用者側通信装置２０からエンジン始動指令を受けると、車両のエンジンを始動する処理を行う。

【０１１３】

よって、第２エンジン始動処理に代えて第３エンジン始動処理を実行する第３車両用電源管理装置によれば、車両利用者は、車両から離れた場所にいる場合であっても、無線通信により、第３車両用電源管理装置に対してエンジン始動指令を送信することで、車両のエンジンを始動することができる。つまり、車両利用者は、車両まで移動する労力を費やすことなくエンジンを始動でき、車載バッテリ１５の充電残容量を増加させることができるため、バッテリ上がりを防止するための作業の煩雑さを解消できる。

【０１１４】

なお、第３エンジン始動処理では、Ｓ５３０が、特許請求の範囲に記載のエンジン始動手段に相当し、Ｓ５１０が、稼働機器情報出力手段および周辺情報出力手段に相当する。また、第３エンジン始動処理のＳ５２０では、利用者側通信装置２０ではなくスタータ用リモコン１９から送信されるエンジン始動指令信号を受信した場合に、肯定判定するように処理を実行しても良い。

【０１１５】

次に、上記実施例の車両用電源管理装置は、車両の走行経路を案内する装置（車両用経路案内装置、カーナビゲーション装置）と一体に構成された車両用電源管理装置であるが、カーナビゲーション装置と分割された状態で同一の車両に搭載される車両用電源管理装置として構成しても良い。

【０１１６】

さらに、車両側通信装置４１は、電源管理機能を実現するための専用の通信装置に限られることはなく、例えば、自動車電話で構成しても良い。また、車両側通信装置４１は、車両に固定設置された装置に限られることはなく、携帯電話などの移動体通信装置で構成しても良い。この場合、車両用電源管理装置は、移動体通信装置との間で情報伝達経路を形成するための伝達経路接続手段（接続コネクタ）を備える必要がある。

【０１１７】

また、上記実施例に記載された各数値は、上記数値に限定されることはなく、例えば、上記各制御処理の実行周期は、車両の用途や使用環境などに応じて適切な値に設定すると良

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い。つまり、電源マネジメント処理の実行周期は、３０分周期に限らず、１時間周期あるいはその他の周期に設定しても良い。

【０１１８】

次に、上記の車両用電源管理装置は、Ｓ４２０での処理により、警告通知信号とエンジンＯＮ通知信号（エンジン始動通知信号）とを、外部ネットワーク送受信センタ１７に向けて出力する構成であるが、信号の出力先がスタータ用リモコン１９となるように構成してもよい。つまり、リモコンセンサ３１からスタータ用リモコン１９に対して、警告通知信号とエンジンＯＮ通知信号とを出力することにより、車両利用者に対して、車載バッテリの残容量不足状態およびエンジンのＯＮ状態移行を通知しても良い。この場合、スタータ用リモコン１９が、特許請求の範囲に記載の利用者側通信装置に相当する。

【０１１９】

さらに、Ｓ６８０で用いる充電完了基準値は、予め定められた固定値に限ることはなく、Ｓ２３０での適正容量下限値の設定処理のように、環境情報や駐車時電力消費量などに基づいて補正・更新しても良い。

また、車両利用者が車両まで移動してエンジンを始動させる場合には、操作スイッチ群４３を用いるのではなく、イグニッションキーによる通常のエンジン始動によりバッテリの充電残容量を増加させても良い。

【０１２０】

さらに、周辺情報取得装置３９は、要求される検出精度を満足する場合には、外部カメラまたは全方位センサのいずれか一方を備えて構成しても良く、あるいは、外部カメラおよび全方位センサに加えて更に他のセンサなどを備えて構成してもよい。

【０１２１】

また、上記実施例では、４個の検出部を有する位置検出器５１を用いるが、必要な精度を確保できる場合には、３個以下の検出部を有する位置検出器を用いても良く、あるいは、より高い精度が求められる場合には、５個以上の検出部を有する位置検出器を用いてもよい。上記以外の検出部としては、例えば、ステアリングの回転センサや、各転動輪の車輪センサなどが挙げられる。

【０１２２】

なお、上記実施例では、エンジンを自動的に停止する手段（充電完了判断処理のＳ６６０）を備える車両用電源管理装置について説明したが、エンジンを自動的に停止する手段を備えていない車両用電源管理装置においては、充電完了通知信号を出力するように構成することで、車両から離れた場所に居る車両利用者に対して、充電完了時期を知らせることができる。これにより、充電完了後もエンジンの運転が継続されて無駄に燃料が消費されるのを抑制することができる。

【図面の簡単な説明】

【図１】実施例の車両用電源管理装置を有する車両を備えて構成される電源管理システムの概略構成図である。

【図２】車両用電源管理装置の構成図である。

【図３】電源マネジメント処理の処理内容を表すフローチャートである。

【図４】（ａ）は、エンジン始動処理の処理内容を表すフローチャートであり、（ｂ）は、第２エンジン始動処理の処理内容を表すフローチャートであり、（ｃ）は、第３エンジン始動処理の処理内容を表すフローチャートである。

【図５】充電完了判断処理の処理内容を表すフローチャートである。

【符号の説明】

１　電源管理システム、３　車両、１１　車両用電源管理装置、１３　エンジンスタータ、１５　車載バッテリ（車載電源装置）、１７　外部ネットワーク送受信センタ、１９　スタータ用リモコン、２０　利用者側通信装置、２１　制御回路、２３　電源状態検出器、３１　リモコンセンサ、３７　マイクロフォン、３９　周辺情報取得装置、４１　車両側通信装置、４３　操作スイッチ群。

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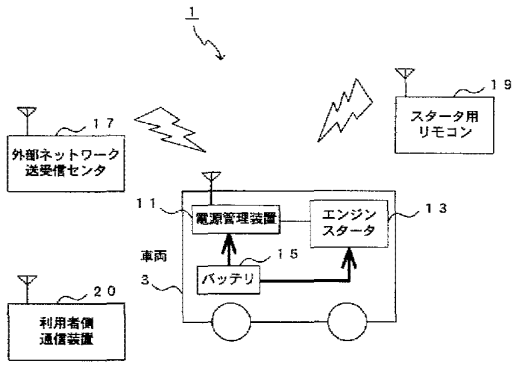
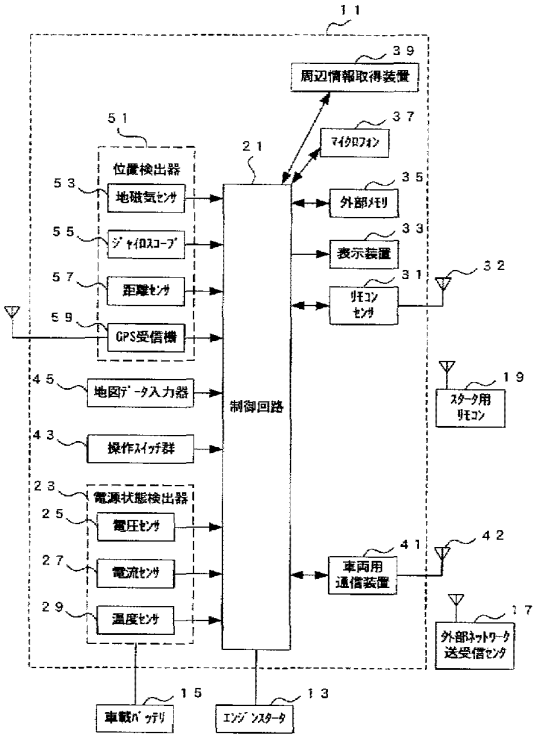
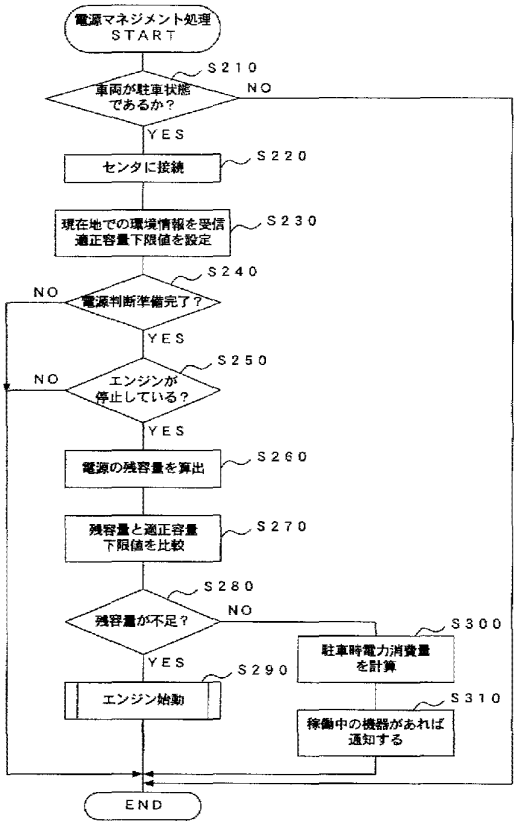
【図１】


1
19
スタータ用
リモコン
17
外部ネットワーク
送受信センタ
11
電源管理装置
エンジン
スタータ
13
車両
3
15
バッテリ
20
利用者側
通信装置

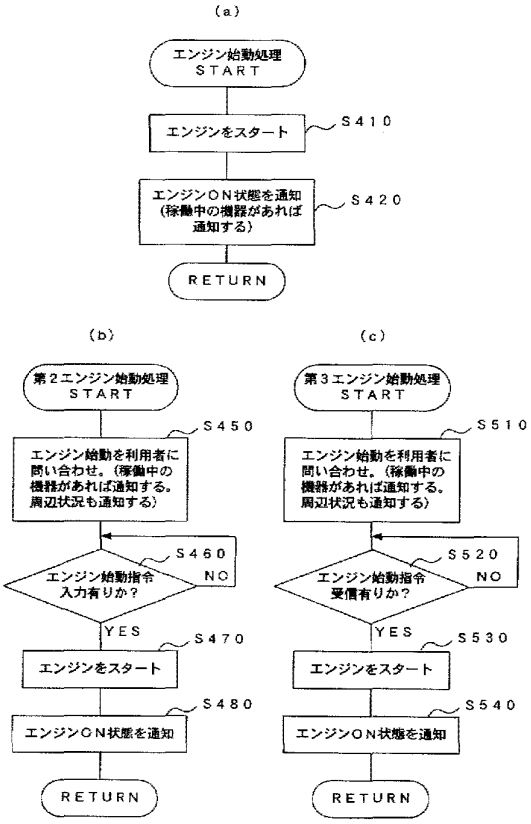
【図２】


11
39
周辺情報取得装置
51
37
マイクロフォン
位置検出器
21
53
地磁気センサ
35
外部メモリ
55
ジャイロスコープ
33
表示装置
57
距離センサ
31
32
リモコン
センサ
59
GPS受信機
19
スタータ用
リモコン
45
地図データ入力器
制御回路
43
操作スイッチ群
23
電源状態検出器
25
電圧センサ
41
42
27
電流センサ
車両用
通信装置
29
温度センサ
17
外部ネットワーク
送受信センタ
15
車載バッテリ
13
エンジンスタータ

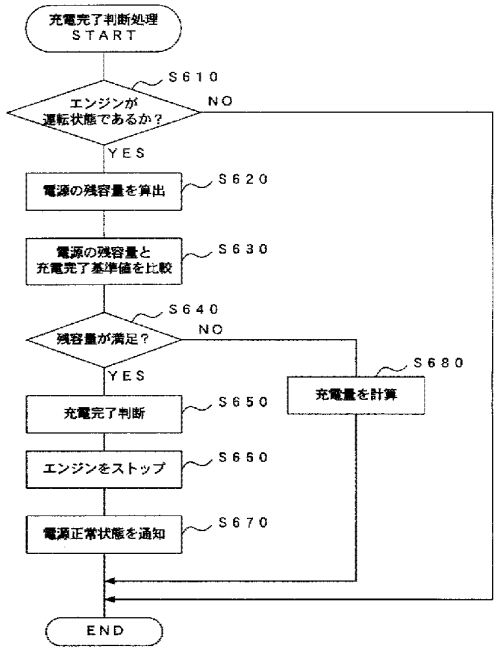
【図３】


電源マネジメント処理
START
S210
車両が駐車状態
であるか？
NO
YES
センタに接続
S220
現在地での環境情報を受信
適正容量下限値を設定
S230
S240
NO
電源判断準備完了？
YES
S250
NO
エンジンが
停止している？
YES
電源の残容量を算出
S260
残容量と適正容量
下限値を比較
S270
S280
残容量が不足？
NO
YES
S290
エンジン始動
S300
駐車時電力消費量
を計算
S310
稼働中の機器があれば
通知する
END

【図４】


(a)
エンジン始動処理
START
エンジンをスタート
S410
エンジンON状態を通知
(稼働中の機器があれば
通知する)
S420
RETURN
(b)
第２エンジン始動処理
START
S450
エンジン始動を利用者に
問い合わせ。(稼働中の
機器があれば通知する。
周辺状況も通知する)
S460
エンジン始動指令
入力有りか？
NO
YES
S470
エンジンをスタート
S480
エンジンON状態を通知
RETURN
(c)
第３エンジン始動処理
START
S510
エンジン始動を利用者に
問い合わせ。(稼働中の
機器があれば通知する。
周辺状況も通知する)
S520
エンジン始動指令
受信有りか？
NO
YES
S530
エンジンをスタート
S540
エンジンON状態を通知
RETURN

【図５】


充電完了判断処理
START
S610
エンジンが
運転状態であるか？
NO
YES
電源の残容量を算出
S620
電源の残容量と
充電完了基準値を比較
S630
S640
残容量が満足？
NO
YES
S680
充電量を計算
充電完了判断
S650
エンジンをストップ
S650
電源正常状態を通知
S670
END

フロントページの続き

(51)Int.Cl.[7]	F I	テーマコード（参考）
	H02J 7/00	M

(72)発明者 坂下 尚広
愛知県刈谷市昭和町１丁目１番地 株式会社デンソー内

Fターム(参考) 2G016 CA03 CB12 CB13 CC01 CC04 CC06 CC07 CC13 CC27 CC28
CE00 CF06
5G003 BA01 EA05
5H030 AA04 AS08 FF41 FF44

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Tesla EX1002 Page 254

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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
17/949,911	09/21/2022	2859	830	013350-9003-US57	20	2

CONFIRMATION NO. 6463

CORRECTED FILING RECEIPT

23409
MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

Date Mailed: 10/19/2022

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.

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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

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 16/249,028 01/16/2019 PAT 11,489,207
which is a CON of 16/056,041 08/06/2018 ABN
which is a CON of 12/737,803 02/17/2011 PAT 10,090,567
which is a 371 of PCT/US2009/054174 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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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: 10/04/2022
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/949,911**
Projected Publication Date: 01/12/2023
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE 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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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.

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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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Title 37, Code of Federal Regulations, 5.11 & 5.15

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PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Not Yet Assigned
Attorney Docket Number	013350-9003-US57

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	5646500		1997-07-08	Wilson	

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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	20060028178		2006-02-09	Hobbs	
	2	20070145830		2007-06-28	Lee, et al.	
	3	20080122402		2008-05-29	Hoffman, et al.	
	4	20090079386		2009-03-26	Gallagher et al.	
	5	20090229900		2009-09-17	Hafner, et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	013350-9003-US57

	6	20090315512		2009-12-24	Ichikawa, 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	2416852	GB	A	2006-02-08	Edwards		

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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		

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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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	013350-9003-US57

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)	2023-01-17
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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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.

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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.

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.

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Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**01/17/2023 05:39:25 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Eliana Carter
PATENT CENTER #	61448780	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57_IDS_as_filed_1-17-23.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	1010 KB
000GB2416852_FOR.pdf	28	Foreign Reference	1294 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57_IDS_as_filed_1-17-	9523F959E8B5719F558929722A5EB83C1EC553090EB7B1D7D DB78BB04CA31389F4653AD03AC0C82700F1CAF95F5376F26C

23.pdf	7DADBE6E5ED00073963797 4B9C0DED
000GB2416852_FOR.pdf	6CB75EBA4076121070FA6095A6970FF2B18504886DF62C5663 E68955168BAA82F92AABB1481F5399FC652CB6064E1DC72CE A364D2D879B0EEBF482C75AB33270

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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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(51) INT CL:
G01R 22/00 (2006.01)

(52) UK CL (Edition X):
G1U UR2200

(56) Documents Cited:
GB 2264566 A
GB 2100036 A
US 5589764 A
GB 2203252 A
WO 1982/003482 A1
US 4120031 A

(58) Field of Search:
UK CL (Edition X) G1U
INT CL[7] G01R
Other: Online: EPODOC, WPI

(54) Abstract Title: **Power consumption cost monitoring device**

(57) A power consumption monitoring device 10 is provided for monitoring the cost of power consumption of an electrical appliance 45 such as a washing machine or tumble dryer. The device comprises measuring means for measuring power consumption, calculation means (65) for calculation the cost of the power as it is consumed and displaying means 25 for displaying the accumulating power cost. The device can also receive a signal which determines the power cost value or the power unit cost can be entered by a user. The device can be integral with the power source, integral with the appliance or form a plug in device. The device can cut off the power at a predetermined cost threshold or can sound an alarm at a predetermined value. The device can also retain historical data.

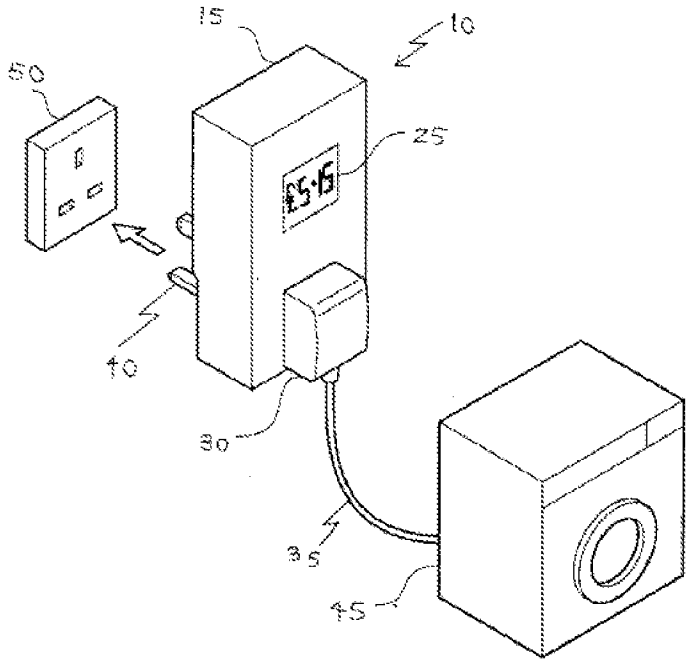

Figure 3

GB 2 416 852 A

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.
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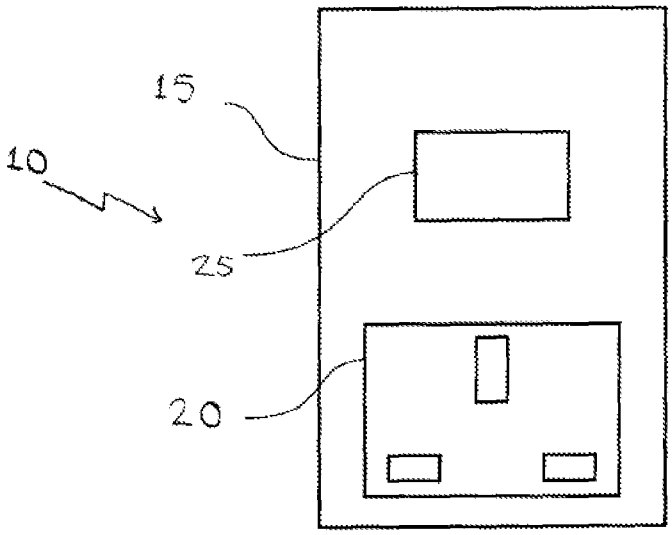

Figure 1

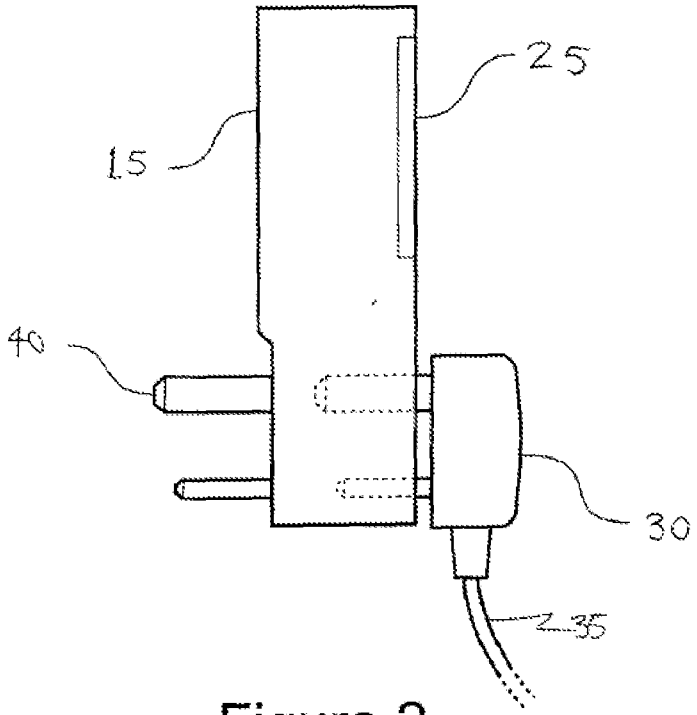

Figure 2

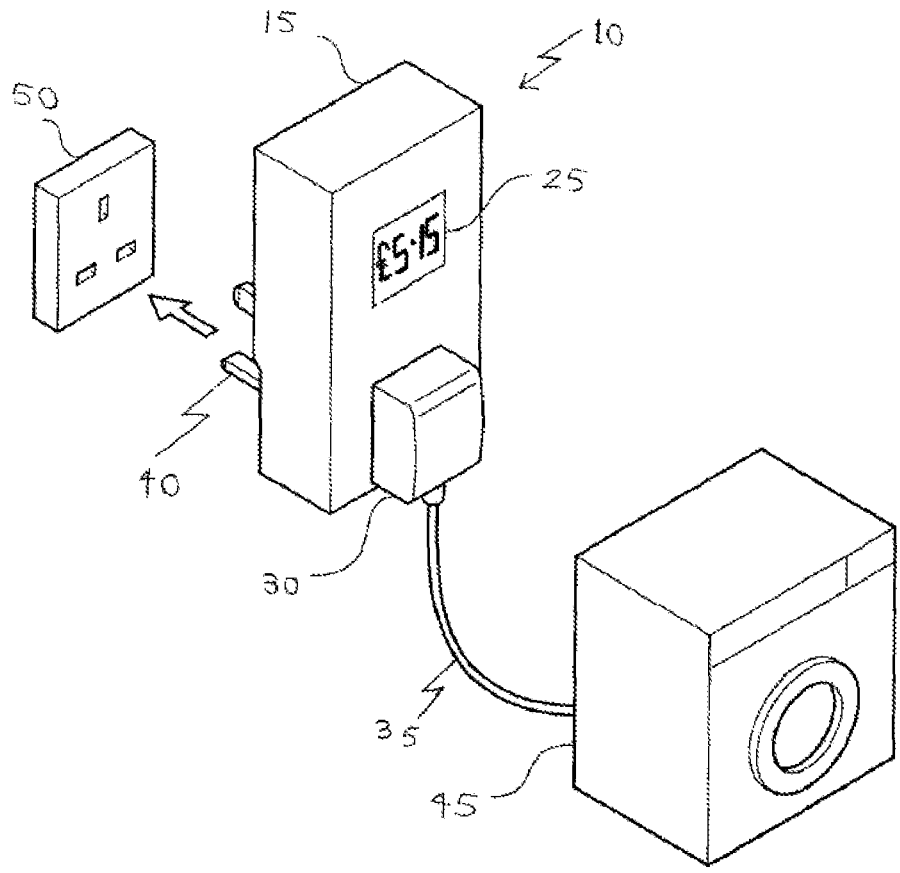

Figure 3

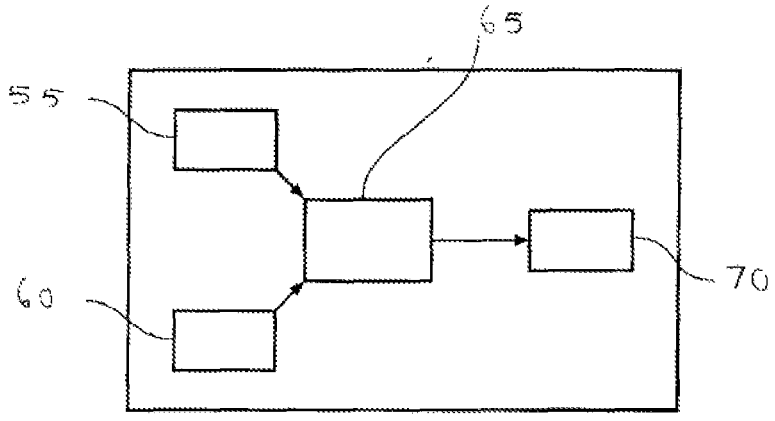

Figure 4

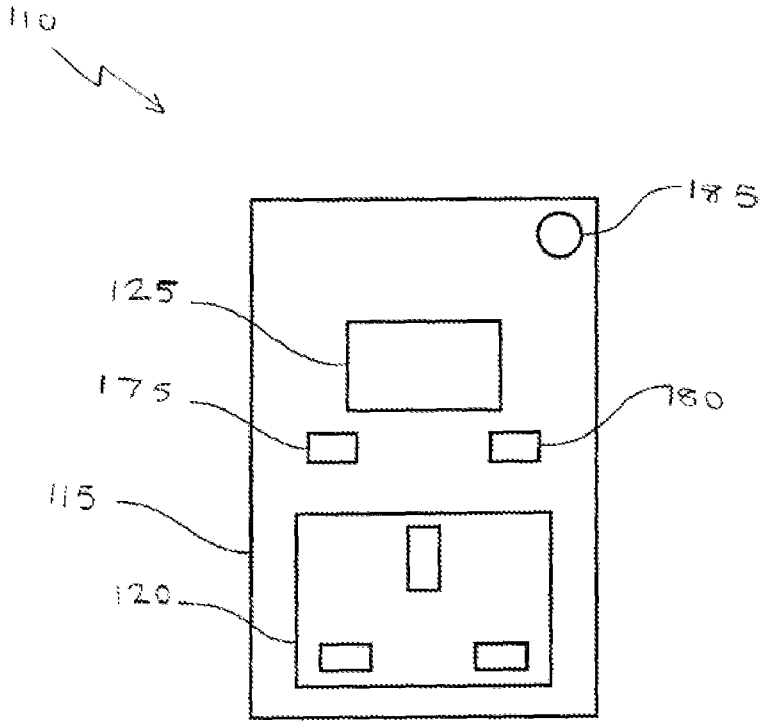

Figure 5

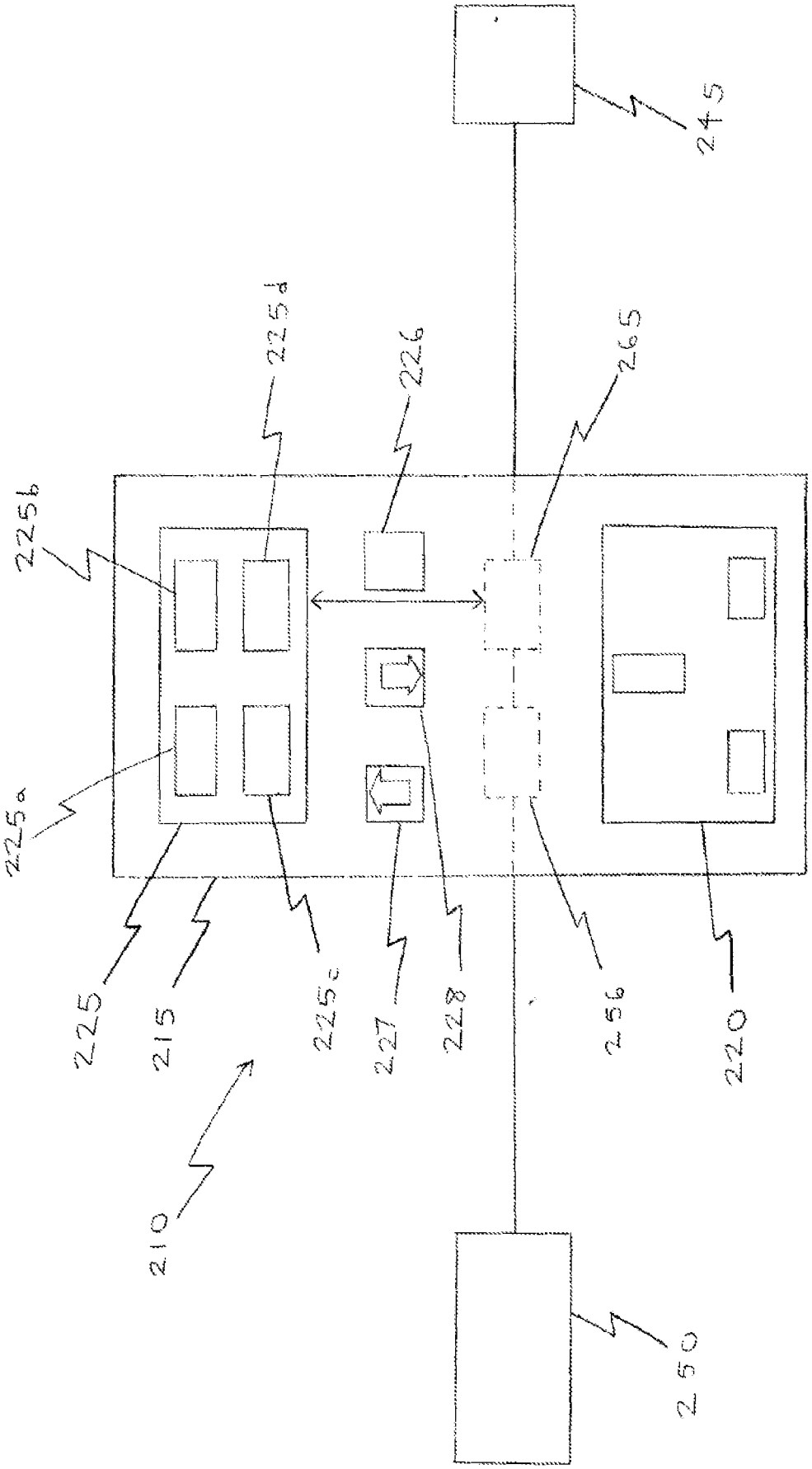

Figure 6

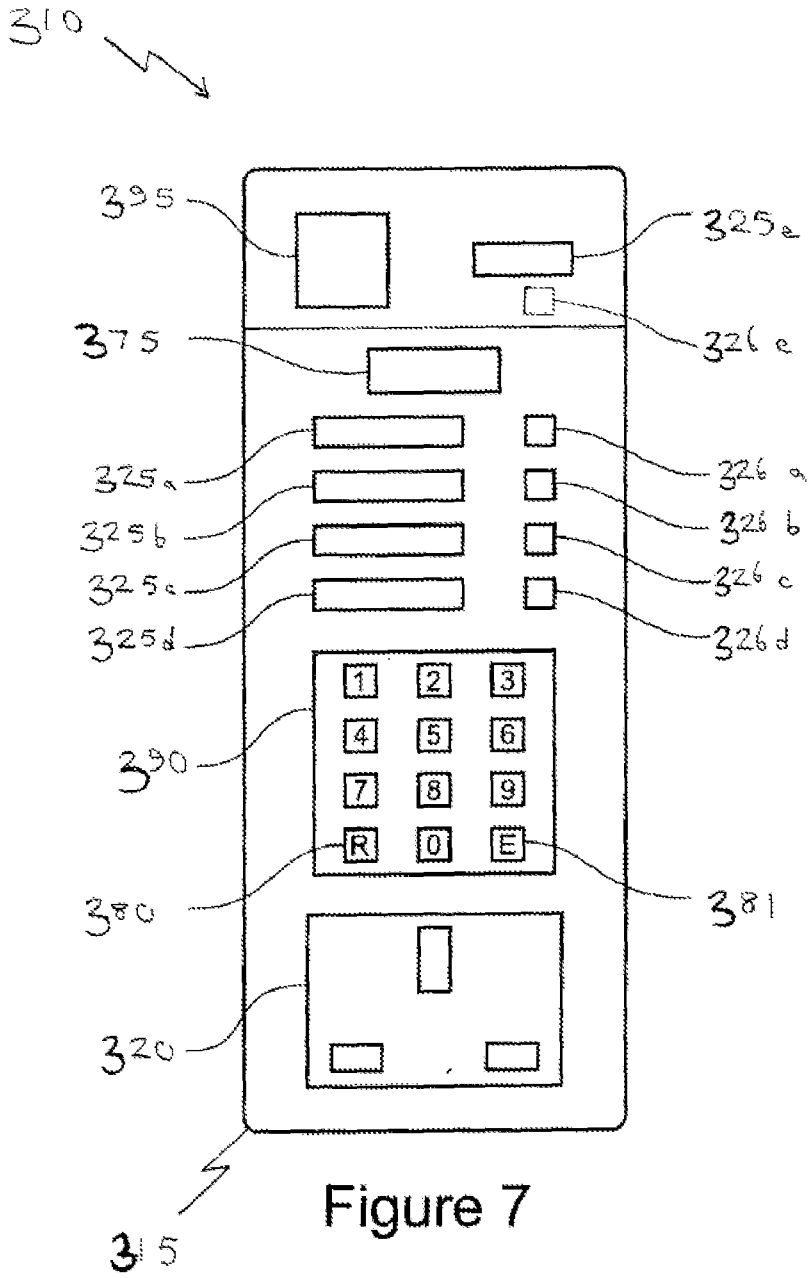
310
395
325e
375
326e
325a
325b
325c
325d
326a
326b
326c
326d
1
2
3
4
5
6
7
8
9
R
0
E
390
380
381
320
315

Figure 7

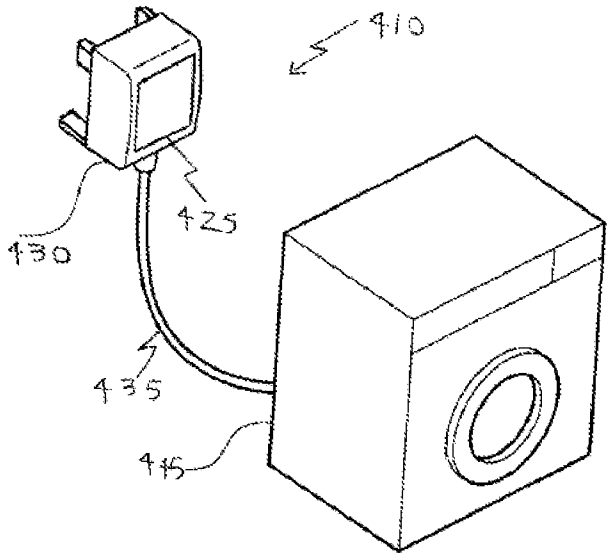

Figure 8

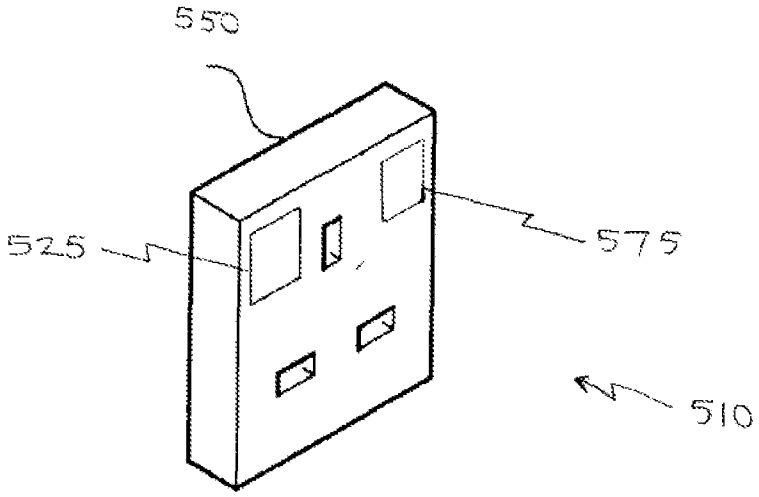

Figure 9

A POWER CONSUMPTION MONITORING DEVICE

The present invention relates generally to a monitoring device and particularly to a monitoring device for monitoring the power consumption of an electrical appliance.

The use of electrical appliances has expanded enormously in recent times. At the same time public awareness of the importance of energy conservation has also increased. In most cases electrical appliances are used without knowledge of the rate of power consumption. Knowledge of power consumption, particularly of electrical appliances which consume at a high rate, could lead to moderation of appliances and especially those which are simply used for convenience. For example, tumble dryers in general consume relatively high levels of power and may be used regardless of whether it would be possible to dry clothes outdoors.

In most cases the overall electrical consumption of a domestic or industrial premises will be monitored by an electricity meter at the main point of entry. This can give an indication of power consumption trends for the entire premises over time. However, individual electrical appliances are not monitored in any way.

Documents US 5, 811, 966 and US 5, 869, 960 describe devices which measure the amount of electricity consumed by an individual appliance. However, these documents only describe devices which indicate the level of power consumption without in any way giving an indication of the costs involved in that consumption.

The present invention seeks to address the problems with known electricity consumption monitoring facilities.

Accordingly the present invention provides a power consumption monitoring device for an electrical appliance, the device comprising: means for measuring power consumption; means for calculating the cost of the power as it is consumed; and means for displaying the accumulating cost as power is consumed.

The present invention therefore measures power consumption of an appliance and then calculates the cost of the power consumed and displays the monetary cost of the power consumption on a continuous basis. Therefore the information presented to an individual is in a format in which they can immediately appreciate the financial consequence of the use of that appliance, which might result in moderation of use.

The device may be connectable between an electrical power source and the electrical appliance to be monitored. Accordingly the present invention may provide a plug-in device which is connectable in-line between a commercial power supply and an electrical appliance.

The device may be formed separately from both the power source and the appliance so as to be connectable between any power source and appliance as required. For example, the device may be adapted to plug into an electric wall

socket and to receive the plug of an electrical appliance. In this way the device is not restricted to a particular appliance or power source location.

The device may include means for connection to a power supply, such as a male plug to allow connection into a power supply socket. In addition the device may include means for allowing an appliance to be connected thereto, such as a female plug socket to allow an appliance plug to be connected thereto.

The form of the connection means, such as male and female plug connectors will be dependent on the specification of the power system within which the device is intended to operate.

The plug connections provided by the device may be adapted to suit UK, continental European or US supply systems and accordingly will have the required pin and socket configurations and fuse ratings.

As an alternative to forming the device as a separate unit which can be selectively introduced between a power source and an appliance, the device may be integrally formed as part of the power source (such as a plug socket) or as part of the appliance. For example, the device may form part of a plug for the appliance.

In other embodiments the device may be configured so that an appliance can be connected by connecting the appliance wire directly into the device without using a plug. The device can then effectively form the plug for the appliance.

The means for measuring power consumption may comprise a watt meter, ammeter, voltmeter or the like.

In order to determine the actual power consumption of an electrical appliance it is necessary to determine the voltage, the current and the phase angle between the voltage and current. The means for measuring power consumption may comprise a current sensor for sensing the phase angle and magnitude of the current supplied to the appliance, and a voltage sensor for sensing the phase angle and magnitude of the voltage supplied to the appliance.

A circuit may therefore be provided for measuring power consumption comprising sensing means for sensing the voltage applied and the current flowing as it passes through the device to the appliance.

The power sensor may be a conventional kilowatt hours meter of the type having a rotating disk. The speed of rotation of the disk is proportional to power consumption. An optical reading device can be provided to detect the speed of rotation and translate this into a power consumption signal.

Whatever its form, the power measuring means provide a value for power consumption, for example in kilowatt hours. The increasing power consumption value can then be used by the calculating means to calculate the cost of the power on an on-going basis as the power is consumed. The cost can be calculated by a processor which is provided with: i) the power unit consumption value; and ii) a

multiplication factor which represents the cost of power per unit consumed. The accumulating cost of the power consumed over time is then displayed by the device to give an indication of the monetary consequence of the use over time.

A digital data processing means may be provided which is operative to compute power consumption from the values of voltage and current, and to compute a monetary value for the power consumed based on the cost of power per unit.

The multiplication factor used to calculate the cost of the power as it is consumed will probably be determined by the company supplying the power. Information relating to the cost per unit could be obtained by the individual from their electricity company and this value inputted to the device. The cost per unit of power consumed could be entered directly into the processor of the device. Alternatively, the cost information could be supplied to the device remotely. For example, it is known to supply information along power lines and this signal could be decoded by the device so that the power-providing company could ensure that the device is using the correct multiplication factor at all times.

It is possible that the cost of power will vary depending on the time of day and therefore the device maybe provided with an internal clock which would trigger the use of different power cost values depending on the time of usage.

The device may further comprise a programmable memory for storing data such as the cost per unit of power consumed.

The power for the device itself may in fact be provided by electrical power source, or the device may include an internal power source, such as a battery or solar cell.

The device may include a reset function so that the cost displayed can be returned to zero for the start of a session of use. Alternatively or additionally the device may include the facility to retain historical cost details to provide the costs over a period of a day, week, month, year or other useful period.

In addition to displaying the accumulating cost as power is consumed, the device may also display other information such as: the value for the units of power which have been consumed; the current unit cost; a timer to indicate the length of time over which a displayed cost has been accumulated; and a clock to display the current time. The different pieces of information may be shown on a single display or in discrete display elements. Conveniently the or each display may comprise an LCD panel.

The device may include an alarm function which could be set to sound when the accumulated cost approaches or reaches a predetermined level, which could be set by the user to avoid exceeding a cost threshold. This could offer the user help with budgeting so that excessive costs are not accumulated. The device may include an automatic cut-off function which turns off the supply of power when the cost threshold has been exceeded.

The device may also allow an optional monetary loading value to be applied to the cost indicated. This could allow a user to factor in the cost of other things involved in use of an appliance. For example, the user may wish to include a cost for detergent and softener involved in the use of a washing machine.

The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic front view of a monitoring device according to a first embodiment of the present invention;

Figure 2 is a diagrammatic side view of the device of Figure 1 shown with the plug of an associated electric device connected;

Figure 3 is a diagrammatic perspective view of the device of Figure 2 shown with an associated appliance connected and an associated electric wall socket;

Figure 4 is a flow diagram illustrating the data input and processing involved in calculating the accumulating costs of power consumption;

Figure 5 is a front view of a device according to an alternative embodiment;

Figure 6 is a diagrammatic front view of a device according to a further alternative embodiment;

Figure 7 is a front view of a device according to a still further embodiment;

Figure 8 is a diagrammatic perspective view of an appliance fitted with a plug incorporating a device according to a further embodiment of the present invention; and

Figure 9 shows a wall socket incorporating a device according to a further embodiment of the present invention.

Referring first to Figures 1 and 2 there is shown a monitoring device generally indicated 10. The device 10 comprises a body or casing 15 housing a plug socket 20 for receiving the plug 30 of an appliance.

The plug 30 is shown inserted into the socket section 20 to connect the appliance power line 35 to the device 10. Figure 2 shows that the rear face of the device 10 includes its own male plug section 40 to allow the device 10 to be plugged into a wall socket. The rear face may conveniently include instructions (not shown) for operation of the device.

Referring now also to Figure 3 the device 10 is shown with the appliance plug 30 connected and leading via power supply line 35 to an appliance, in this case a tumble dryer 45. The plug section 40 on the device 10 allows it to be connected to a wall socket 50 and in doing so allows electricity to flow to the appliance 45 through the device 10. As the electricity flows to the appliance 45 the power consumption is measured and the accumulating cost for that power consumption is calculated by a processor in the device. The result of the cost calculation is displayed by a rectangular LCD panel 25.

Referring now to Figure 4 there is shown a flow diagram illustrating the flow of information within the device to result in the generation of the accumulating cost for the power consumed by the appliance. As electricity is drawn from the socket by the appliance the accumulating amount of power consumed over time is measured in kilowatt hours by a watt meter and a consumption value 55 is provided. In order to calculate the monetary cost of the consumption value 55, a multiplication factor 60 is provided which corresponds to the cost of electricity per kilowatt hour. The product of the consumption value 55 and the multiplication factor 60 is calculated by a processor 65 and an accumulating cost figure 70 is output by the processor 65 and can be displayed by the display panel on the device.

In the simple embodiment shown in Figures 1 to 3 the power to the device is provided by the electricity from the socket 50 directly. Accordingly the device 10 is only active when it is plugged in to the socket 50. In addition the multiplication factor 60 is supplied to the processor 65 via the socket 50, as the information is carried by a signal sent together with the electricity through the socket 50 and into the device 10. The signal is interpreted by the processor 65 to determine the multiplication factor 60.

Referring now to Figure 5 there is shown an alternative embodiment in which a device 110 is of the same general construction as the device 10 shown in Figures 1 to 3. In this embodiment the device 110 is provided with a start/stop button 175 which allows the user to determine when the device should start measuring and displaying the accumulating cost. In addition the device 110 is provided with a

reset button 180 which can be used to reset the accumulating cost value in the display panel 125. The device is further provided with an indicator light 185 which is activated when the device is in use.

Referring now to Figure 6 there is shown a device 210 according to an alternative embodiment. The device 210 functions in the same basic way as the device shown in Figures 1 to 3 in that power is transmitted from a commercial power source 250 to an appliance 245 through the device 210.

As electricity passes into the device 210 it passes through a current meter/voltmeter 256 which measures the current and voltage of the electricity and provides this data to a processor 265 which calculates a power value. The processor 265 uses the power value to calculate the ongoing cost of power consumption by applying a multiplication factor based on a cost per unit of power value entered by a user as described in more detail below.

The device 210 includes a display screen 225 comprising four discrete display areas 225a, 225b, 225c, 225d. Area 225a serves as a clock to display current time; area 225b displays a value for the cost of power per unit; area 225c displays the accumulating cost of power consumed; and area 225d displays accumulating power consumption in terms of actual power units.

The values for time in display area 225a and power unit cost in area 225b can be entered and amended by a user using increasing button 227 and decreasing button 228. Select button 226 is used to change the display area affected by the buttons 227, 228.

The value entered by a user in the power cost unit display area 225b is communicated to the processor 265 to use as the multiplication factor in calculating the accumulating cost of power consumption. The processor 265 subsequently outputs a value for the accumulating cost to display area 225c and a value for accumulating power consumption to area 225d.

The device 210 also includes a battery back-up (not shown) so that values inputted can be retained by a programmable memory after the device 210 has been disconnected from the power supply 250.

Referring now to Figure 7 a device 310 according to an alternative embodiment is shown. The basic function of the device 310 is the same as the device 10 shown in Figures 1 to 3 in that the device 310 includes a socket 320 for receiving the plug of an appliance and the device 310 can be plugged into a wall socket so that electricity runs through it on its way to an appliance.

In this embodiment the display function of the device 310 is split into five discrete displays as follows: 325a is a display for the current time; 325b is a display to indicate the price per unit of electricity which is currently stored and in use by the

device; 325c is a display for the time that the current session of appliance usage has continued for; 325d displays the accumulated cost to date in the current session; and 325e displays a preset cost which can be entered by the user and is described in more detail below.

The device 310 is provided with a keypad 390 which allows values for the current time, price per unit and preset cost to be determined for display element 325a, 325b and 325e. In addition the keypad includes a reset button 380 to allow resetting of the values in any of the display elements 325a to 325e. The keypad 390 also includes an enter button 381 so that once a value has been entered into a display element it can be finalised and stored.

In order to select a display element 325a to 325e the device 310 is provided with corresponding select buttons 326a to 326e so that a value can be entered, adjusted or reset as appropriate.

Once the user is satisfied that the values required have been entered correctly the start/stop button 375 can be used to commence monitoring.

The preset cost display element 325e allows the user to enter a cost value which they do not want to exceed. When the cost value in the display element 325d reaches or approaches the preset cost value in the display element 325e an alarm 395 is triggered to alert the attention of the user. In this embodiment the alarm 395 comprises a buzzer, but other suitable alarm signals could be generated such as a

light or vibration signal; the alarm signal could even be sent remotely, for example to a mobile phone, to alert the attention of the user. In this embodiment the alarm signal has no further consequences, but in other embodiments once the preset cost has been exceeded the device 310 can be programmed to prevent further supply to the appliance.

Referring now to Figure 8 there is shown an alternative embodiment in which a monitoring device 410 is incorporated into the plug 430 of an appliance 445. Accordingly the plug 430 is provided with a display element 425 for displaying accumulated costs. The means for determining power usage and for calculating the cost of that power usage are incorporated into the plug 430.

Referring now to Figure 9 there is shown a still further embodiment in which the monitoring device 510 is provided as an integral part of an electric plug socket 550 such as an electric wall-mounted socket. The device 510 is provided with a display element 525 for displaying ongoing costs and a start/stop button 575 for determining if power flowing through the socket 550 should be monitored. The means for determining power usage and for calculating the cost of that power usage are incorporated into the socket 550.

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CLAIMS

1. A power consumption monitoring device for an electrical appliance, the device comprising: means for measuring power consumption; means for calculating the cost of the power as it is consumed; and means for displaying the accumulating cost as power is consumed.

2. A device as claimed in Claim 1, in which the device continuously measures power consumption of an appliance, continuously calculates the cost of the power consumed and displays the monetary cost of the power consumption on a continuous basis.

3. A device as claimed in Claim 1 or Claim 2, in which the calculation means is operative to calculate the cost of power consumed based on a power consumption value and a power cost value.

4. A device as claimed in Claim 3, in which the device comprises means for determining one or more power cost values.

5. A device as claimed in Claim 3 or Claim 4, in which the device comprises means for allowing a user to input the or each power cost value.

6. A device as claimed in Claim 3 or Claim 4, in which the device comprises means for receiving a signal which determines the or each power cost value.

7. A device as claimed in any of Claims 3 to 6, in which the device comprises means for amending the or each power cost value.

8. A device as claimed in any preceding Claim, in which the device is connectable between an electrical power source and an electrical appliance to be monitored.

9. A device as claimed in any preceding Claim, in which the device is integrally formed as part of a power source.

10. A device as claimed in any of Claims 1 to 8, in which the device is formed as part of an appliance.

11. A device as claimed in any of Claims 1 to 8, in which the device forms part of a plug for an appliance.

12. A device as claimed in any preceding Claim, in which the means for measuring power consumption comprise a current sensor for sensing the phase angle and magnitude of the current supplied to the appliance, and a voltage sensor for sensing the phase angle and magnitude of the voltage supplied to the appliance.

13. A device as claimed in any preceding Claim, in which the device has a digital data processing means which is operative to compute power consumption from values of voltage and current, and to compute a monetary value for power consumed based on the cost of power per unit.

14. A device as claimed in any preceding Claim, in which the device is provided with an internal clock for triggering the use of different power cost values depending on the time of usage.

15. A device as claimed in any preceding Claim, in which the device further comprises a programmable memory for storing data.

16. A device as claimed in any preceding Claim, in which the power for the device is provided by an electrical power source also used to power the appliance.

17. A device as claimed in any preceding Claim, in which the device includes an internal power source.

18. A device as claimed in any preceding Claim, in which the device includes a reset function.

19. A device as claimed in any preceding Claim, in which the device includes means for retaining historical cost details.

20. A device as claimed in any preceding Claim, in which the device comprises display means for displaying the value for units of power which have been consumed.

21. A device as claimed in any preceding Claim, in which the device comprises display means for displaying the length of time over which a displayed cost has been accumulated.

22. A device as claimed in any preceding Claim, in which the device comprises display means for displaying the current time.

23. A device as claimed in any preceding Claim, in which the device comprises display means for displaying the current power cost value being used to calculate the accumulating power cost.

24. A device as claimed in any preceding Claim, in which the display means comprise a single display.

25. A device as claimed in any preceding Claim, in which the display means comprises discrete display elements.

26. A device as claimed in Claim 24 or Claim 25, in which the or each display comprises an LCD panel.

27. A device as claimed in any preceding Claim, in which the device comprises means for determining a predetermined power cost threshold.

28. A device as claimed in Claim 27, in which the device includes an alarm function which operable to sound when the accumulated cost approaches or reaches the predetermined power cost threshold.

29. A device as claimed in Claim 27 or Claim 28, in which the device includes an automatic cut-off function which turns off the supply of power to the appliance when the predetermined cost threshold has been exceeded.

30. A device as claimed in any preceding Claim, in which the device includes means for incorporating a monetary loading value to the accumulating cost indicated.

31. A device as claimed in any preceding Claim, in which the calculation means comprise a multiplier.

32. A device as claimed in any preceding Claim, in which the device comprises an indicator which is activated when the device is in use.

33. A device as claimed in any preceding Claim, in which the device include a start/stop function for determining when the accumulating power cost should be determined.

34. A device substantive as hereinbefore described with reference to, and as shown in, the accompanying drawings.

5

Application No: GB0417642.6 **Examiner:** Ralph Cannon

Claims searched: All **Date of search:** 31 August 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-5, 7-11, 13, 15-18, 20, 21, 23, 25, 27 and 32 at least	US 5589764 A (LEE) figs 1A-D, 2, 4, 6 , 8B and related passages
X	1-5, 7-8, 12-19, 24, 25, 27 and 31-33 at least	US 4120031 A (KINCHELOE) figs. 1, 2, 3A, 11 and related passages
X	1-3, 5, 7-9, 15-23, 25 and 33 at least	GB 2203252 A (KENCH) figs. 1, 2, 3A-E and related passages
X	1-8, 14-17, 19, 20, 22-26 and 30 at least	GB 2264566 A (INTERACTIVE SYSTEMS) figs. 1, 3, 4 and related passages.
X	1-3, 5, 7-9, 12-16, 19, 24, 27 and 29-31 at least	GB 2100036 A (ADAGELYNN) figs. 1-3 and related passages
X	1-3, 8, 9, 15, 16, 18, 19, 21, 22, 27-29 and 33 at least	WO 82/03482 A1 (DUPONT) figs. 1C, 2 and related passages.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if	P	Document published on or after the declared priority date but

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	combined with one or more other documents of same category		before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

G1U

Worldwide search of patent documents classified in the following areas of the IPC[07]

G01R

The following online and other databases have been used in the preparation of this search report

Online: EPODOC, WPI

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57

CONFIRMATION NO. 6463

23409
MICHAEL BEST & FRIEDRICH LLP (Mke)
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PUBLICATION NOTICE

OC000000137233380

Title:VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Publication No.US-2023-0020418-A1
Publication Date:01/19/2023

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/.

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Notice of References Cited	Application/Control No. 17/949,911	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-5757595-A	05-1998	Ozawa; Akira	B60L58/12	340/455
*	C	US-20100228405-A1	09-2010	Morgal; Richard	B62H3/00	701/1
*	D	US-5548200-A	08-1996	Nor; Jiri K.	B60L53/11	320/132
*	E	US-20090312903-A1	12-2009	Hafner; James Lee	B60L53/64	701/36
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*	G	US-20080052145-A1	02-2008	Kaplan; David L.	H02J3/322	705/7.31
*	H	US-20080054845-A1	03-2008	Wang; Jeen-Shuh	H02J7/0042	320/111
*	I	US-6963186-B2	11-2005	Hobbs; Raymond	B60L53/14	320/128
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	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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	N					
	O					
	P					
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	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*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
	17/949,911	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	03/21/2023								
	1	-								
	2	-								
	3	-								
	4	-								
	5	-								
	6	-								
	7	-								
	8	-								
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	39	✓								
	40	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M 10/44	03/21/2023	nrp
B60L 53/68,14,305,18,38,63	03/21/2023	nrp

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
320	109	03/21/2023	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	03/21/2023	nrp
A.I. Similarity searches on spec and claims	03/21/2023	nrp
text searched for key concepts	03/21/2023	nrp

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

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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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	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	
Attorney Docket Number	013350-9003-US57

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	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.	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Christopher B. Austin
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	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	9	5595271		1997-01-21	Tseng, Ling-yuan	
	10	5650710		1997-07-22	Hotta, Yoshihiko	
	11	6281663		2001-08-28	Yagi, Kazuhiko, et al.	
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	13	6963186		2005-11-08	Hobbs, Raymond	
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	Attorney Docket Number	013350-9003-US57

	20	8193766		2012-06-05	Rondoni et al.	

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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.	
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	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

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	Attorney Docket Number	013350-9003-US57

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

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	Examiner Name	
	Attorney Docket Number	013350-9003-US57

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	43	20090312903		2009-12-17	Hafner et al.	
	44	20090047991		2009-02-19	ELG	

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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)	☒
	3	WO2001018899	WO		2001-03-15	Tokyo R & D Co., Ltd.		☒
	4	JP2004142661	JP		2004-05-20	Kawakami et al.		☒

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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]

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	Application Number	17949911
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	Art Unit	2859
	Examiner Name	
	Attorney Docket Number	013350-9003-US57

	1	Search Report issued in corresponding PCT/US2009/054174; December 3, 2009	
	2	Written Opinion issued in corresponding PCT/US2009/054174; December 3, 2009	
	3	Search Report issued in corresponding EP09808718.2; September 21, 2017	
	4	English Translation of relevant text for WO 0118899, 3 pages (Year: 2001).	

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EXAMINER SIGNATURE

Examiner Signature	/NATHANIEL R PELTON/	Date Considered	03/21/2023

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[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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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	
Attorney Docket Number	013350-9003-US57

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)	2022-10-10
Name/Print	Christopher B. Austin	Registration Number	41,592

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Bibliographic Data

Application No: 17/949,911

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 DISPLAYING CHARGE INFORMATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/21/2022	320	2859	013350-9003-US57
RULE			

APPLICANTS

INVENTORS

Christopher B. Austin, Grafton, WI, UNITED STATES

CONTINUING DATA

This application is a CON of 16249028 01/16/2019 PAT 11489207

16249028 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/US2009/054174 08/18/2009

PCT/US2009/054174 has PRO of 61189353 08/18/2008

FOREIGN APPLICATIONS

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L2	20	L1 AND (repeat$3 OR repeated$3).clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/20 07:02 PM
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L5	1050	320/109.ccls.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2013/07/14 09:18 PM
L6	48	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2013/07/14 09:18 PM
L7	138	US-5194799-$.DID. OR US-5760569-$.DID. OR US-4389608-$.DID. OR US-5765656-$.DID. OR US-5793185-$.DID. OR US-5772309-$.DID. OR US-5444352-$.DID. OR US-5798630-$.DID. OR US-5631536-$.DID. OR US-5803760-$.DID. OR US-5670861-$.DID. OR US-5844384-$.DID. OR US-5773962-$.DID. OR US-5889384-$.DID. OR US-4248942-$.DID. OR US-5905360-$.DID. OR US-4334819-$.DID. OR US-5933010-$.DID. OR US-5202617-$.DID. OR US-6036574-$.DID. OR US-5219034-$.DID. OR US-6087805-$.DID. OR US-5229703-$.DID. OR US-6104312-$.DID. OR US-5397991-$.DID. OR US-6114833-$.DID. OR US-5402056-$.DID. OR US-6154005-$.DID. OR US-5528148-$.DID. OR US-6160374-$.DID. OR US-5545046-$.DID. OR US-6242889-$.DID. OR US-5548200-$.DID. OR US-5583418-$.DID. OR US-3603860-$.DID. OR US-5602459-$.DID. OR US-3694729-$.DID. OR US-5610499-$.DID. OR	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2013/07/14 09:19 PM

		US-3673379-$.DID. OR US-5710502-$.DID. OR US-3898547-$.DID. OR US-5807129-$.DID. OR US-3870855-$.DID. OR US-3841428-$.DID. OR US-5952813-$.DID. OR US-4012681-$.DID. OR US-5997333-$.DID. OR US-4139896-$.DID. OR US-6225780-$.DID. OR US-4141425-$.DID. OR US-4252217-$.DID. OR US-4286911-$.DID. OR US-4292578-$.DID. OR US-4309644-$.DID. OR US-4333134-$.DID. OR US-4435675-$.DID. OR US-4435486-$.DID. OR US-4450400-$.DID. OR US-4777416-$.DID. OR US-4906815-$.DID. OR US-4983904-$.DID. OR US-5179494-$.DID. OR US-5206578-$.DID. OR US-5281792-$.DID. OR US-5351283-$.DID. OR US-5369352-$.DID. OR US-5396162-$.DID. OR US-5539296-$.DID. OR US-5563491-$.DID. OR US-5594318-$.DID. OR US-5606239-$.DID. OR US-5690503-$.DID.					
L8	99	US-5289103-$.DID. OR US-20070090810-$.DID. OR US-5418437-$.DID. OR US-20070169970-$.DID. OR US-5524726-$.DID. OR US-20070181547-$.DID. OR US-5596258-$.DID. OR US-20070284159-$.DID. OR US-5646507-$.DID. OR US-20080169138-$.DID. OR US-5910714-$.DID. OR US-20080203973-$.DID. OR US-5926004-$.DID. OR US-20090075704-$.DID. OR US-5952813-$.DID. OR US-20090309422-$.DID. OR US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2013/07/14 09:19 PM

		5977744-$.DID. OR US-20090315328-$.DID. OR US-6021862-$.DID. OR US-6104160-$.DID. OR US-6184656-$.DID. OR US-6243644-$.DID. OR US-6664757-$.DID. OR US-6822425-$.DID. OR US-6917180-$.DID. OR US-6963186-$.DID. OR US-7096984-$.DID. OR US-7411371-$.DID. OR US-7497285-$.DID. OR US-7679336-$.DID. OR US-7681676-$.DID. OR US-7687934-$.DID. OR US-7778746-$.DID. OR US-7859224-$.DID. OR US-7884569-$.DID. OR US-7999403-$.DID. OR US-8047316-$.DID. OR US-8089249-$.DID. OR US-8115455-$.DID. OR US-8125183-$.DID. OR US-8143843-$.DID. OR US-8143859-$.DID. OR US-8180509-$.DID. OR US-8298692-$.DID. OR US-20040069549-$.DID. OR US-20040100225-$.DID. OR US-20040169489-$.DID. OR US-20040239288-$.DID. OR US-20050141154-$.DID. OR US-20050285564-$.DID. OR US-20060028178-$.DID. OR US-20060052918-$.DID. OR US-20060135035-$.DID. OR US-20060208570-$.DID. OR US-20060267552-$.DID.					
L9	12	US-6983186-$.DID. OR US-5462439-$.DID. OR US-7243746-$.DID. OR US-5548200-$.DID. OR US-20070164704-$.DID. OR US-20080052145-$.DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2013/07/14 09:20 PM
L10	1	"6963186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2013/07/14 09:21 PM
L11	2	"20110175569".pn.	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2016/03/21 11:27 AM

L12	1	"20110175569".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/03/21 11:27 AM
L13	74	((Christopher) near2 (Austin)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/03/21 11:28 AM
L14	1	L13 and ((vehicle or car or automobile) with (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:29 AM
L15	3	L13 and (charg$5 or recharg$5)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:30 AM
L16	7153	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:38 AM
L17	2140	L16 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:38 AM
L18	287	L17 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:39 AM
L19	2	"6963186".pn. or "5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:39 AM
L20	1	"2007029965".pn. or "7495414".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/22 02:56 PM
L21	1	"20070029965".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/22 02:57 PM
L22	2	"20100194336".pn. or "7180265".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/22 03:00 PM
L23	32353	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	ON	2016/04/27 01:15 PM
L24	3660	L23 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 01:16 PM
L25	2	"6963186".pn. or "5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 01:17 PM
L26	2	"6963186".pn. or "5548200".pn. or "7243746".pc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 01:24 PM
L27	3	"6963186".pn. or "5548200".pn. or "7243746".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 01:24 PM
L28	12280	L23 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 01:27 PM
L29	369	L28 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 01:28 PM
L30	1	"20090243549".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 02:04 PM

L31	1	L29 and L30	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 02:04 PM
L32	1	"20080052145".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 02:49 PM
L33	39	L28 and (automatic$4 near3 communicat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 02:55 PM
L34	6	"20140253024".pn. or "20130214931".pn. or "20100194336".pn.	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2016/04/27 03:44 PM
L35	3	"20140253024".pn. or "20130214931".pn. or "20100194336".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 03:45 PM
L36	1	"8193769".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 04:00 PM
L37	1	"20150229158".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 07:35 PM
L38	3	"9054749".pn. or "20090096422".pn. or "20110234157".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 07:51 PM
L39	7940	320/108 or h02j7/025.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 07:59 PM
L40	20884	320/108 or h02j7/025.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:00 PM
L41	10630	L40 and @ad<"20120321"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:00 PM
L42	42	L41 and ((first and second) near5 regulat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:04 PM
L43	6455	(g01r19/0084.cpc. or h04b5/0037.cpc. or h04b5/0081.cpc.) and @ad<"20120321"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:26 PM
L44	33	L43 and ((first and second) near5 regulat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:26 PM
L45	127	L43 and ((first and second) near5 (regulat$3 or convert$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:27 PM
L46	265	L41 and ((first and second) near5 (regulat$3 or convert$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:27 PM
L47	368	L45 or L46	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2016/04/27 08:27 PM

			JPO; DERWENT; IBM_TDB)				
L48	1	"US 20110175569"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/08/09 04:11 PM
L49	29042	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	ON	2016/08/09 04:17 PM
L50	8357	L49 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:19 PM
L51	16	L50 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	ON	2016/08/09 04:22 PM
L52	5	"5548200".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:23 PM
L53	1	"5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/08/09 04:23 PM
L54	1	"20090243549".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/08/09 04:32 PM
L55	10	L50 and (overrid$3 with (below or lower or less))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:35 PM
L56	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	ON	2016/08/09 04:39 PM
L57	2	"20020079868".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 05:33 PM
L58	38844	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	ON	2017/04/14 02:21 PM
L59	9252	L58 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/14 02:21 PM
L60	363	L59 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	ON	2017/04/14 02:21 PM

L61	3	"8772970".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/15 01:19 PM
L62	1	"8772970".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/15 01:20 PM
L63	3	"6963186".pn. or "20090243549".pn. or "5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/16 09:33 AM
L64	1	"20020079868".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/16 09:48 AM
L65	38868	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	ON	2017/04/16 10:53 AM
L66	9253	L65 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/16 10:53 AM
L67	10	L66 and (overrid$3 with (below or lower or less))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/16 10:53 AM
L68	41747	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	ON	2017/09/30 10:39 AM
L69	9450	L68 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 10:39 AM
L70	0	L69 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	ON	2017/09/30 10:42 AM
L71	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	ON	2017/09/30 10:43 AM
L72	83	L69 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (below or	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 10:59 AM

		lower or less))					
L73	2	"20040164711".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 11:53 AM
L74	1	"20040164711".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:53 AM
L75	171	"320".clas. and (decrypt$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:56 AM
L76	5	"320".clas. and (decrypt$3 with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:57 AM
L77	1	"20100076825".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:00 PM
L78	2222	(decrypt$3 with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:04 PM
L79	1513	L78 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:04 PM
L80	1216	((decrypt$3 near5 key) with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:05 PM
L81	856	L80 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:05 PM
L82	82	((decrypt$3 near5 key) with (manufacturer or supplier) with server)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:07 PM
L83	47	L82 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:07 PM
L84	242	((decrypt$3 near5 key) with (manufacturer or supplier) with request$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:13 PM
L85	131	L84 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:13 PM
L86	11740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L87	2157	L86 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L88	293	L87 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L89	50398	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	ON	2018/10/02 01:43 PM
L90	9772	L89 and	(US-PGPUB; USPAT;	OR	ON	ON	2018/10/02

		@ad<"20080818"	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				01:43 PM
L91	372	L90 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	ON	2018/10/02 01:43 PM
L92	1291	((decrypt$3 near5 key) with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 05:10 PM
L93	2233	dunn.xa.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L94	1675	L93 and @ad<"20080101"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L95	1401	L93 and @ad<"20040101"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L96	410	(drew near2 dunn).xa.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:23 PM
L97	2033	320/109.ccls.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2018/10/03 05:09 PM
L98	53838	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	ON	2018/10/03 05:09 PM
L99	1324	(L97 or L98) 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	ON	2018/10/03 05:09 PM
L100	11740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L101	2157	L100 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L102	293	L101 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L103	2	"20110175569".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2018/10/13 02:00 PM
L104	1	"20110175569".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:00 PM
L105	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:48 PM
L106	11629	320/109 or h02j7/0042.cpc. or	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:49 PM

		h02j7/0047.cpc.					
L107	4808	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:50 PM
L108	3622	(L106 or L107) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:50 PM
L109	194	L108 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	ON	2018/10/13 02:55 PM
L110	40433	(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	ON	2018/10/13 03:36 PM
L111	876	L110 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 03:36 PM
L112	2	"20180375175".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/06/16 03:26 PM
L113	103122	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	ON	2020/06/17 02:03 PM
L114	5602	L113 and ((coil or core or inductiv$3) near5 (position$3 or align$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/06/17 02:05 PM
L115	262	L114 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/06/17 02:05 PM
L116	6	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$).did.	(US-PGPUB)	OR	OFF	OFF	2020/09/14 08:56 AM
L117	2	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB)	OR	OFF	OFF	2020/09/14 08:58 AM
L118	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/14 08:58 AM
L119	31994	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	OFF	2020/09/14 09:02 AM

			IBM_TDB)				
L120	7985	L119 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:02 AM
L121	39132	b60l53/68,126,14,305,18,38,63.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:03 AM
L122	3591	L121 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:03 AM
L123	103	(L120 or L122) 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	OFF	2020/09/14 09:06 AM
L124	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	OFF	2020/09/14 09:32 AM
L125	6	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/14 09:32 AM
L126	93	(L120 or L122) 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	OFF	2020/09/14 09:33 AM
L127	27	(L120 or L122) and ((input$4 or user) with (time near2 day))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:54 AM
L128	2	"20180375175".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 10:33 AM
L129	192	(US-16056043-$ | US-3603860-$ | US-3624723-$ | US-3673379-$ | US-3740896-$ | US-3870855-$ | US-3898547-$ | US-3900784-$ | US-3911284-$ | US-4012681-$ | US-4146825-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 12:25 PM

		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-$).DID.					
L130	194	(US-16056043-$ | US- 4245640-$ | US- 4320333-$ | US- 4380725-$ | US- 4389608-$ | US- 4402524-$ | US- 4430569-$ | US- 4446680-$ | US- 4449049-$ | US- 4468605-$ | US- 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-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 12:25 PM

		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-$).DID.					
L131	1	"20190148794".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:25 AM
L132	11666	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:36 AM
L133	20499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:37 AM
L134	4231	(L132 or L133) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:38 AM
L135	4	"20080007202".pn. or "7243746".pn. or "5548200".pn. or "20080103370".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:03 AM
L136	10	(US-20090243549-$ 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-$).did.	(US-PGPUB)	OR	OFF	OFF	2020/09/29 10:07 AM
L137	12	(US-20090243549-$ 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-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:08 AM
L138	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:08 AM

		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-$).did.					
L139	1	"6983186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:09 AM
L140	1	"6963186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:10 AM
L141	13	(US-20090243549-$ 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-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:10 AM
L142	1	"20080052145".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:15 AM
L143	14	(US-20090243549-$ 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	OFF	2020/09/29 10:17 AM
L144	410	L134 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:40 AM
L145	236	L134 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	OFF	2020/09/29 11:32 AM
L146	1	"20080103370".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 11:45 AM
L147	1551	(((data or information) near5 (progress)) with (indicator))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 11:49 AM

L148	437	L147 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 11:50 AM
L149	1	"20190148785".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 02:42 PM
L150	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	OFF	2020/09/29 02:49 PM
L151	11666	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L152	20499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L153	4231	(L151 or L152) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L154	4	L153 and ((controller or display) near3 (on or within or built$1in) with (cord or cable or plug))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 03:58 PM
L155	1716	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 04:06 PM
L156	219	L155 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 04:07 PM
L157	1	"20070164704".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/30 08:48 AM
L158	1	"10090567".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/30 08:57 AM
L159	2049	((charg$5 or recharg$5) adj4 (cable or plug)) with (display or transmit$4 or reciev$3)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/30 09:03 AM
L160	2290	((charg$5 or recharg$5) adj4 (cable or plug or cord)) with (display or transmit$4 or reciev$3)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/30 09:03 AM
L161	328	L160 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/09/30 09:03 AM
L162	131	((Christopher) near2 (Austin)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:29 AM

L163	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	OFF	2020/10/23 09:30 AM
L164	11732	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L165	20693	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L166	4231	(L164 or L165) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L167	236	L166 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	OFF	2020/10/23 09:30 AM
L168	410	L166 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/10/23 10:35 AM
L169	133	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:14 AM
L170	11784	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L171	20795	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L172	4231	(L170 or L171) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L173	410	L172 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 11:52 AM
L174	677	L172 and ((interrupt$3 or disconnect$3) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 12:57 PM
L175	1	"10014703".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 01:03 PM
L176	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 09:54 AM

		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-$).did.					
L177	19	(US-20090243549-$ 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; USOCR)	OR	ON	ON	2020/12/16 09:54 AM
L178	17	L177 and ((tim$3 or length or long or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/16 09:57 AM
L179	1746	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:21 AM
L180	1122	vasant.in.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L181	7	L180 and voltage and lcd	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L182	139	L180 and voltage	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L183	68	L182 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/16 11:59 AM
L184	2	"7243746".pn.	(US-PGPUB; USPAT;	OR	ON	ON	2020/12/16

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:01 PM
L185	11973	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L186	21117	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L187	4231	(L185 or L186) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L188	410	L187 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 12:18 PM
L189	14	g01r31/371 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	OFF	2020/12/16 02:42 PM
L190	21	g01r31/371 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 02:42 PM
L191	33	L190 or L189	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 02:42 PM
L192	49137	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	ON	2020/12/17 08:31 AM
L193	8033	L192 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 08:31 AM
L194	17898	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L195	5661	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L196	3727	(L194 or L195) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L197	11978	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L198	21147	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L199	4231	(L197 or L198) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L200	5269	L199 or L193 or L196	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 08:31 AM
L201	121	L200 and ((send$3 or signal$3 or notify$3)	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 08:36 AM

		near6 interrupt$3)					
L202	861	((display$3) near6 (interrupt$3 or error or fault)) with (charg$5 or recharg$5) with (power or energy or voltage or current)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/12/17 09:14 AM
L203	157	L202 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 09:15 AM
L204	135906	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:45 AM
L205	103	L200 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 09:46 AM
L206	701	L204 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 09:46 AM
L207	791	L204 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:47 AM
L208	104	L207 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:47 AM
L209	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/17 09:51 AM

		5594318-$).did.					
L210	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 09:52 AM
L211	14	L204 and ((display$3 or indicat$3) near5 loss near5 (communicat$3 or signal))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:50 AM
L212	11203	((display$3 or indicat$3) near5 loss near5 (communicat$3 or signal))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:52 AM
L213	5022	L212 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:52 AM
L214	285	L213 and (charg$3 or recharg$3) and (vehicle or car or auto or automobile)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:56 AM
L215	194	(US-17005819-$ | US-4245640-$ | US-4320333-$ | US-4380725-$ | US-4389608-$ | US-4402524-$ | US-4430569-$ | US-4446680-$ | US-4449049-$ | US-4468605-$ | US-4591778-$ | US-4602204-$ | US-4616169-$ | US-4774449-$ | US-4873160-$ | US-4956563-$ | US-4990099-$ | US-5194799-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 11:59 AM

		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-$).DID.					
L216	162	(US-10587127-$ | US- 17005819-$ | US- 20180198289-$ | US- 3582942-$ | US- 3584893-$ | US- 3584921-$ | US- 3589692-$ | US- 3594642-$ | US- 3602881-$ | US- 3612491-$ | US- 3614564-$ | US- 3621929-$ | US- 3623159-$ | US- 3624480-$ | US- 3624482-$ | US- 3624723-$ | US- 3628284-$ | US- 3638054-$ | US- 3639896-$ | US- 3651452-$ | US- 3653729-$ | US- 3654538-$ | US- 3656135-$ | US- 3665501-$ | US- 3671843-$ | US- 3673588-$ | US- 3683624-$ | US- 3684255-$ | US- 3694890-$ | US- 3695731-$ | US- 3704446-$ | US- 3718849-$ | US- 3727994-$ | US- 3740637-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 12:00 PM

		3746988-$ | US- 3758031-$ | US- 3758166-$ | US- 3765555-$ | US- 3767065-$ | US- 3790806-$ | US- 3792709-$ | US- 3794968-$ | US- 3800771-$ | US- 3809995-$ | US- 3811526-$ | US- 3815088-$ | US- 3828235-$ | US- 3842288-$ | US- 3848933-$ | US- 3851305-$ | US- 3866168-$ | US- 3866702-$ | US- 3867647-$ | US- 3881128-$ | US- 3898547-$ | US- 3898809-$ | US- 3900784-$ | US- 3904920-$ | US- 3906330-$ | US- 3909685-$ | US- 3916376-$ | US- 3918543-$ | US- 3952511-$ | US- 3962677-$ | US- 3962870-$ | US- 3966266-$ | US- 3973238-$ | US- 3976158-$ | US- 3988041-$ | US- 3992695-$ | US- 3997830-$ | US- 4008423-$ | US- 4010410-$ | US- 4012681-$ | US- 4019120-$ | US- 4025126-$ | US- 4033629-$ | US- 4033632-$ | US- 4034369-$ | US- 4067259-$ | US- 4078798-$ | US- 4082988-$ | US- 4086564-$ | US- 4088937-$ | US- 4089564-$ | US- 4094556-$ | US- 4109193-$ | US- 4125826-$ | US- 4127308-$ | US- 4128800-$ | US- 4139812-$ | US- 4143926-$ | US-					

		4146825-$ | US-4153168-$ | US-4156836-$ | US-4159467-$ | US-4159854-$ | US-4168866-$ | US-4207511-$ | US-4218624-$ | US-4218644-$).DID.					
L217	356	L215 or L216	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 12:00 PM
L218	337	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2021/03/10 11:55 AM
L219	2	"20200395637".pn.	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2021/05/05 08:44 AM
L220	1	"20200395637".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2021/05/05 08:45 AM
L221	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/05/05 10:05 AM
L222	142845	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:08 AM
L223	1842	L222 and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:08 AM
L224	220	L223 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:09 AM

L225	52046	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	ON	2021/05/05 11:36 AM
L226	8131	L225 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 11:36 AM
L227	19179	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L228	5910	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L229	3790	(L227 or L228) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L230	305	(L226 or L229) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L231	53599	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	ON	2021/06/23 04:13 PM
L232	8476	L231 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/06/23 04:13 PM
L233	19760	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L234	5999	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L235	3869	(L233 or L234) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L236	308	(L232 or L235) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L237	56047	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	ON	2021/08/19 09:31 AM
L238	8890	L237 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/08/19 09:31 AM

			JPO; DERWENT; IBM_TDB)				
L239	20469	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L240	6139	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L241	3956	(L239 or L240) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L242	304	(L238 or L241) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L243	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 10:14 AM
L244	1914	L243 and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 10:14 AM
L245	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 01:46 PM
L246	40	L245 and ((display$3 or indicat$3) near5 (input$3) near5 (delay$3 or program$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 01:46 PM
L247	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 02:58 PM
L248	4354	L247 and ((display$3 or indicat$3) near5 (input$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 02:58 PM
L249	457	L248 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 02:59 PM
L250	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 08:18 AM
L251	0	L250 and ((delay$4 near5 session) near5 (input$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 08:18 AM
L252	18	L250 and ((delay$4 near5 charg$5) near5	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/08/20 08:19 AM

		(input$3))	JPO; DERWENT; IBM_TDB)				
L253	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 09:39 AM
L254	46	L253 and ((delay$4 near5 charg$5) and (manual near4 (input$3 or restart$3 or stop$4)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 09:39 AM
L255	79223	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	ON	2021/08/23 08:43 AM
L256	15711	L255 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/23 08:43 AM
L257	389	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/23 08:43 AM
L258	46	("20020079868"|"20030015995"|"20030127155"|"20030209375"|"20050046387"|"20060276938"|"20070080827"|"20070144605"|"20070164704"|"20080040223"|"20080040296"|"20080052017"|"20080052145"|"20080054845"|"20080103370"|"20080156553"|"20080203973"|"20080265684"|"20080281168"|"20080296978"|"20090021213"|"20090063193"|"20090139781"|"20090237034"|"20090243538"|"20090278492"|"20090313034"|"20090313103"|"20090313174"|"20100010698"|"20100030389"|"20100081378"|"20100169008"|"20100228405"|"20100281183"|"20110266996"|"4532418"|"4742283"|"5202617"|"5311973"|"5461298"|"5462439"|"5595271"|"5650710"|"6281663"|"6421600").PN.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/10/04 12:24 PM
L259	46	("20020079868"|"20030015995"|"20030127155	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/10/08 12:54 PM

		"|"20030209375"|"2005 0046387"|"2006027693 8"|"20070080827"|"200 70144605"|"200701647 04"|"20080040223"|"20 080040296"|"20080052 017"|"20080052145"|"2 0080054845"|"2008010 3370"|"20080156553"|" 20080203973"|"200802 65684"|"20080281168"| "20080296978"|"20090 021213"|"20090063193 "|"20090139781"|"2009 0237034"|"2009024353 8"|"20090278492"|"200 90313034"|"200903131 03"|"20090313174"|"20 100010698"|"20100030 389"|"20100081378"|"2 0100169008"|"2010022 8405"|"20100281183"|" 20110266996"|"453241 8"|"4742283"|"5202617" |"5311973"|"5461298"|" 5462439"|"5595271"|"5 650710"|"6281663"|"64 21600").PN.					
L260	4	"6424158".pn. OR "7917179".pn. OR "20090063183".pn. OR "20100106631".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/01/19 11:20 AM
L261	380	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/19 12:42 PM
L263	24	((US-20080156553-A1 OR US-20080275600-A1 OR US-20080040296-A1 OR US-20100102776-A1 OR US-20110266996-A1 OR US-20070164704-A1 OR US-20080054845-A1 OR US-20090313174-A1 OR US-20080052145-A1 OR US-20080007202-A1 OR US-20090139781-A1 OR US-20100010698-A1 OR US-20100090524-A1 OR US-20090243538-A1 OR US-20090313034-A1 OR US-20060276938-A1	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/20 07:35 PM

		OR US-20020079868-A1 OR US-20090243549-A1 OR US-20100228405-A1 OR US-20090313103-A1).did. AND PGPB.dbnm.) OR ((US-5594318-A OR US-6963186-B2 OR US-7243746-B1 OR US-5548200-A).did. AND USPT.dbnm.)					
L264	7	("20060028178" OR "20070145830" OR "20080122402" OR "20090079386" OR "20090229900" OR "20090315512" OR "5646500").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/21 08:29 AM
L265	64	("20020079868" OR "20030015995" OR "20030127155" OR "20030209375" OR "20050046387" OR "20060276938" OR "20070080827" OR "20070144605" OR "20070164704" OR "20080007202" OR "20080039989" OR "20080040223" OR "20080040296" OR "20080052017" OR "20080052145" OR "20080054845" OR "20080103370" OR "20080156553" OR "20080203973" OR "20080238355" OR "20080265684" OR "20080281168" OR "20080296978" OR "20090021213" OR "20090047991" OR "20090063183" OR "20090063193" OR "20090139781" OR "20090237034" OR "20090243538" OR "20090243549" OR "20090278492" OR "20090312903" OR "20090313034" OR "20090313103" OR "20090313174" OR "20100010698" OR "20100030389" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/21 08:30 AM

		"20100081378" OR "20100106631" OR "20100169008" OR "20100228405" OR "20100281183" OR "20110266996" OR "4532418" OR "4742283" OR "5202617" OR "5311973" OR "5461298" OR "5462439" OR "5548200" OR "5594318" OR "5595271" OR "5650710" OR "6281663" OR "6421600" OR "6424158" OR "6928372" OR "6963186" OR "7243746" OR "7782021" OR "7881957" OR "7917179" OR "8193766").pn.					
L266	71	L265 OR l264	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 08:30 AM
L267	34	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time near3 remain$3) near9 display$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 09:57 AM
L268	6	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:31 AM
L269	1838	@ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:39 AM
L270	13	@ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3)) near9 (charg$5 OR recharg$5)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:39 AM
L271	19	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((phone) near9	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 12:28 PM

		display$3)					
L272	5365	B60L53/68,14,305,18,38,63.cpc. AND @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/21 01:11 PM
L273	229	l272 AND ((display$3 OR indicat$3) near5 (time OR length OR duration OR period) near5 (charg$5 OR recharg$5))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/21 01:11 PM
L274	49	(Artificial Intelligence) Similar to: 17/949,911 with 0 CPC Selections and 0 Text Selections Text: (US-20220209313-A1 OR US-11258112-B2 OR US-20220209318-A1 OR US-20230020418-A1 OR US-11258107-B2 OR US-11482734-B2 OR US-20220238931-A1 OR US-11258108-B2 OR US-20220238928-A1 OR US-11355791-B2 OR US-20220209315-A1 OR US-11349157-B2 OR WO-2010022059-A1 OR EP-2329559-A1 OR US-20220209314-A1 OR US-20220216530-A1 OR US-20230013807-A1 OR US-20210234205-A1 OR US-20220247000-A1 OR US-11588191-B2 OR US-11515581-B2 OR US-11515582-B2 OR US-20220238929-A1 OR US-11489207-B2 OR US-20220216529-A1 OR US-20220200066-A1 OR US-20230016705-A1 OR US-11489208-B2 OR US-20220209316-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

		OR US-11251471-B2 OR US-11482736-B2 OR US-20230014364-A1 OR US-20200395636-A1 OR US-11482735-B2 OR US-20210126296-A1 OR US-20220209317-A1 OR US-20210135296-A1 OR US-11258110-B2 OR US-20220246999-A1 OR US-11264652-B2 OR US-11355792-B2 OR US-11258109-B2 OR US-20200395637-A1 OR US-20230012593-A1 OR US-20190148785-A1 OR US-20190148787-A1 OR US-20190148786-A1 OR US-20110175569-A1 OR US-20190148791-A1 OR US-20190148789-A1).did.					
L275	49	(Artificial Intelligence) Similar to: 17/949,911 with 0 CPC Selections and 2 Text Selections Text: (US-20230020418-A1 OR US-20190148786-A1 OR US-11258112-B2 OR US-11489207-B2 OR US-20190148785-A1 OR US-20230016705-A1 OR US-20190148787-A1 OR JP-2010110101-A OR US-20220209318-A1 OR JP-5267050-B2 OR JP-2012244768-A OR US-20220209315-A1 OR JP-2011112617-A OR US-11482735-B2 OR US-11258108-B2 OR US-20220209313-A1 OR US-11482734-B2 OR US-11515581-B2 OR EP-2329559-A1 OR WO-2010022059-A1 OR US-20190148791-A1 OR US-20160059716-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

		JP-2018137838-A OR KR-102013155-B1 OR KR-20110000011-A OR KR-20150022511-A OR US-11258107-B2 OR US-20210135295-A1 OR US-20220216530-A1 OR US-20200395638-A1 OR US-11355792-B2 OR US-20220238928-A1 OR US-20220247000-A1 OR JP-5328304-B2 OR JP-2010119224-A OR JP-6826320-B2 OR US-20220246999-A1 OR CN-103580093-A OR KR-101113425-B1 OR US-10090567-B2 OR JP-2016025390-A OR DE-10353839-A1 OR US-20230012593-A1 OR US-20230014364-A1 OR JP-2005253269-A OR JP-2000102104-A OR US-11349157-B2 OR KR-102048714-B1 OR US-6992464-B2 OR US-20040135548-A1).did.					
L276	73	L274 OR l275	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	378	((vehicle or auto or car or automobile)(charg$5 or recharg$5)(display$3 or lcd or monitor or led or screen)(program$3)(time or period or length or long)(manual or user)(input$3 or switch$3 or button)).clm.	(US-PGPUB; USPAT)	AND	ON	ON	2021/08/23 10:47 AM

PE2E SEARCH - Search History (Similarity Search)

Ref #	Sort and Retrieval Information	Text Selections	CPC Selections

L274	Sort results by: Similarity to Application # 17/949,911 Retrieve results by: Application # 17/949,911	No selections	No selections
L275	Sort results by: Similarity to Application # 17/949,911 Retrieve results by: Application # 17/949,911	(Claims) establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger, receive a wireless signal from the portable controller, responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery, repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and repeatedly display: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and information indicative of the level of charge of the battery. (Claims) receiving, at a controller, at least one signal indicative of a level of charge of the battery; transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller the at least one signal indicative of the level of	No selections

		charge of the battery and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery; displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller.	

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
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Not Yet Assigned
Attorney Docket Number	013350-9003-US57

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	5646500		1997-07-08	Wilson	

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	20060028178		2006-02-09	Hobbs	
	2	20070145830		2007-06-28	Lee, et al.	
	3	20080122402		2008-05-29	Hoffman, et al.	
	4	20090079386		2009-03-26	Gallagher et al.	
	5	20090229900		2009-09-17	Hafner, et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.B.A./

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Tesla EX1002 Page 345

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Not Yet Assigned
Attorney Docket Number	013350-9003-US57

	6	20090315512		2009-12-24	Ichikawa, et al.			

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	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	2416852	GB	A	2006-02-08	Edwards		

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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		

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EXAMINER SIGNATURE

Examiner Signature	/NATHANIEL R PELTON/	Date Considered	03/21/2023

*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	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Not Yet Assigned
Attorney Docket Number	013350-9003-US57

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)	2023-01-17
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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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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

23409 7590 03/24/2023

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
03/24/2023	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mkeipdocket@michaelbest.com

Office Action Summary	Application No. 17/949,911	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 application filed on 09/21/2022.

☐ 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) 21-40 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) 21-40 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 09/21/2022 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 10/10/2022,01/17/2023.

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

4) ☐ Other: _____.

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Tesla EX1002 Page 350

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 10/10/2022 and 01/17/2023 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Response to Amendment

Acknowledgement is made of the preliminary amendment filed on 09/21/2022 in which claims 1-20 were canceled and claims 21-40 added. Therefore, claims 21-40 are pending for examination below.

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 21-24 and 27-29 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] in view of Ozawa et al. [US 5,757,595].

With respect to claim 21, Pryor discloses a system for charging a battery of a vehicle with a vehicular battery charger [**Figs 1-2**], the system comprising: a controller [**110/114**] configured to:

establish wireless communication [**via 124/126**] with a portable controller of a user remote from the vehicle and the vehicular battery charger [**see Fig. 5**], receive a wireless signal from the portable controller [**par. 0023-0025**], responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger [**the received signal includes CIT which is a factor in starting the recharging operation for the vehicle**], and during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery [**154 and/or 132**]. However, Pryor fails to explicitly disclose estimating a time remaining to charge and displaying the time and level of charge.

Ozawa relates to the field of charging an electric vehicle and discloses repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery and repeatedly display: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step [**display 38 displays time remaining to charge every time 42 is pressed**], and information indicative of the level of charge of the battery [**display 38 displays current level of charge every time 40 is pressed**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor such that the estimated remaining time and level of charge of the battery can be displayed for the benefit easily displaying to the user relevant information relating to the recharging operation of the vehicle thereby allowing them to make informed decision regarding time left and current battery/fuel level of the vehicle.

With respect to claim 22, Ozawa as applied above further discloses wherein the controller is configured to display information indicative of the amount of time remaining to charge the battery by displaying the information on a display electrically coupled to the controller [**Fig. 4**].

With respect to claim 23, Ozawa as applied above further discloses wherein the controller is configured to display information indicative of the amount of time remaining to charge the battery by displaying the information on a display mounted within the vehicle [**Figs 1-2, within cavity 18**].

With respect to claim 24, Pryor fails to discloses wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery. However, such a modification would be within the level of ordinary skill to a person having ordinary skill in the art as the solution is a simple math problem, i.e. adding the time remaining to the current time (if it is 2pm and 1 hour remaining then 2+1 equals 3pm).

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor as applied above such that the estimated remaining time is displayed as a time of day for the benefit quickly identifying to the user the exact time the charging will be completed.

With respect to claim 27, Pryor further discloses wherein the controller is included in the vehicular battery charger [**Fig. 2**].

With respect to claims 28-29, Pryor further discloses wherein the wireless signal includes a time of day and wherein the controller is configured to supply electricity from the source of power to the battery based on the time of day and wherein the time of day includes at least one selected from a group consisting of a time of day to start charging and a time of day to complete charging. [**par. 0023-0025; CIT**].

Claim 25 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Ozawa et al. [US 5,757,595] as applied above, and further in view of Morgal et al. [US 2010/0228405].

With respect to claim 25, Pryor fails to explicitly disclose wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

Morgal relates to the field of recharging electric vehicles and discloses a controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle [**par. 0222-0223**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to further be configured to receive another signal for stopping the charge operation for the benefit of performing data collection of the vehicle as stated by Morgal and also for facilitating the management system's ability to control the fleet charging operations (i.e. allowing for stopping of charging and not just starting).

Claims 26 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Ozawa et al. [US 5,757,595] as applied above, and further in view of Nor et al. [US 5,548,200].

With respect to claim 26, Pryor acknowledges cost of charging varies throughout the day and the need for reducing costs [**par. 0004**] but fails to explicitly disclose wherein the controller is further configured to receive data indicative of a cost of power and, based on the received data indicative of the cost of power, stop charging of the battery of the vehicle.

Nor relates to the field of recharging vehicles and discloses wherein the controller is further configured to receive data indicative of a cost of power and, based on the received data indicative of the cost of power, stop charging of the battery of the vehicle [**col. 4 lines 4-45**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to further be configured to stop the charging based on cost for the benefit of minimizing the cost to the user based on their individual price sensitivities.

Claim 30 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Ozawa et al. [US 5,757,595] as applied above, and further in view of Hafner et al. [US 2009/0313174].

With respect to claim 30, Pryor fails to disclose wherein the wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold.

Hafner relates to the field of recharging electric vehicles based on financial plans and discloses a wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold [**par. 0033, 0050, 0054-0056, 0081 Figs. 10-12; i.e. user selected pricing thresholds**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to further be configured to wirelessly receive a cost threshold for control of the charging operation for the benefit of minimizing the cost to the user based on their individual price sensitivities.

Claims 31, 33, and 36-39 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] in view of Rondoni et al. [US 8,193,766].

With respect to claims 31 and 37, Pryor discloses a method of charging a battery of a vehicle with a battery charger [**Figs 1-2**], the method comprising: receiving, at a controller [**110/114**], at least one signal indicative of a level of charge of the battery and transmitting it to a portable controller remote from the vehicle and the battery charger [**par. 0023-0025**], via a transmitter electrically coupled to the controller the at least one signal indicative of the level of charge of the battery [**via 124/126**]. However, Pryor fails to disclose sending the level of charge during charging and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery; displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller.

Rondoni relates to the field of charging batteries and discloses sending a level of charge during charging and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery and displaying, on a display electrically coupled to a portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller [**Figs. 7-9; col. 8 lines 30-55, the display is part of a remote device/programmer; col. 9 line 38 to col. 10 line 67; signals sent for display include level of charge of the battery and time remaining to charge the battery**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include sending and display of battery level and time remaining information to the portable controller for the benefit of providing the relevant charging information to the remote user over any distance thereby providing control to the user/management system without

being constraint to the particular location of each electric vehicle allowing for more efficient load management and charging with the grid.

With respect to claim 33, Rondoni as applied above further discloses wherein the level of charge is a full charge of the battery [**Fig. 8 shows transmission of full charge signal**].

With respect to claim 36, Rondoni further discloses repeatedly sending, with the controller, signals to update the level of charge of the battery on the display [**Fig. 7 shows an update to date charge status, i.e. some bars are black and other shaded as the charging progresses**].

With respect to claims 38-39, Pryor further discloses receiving, at the controller, a wireless signal from the portable controller wherein receiving the wireless signal from the portable controller includes receiving a time of day and further comprising supplying, with the controller, electricity to the battery based on the time of day [**par. 0023-0025; CIT**].

Claim 32 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Rondoni et al. [US 8,193,766] as applied above, and further in view of Kaplan et al. [US 2008/0052145].

With respect to claim 32, Pryor fails to disclose wherein the portable remote controller is defined at least in part by a phone.

Kaplan relates to electric vehicle charging with remote user controlling wherein the remote user interface is define at least in part by a phone [**par. 0227**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor such that the remote controller included a phone for the benefit of

using a device with a reliable network for the user and also for using a device that is mainstream in society thereby facilitating the ease at which a user can adapt/use the remote controller for their vehicle recharging operation controls.

Claim 34 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Rondoni et al. [US 8,193,766] as applied above, and further in view of Wang [US 2008/0054845].

With respect to claim 34, Pryor discloses wherein the display is a first display [**see above**], but fails to disclose displaying, on a second display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery.

Wang teaches displaying, on a display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery [**Fig. 1**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include another display for displaying the level of battery charge in a housing of the battery charger for the benefit of providing a more user friendly display in a convenient manner as stated by Wang [**par. 0009**].

Claim 35 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202], Rondoni et al. [US 8,193,766], and Wang [US 2008/0054845] as applied above, and further in view of Hobbs [US 6,963,186].

With respect to claim 35, Wang as applied above fails to disclose displaying, on the second display, the amount of time remaining to charge the battery.

Hobbs relates to the field of recharging vehicles with a vehicle charger having a display and wherein displaying, on the display located in a charger housing, the amount of time remaining to charge the battery [**col. 7 lines 1-30**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include on the charger display the amount of time remaining to charge the battery for the benefit of providing a more user friendly display in a convenient location that can be quickly and readily seen by the user of the electric vehicle.

Claim 40 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] and Rondoni et al. [US 8,193,766] as applied above, and further in view of Hafner et al. [US 2009/0313174].

With respect to claim 40, Pryor fails to disclose wherein receiving the wireless signal from the portable controller includes receiving a cost threshold and further comprising supplying, with the controller, electricity to the battery based on the cost threshold.

Hafner relates to the field of recharging electric vehicles based on financial plans and discloses a wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold [**par. 0033, 0050, 0054-0056, 0081 Figs. 10-12; i.e. user selected pricing thresholds**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to further be configured to wirelessly receive a cost threshold for control of the charging operation for the benefit of minimizing the cost to the user based on their individual price sensitivities.

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.

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/NATHANIEL R PELTON/
Primary Examiner, Art Unit 2859

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(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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	2					
	3	7265520		2007-09-04	Kosuda et al.	
	4	8040430		2011-10-18	Ogawa	
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	1	20030120442		2003-06-26	Pellegrino et al.	

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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

	2	20090062967		2009-03-05	Kressner et al.	
	3	20100121507		2010-05-13	Ishii et al.	
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	1	2002369315	JP	A	2002-12-20	Ono, Masaro		☒
	2	KR10-2006-0016417	KR	A	2006-02-22	Byun Jin Sub		☒
	3	JP2006331405	JP	A	2006-12-07	Hiraoka, Masamitsu		☒
	4	WO2006076498	WO	A	2006-07-20	Gibson, et al.		☐

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	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

	1	Machine Translation of JP 2002369315, 7 Pages (Year: 2002)
	2	Machine Translation of KR 10-2006-0016417, 9 Pages (Year: 2006)
	3	Machine Translation of JP 2006331405, 19 Pages (Year: 2006)

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	First Named Inventor	Christopher B. Austin
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	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

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).

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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)	2023-06-01
Name/Print	Christopher B. Austin	Registration Number	41,592

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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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B60S 5/02	(2006.01)	B60S	5/02		5H115

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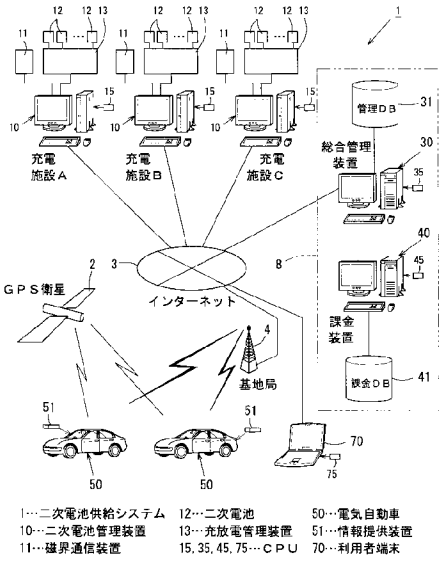
3D026 CA08
5G003 BA02 CC08 GC05
5H030 AA00 AS08 BB00
5H115 PA08 PC06 PG04 P116 TD01 T102

(54)【発明の名称】二次電池供給システムおよび二次電池供給方法

(57)【要約】
【課題】二次電池を供給する充電施設側の都合や要望を反映して電気自動車の利用者に充電施設情報を提供することができる二次電池供給システムおよび二次電池供給方法を提供する。
【解決手段】二次電池供給システム１の総合管理装置３０に、二次電池１２の供給可否または供給可能個数に関する供給可否応答データと、二次電池の供給価格とを前記総合管理装置３０へ送信制御する制御部を備え、前記総合管理装置３０に、前記情報提供装置５１からの問い合わせに基づいて二次電池１２の供給が可能な充電施設に関する充電施設情報を応答制御する制御部を備え、前記情報提供装置５１に、前記総合管理装置３０に前記充電施設に関する問い合わせる問い合わせ処理と、前記総合管理装置からの応答に基づいて前記充電施設情報を提供する情報提供処理とを実行する制御部と、前記充電施設情報を表示する表示部６２とを備える。
【選択図】図１



IPR2026-00382
Tesla EX1002 Page 366

【特許請求の範囲】
【請求項１】
充電施設に設けられて複数の二次電池の充電を管理する二次電池管理装置と、前記二次電池管理装置を複数管理する総合管理装置と、利用者に充電施設情報を提供する情報提供装置とを備え、前記総合管理装置を前記二次電池管理装置と前記情報提供装置とに通信可能に接続した二次電池供給システムであって、
前記二次電池管理装置は、二次電池の供給可否または供給可能個数に関する二次電池供給情報を前記総合管理装置へ送信制御する制御手段を備え、
前記総合管理装置は、前記情報提供装置からの問い合わせに基づいて少なくとも二次電池の供給が可能な充電施設に関する充電施設情報を応答制御する制御手段を備え、
前記情報提供装置は、前記総合管理装置に前記充電施設に関しての前記充電施設情報を問い合わせる問合せ処理、及び前記総合管理装置からの応答に基づいて前記充電施設情報を提供する情報提供処理を実行する制御手段と、前記充電施設情報を出力する出力手段とを備えたことを特徴とする
二次電池供給システム。
【請求項２】
前記情報提供装置の出力手段を、情報表示を行う表示手段で構成し、
前記充電施設情報は、充電施設の位置を含むことを特徴とする
請求項１記載の二次電池供給システム。
【請求項３】
前記二次電池管理装置は、二次電池の供給価格に関する供給価格情報を前記総合管理装置へ送信制御する制御手段を備え、
前記充電施設情報は、二次電池の供給価格を含む
ことを特徴とする請求項１又は２に記載の二次電池供給システム。
【請求項４】
前記情報提供装置に、表示された充電施設のうち任意の充電施設の選択入力を許容する入力手段を備え、
前記情報提供装置の制御手段は、選択入力された充電施設の二次電池を予約する予約処理を実行する構成としたことを特徴とする
請求項１乃至３のいずれか１項に記載の二次電池供給システム。
【請求項５】
前記二次電池管理装置に、利用者を識別する利用者識別情報を取得する識別情報取得手段を備え、
前記二次電池管理装置の制御手段は、二次電池を供給する際に、取得した利用者識別情報と充電施設の充電施設識別情報と実際の取引金額情報とを送信する取引情報送信処理を実行する構成とし、
前記総合管理装置の制御手段は、前記利用者識別情報と充電施設識別情報と取引金額情報とを受信し、受信した情報に基づいて利用者からの料金徴収処理と充電施設への料金支払い処理とを実行する構成としたことを特徴とする
請求項１乃至４のいずれか１項に記載の二次電池供給システム。
【請求項６】
充電施設に設けられて複数の二次電池の充電を管理する二次電池管理装置と、前記二次電池管理装置を複数管理する総合管理装置と、利用者に充電施設情報を提供する情報提供装置とが備えられ、前記総合管理装置が前記二次電池管理装置と前記情報提供装置とに通信可能に接続されて、二次電池を供給する二次電池供給方法であって、
前記二次電池管理装置は、二次電池の供給可否または供給可能個数に関する二次電池供給情報を前記総合管理装置へ送信し、
前記情報提供装置は、前記総合管理装置に前記充電施設に関しての前記充電施設情報を問い合わせ、
前記総合管理装置は、前記情報提供装置からの問い合わせに基づいて少なくとも二次電

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池の供給が可能な充電施設に関する充電施設情報を応答し、
前記情報提供装置は、前記総合管理装置からの応答に基づいて出力手段で前記充電施設情報を提供することを特徴とする
二次電池供給方法。
【発明の詳細な説明】
【技術分野】
【０００１】
この発明は、充電可能な所謂二次電池の供給に関し、特に電気自動車の動力源として使用する二次電池を供給する二次電池供給システムおよび二次電池供給方法に関する。
【背景技術】
【０００２】
従来、二次電池（バッテリ）を動力源とする電気自動車に対して、充電施設にて二次電池を供給するシステムが提案されている。このシステムは、電気自動車の走行距離に応じて放電した二次電池を、充電施設でフル充電された二次電池と交換することで、充電に要する時間（つまり充電時間）が経過するまでの間は電気自動車が走行できないという問題を、解消しようとしている。
【０００３】
このようなシステムとして、充電施設を経由して目的地へ向かう経路を探索し誘導する経路探索装置が提案されている（特許文献１参照）。この経路探索装置は、遠方の目的地へ向かうに際して、電気自動車の利用者が充電施設を経由する経路を調査することを不要とし、利用者に安心感を与えるものである。
【０００４】
また、二次電池の供給に対して課金を行う自動車の給電サービスシステム（特許文献２参照）や、電気車両用エネルギ供給システム（特許文献３参照）が提案されている。前者の自動車の給電サービスシステムは、二次電池の電力使用量や利用可能期間に応じた課金を行うものであり、後者の電気車両用エネルギ供給システムは、二次電池の充電時間と管理費とから月単位で課金するものである。
【０００５】
しかし、これらのシステムや装置は、電気自動車に使用される二次電池を充電する充電施設がガソリンスタンドのように各地に満遍なく設置されていることを前提としている。つまり、これらの公知例は、この充電施設を如何にして普及させるかが考慮されておらず、充電施設側の都合や要望に配慮したものとはなっていなかった。従って、例えば、充電施設において供給可能な二次電池が切れた場合や、事情により二次電池を供給できない場合についても考慮されていなかった。
【特許文献１】特開平１０－１７０２９３号公報（要約、図４）
【特許文献２】特開２００２－１４０３９８号公報（要約、図１）
【特許文献３】特開２００１－５７７１１号公報（要約）
【発明の開示】
【発明が解決しようとする課題】
【０００６】
この発明は、上述の問題に鑑み、二次電池を供給する充電施設側の都合や要望を反映して、電気自動車の利用者に充電施設情報を提供することができる二次電池供給システムおよび二次電池供給方法を提供し、合わせて利用者の満足度を向上させることを目的とする。
【課題を解決するための手段】
【０００７】
この発明は、充電施設に設けられて複数の二次電池の充電を管理する二次電池管理装置と、前記二次電池管理装置を複数管理する総合管理装置と、利用者に充電施設情報を提供する情報提供装置とを備え、前記総合管理装置を前記二次電池管理装置と前記情報提供装置とに通信可能に接続した二次電池供給システムであって、前記二次電池管理装置は、二

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次電池の供給可否または供給可能個数に関する二次電池供給情報を前記総合管理装置へ送信制御する制御手段を備え、前記総合管理装置は、前記情報提供装置からの問い合わせに基づいて少なくとも二次電池の供給が可能な充電施設に関する充電施設情報を応答制御する制御手段を備え、前記情報提供装置は、前記総合管理装置に前記充電施設に関しての前記充電施設情報を問い合わせる問合せ処理、及び前記総合管理装置からの応答に基づいて前記充電施設情報を提供する情報提供処理を実行する制御手段と、前記充電施設情報を出力する出力手段とを備える二次電池供給システムとする。これによって、二次電池を供給する充電施設側の都合や要望を反映して電気自動車の利用者に充電施設情報を提供することができる。

【０００８】

また、前記情報提供装置の出力手段を、情報表示を行う表示手段で構成し、前記充電施設情報は、充電施設の位置を含む二次電池供給システムとすれば、充電施設情報に充電施設の位置情報を加え、利便性はさらに増す。

【０００９】

また、前記二次電池管理装置は、二次電池の供給価格に関する供給価格情報を前記総合管理装置へ送信制御する制御手段を備え、前記充電施設情報は、二次電池の供給価格を含む二次電池供給システムとすれば、充電施設情報に二次電池の供給価格を加えて充電施設選択の可能性を増すことができる。

【００１０】

また、前記情報提供装置に、表示された充電施設のうち任意の充電施設の選択入力を許容する入力手段を備え、前記情報提供装置の制御手段は、選択入力された充電施設の二次電池を予約する予約処理を実行する構成とした二次電池供給システムとすれば、予約を可能とし、より確実かつ円滑な二次電池供給を推進できる。

【００１１】

また、前記二次電池管理装置に、利用者を識別する利用者識別情報を取得する識別情報取得手段を備え、前記二次電池管理装置の制御手段は、二次電池を供給する際に、取得した利用者識別情報と充電施設の充電施設識別情報と実際の取引金額情報とを送信する取引情報送信処理を実行する構成とし、前記総合管理装置の制御手段は、前記利用者識別情報と充電施設識別情報と取引金額情報とを受信し、受信した情報に基づいて利用者からの料金徴収処理と充電施設への料金支払い処理とを実行する構成とした二次電池供給システムとすれば、利用者からの料金徴収処理と充電施設への料金支払い処理とを円滑に管理することができる。

【００１２】

さらに、充電施設に設けられて複数の二次電池の充電を管理する二次電池管理装置と、前記二次電池管理装置を複数管理する総合管理装置と、利用者に充電施設情報を提供する情報提供装置とが備えられ、前記総合管理装置が前記二次電池管理装置と前記情報提供装置とに通信可能に接続されて、二次電池を供給する二次電池供給方法であって、前記二次電池管理装置は、二次電池の供給可否または供給可能個数に関する二次電池供給情報を前記総合管理装置へ送信し、前記情報提供装置は、前記総合管理装置に前記充電施設に関しての前記充電施設情報を問い合わせ、前記総合管理装置は、前記情報提供装置からの問い合わせに基づいて少なくとも二次電池の供給が可能な充電施設に関する充電施設情報を応答し、前記情報提供装置は、前記総合管理装置からの応答に基づいて出力手段で前記充電施設情報を提供する二次電池供給方法とする。これによって、二次電池を供給する充電施設側の都合や要望を反映して電気自動車の利用者に充電施設情報を提供することができる。

【発明の効果】

【００１３】

この発明によれば、二次電池を供給する充電施設側の都合や要望を反映して電気自動車の利用者に充電施設情報を提供することができる。

【発明を実施するための最良の形態】

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【００１４】
この発明の実施の形態を以下図面と共に説明する。
【００１５】
（第一の実施の形態）
まず本発明の一実施の形態としての第一の実施の形態を説明する。
【００１６】
本発明の二次電池供給システムは、リチウム電池等の充電可能な二次電池を動力源として搭載した電気自動車が、各所に点在した充電施設で二次電池の交換、供給を受けることができるようにし、利用者とこれら充電施設について、総合管理センター等の総合管理装置によって総合管理を行えるようにしたものである。
【００１７】
すなわち、総合管理センター等は、利用者に二次電池を供給するための情報（各充電施設の所在や二次電池の供給価格、会員登録についての情報等）を、ＷＥＢ上のホームページ等を利用して広く公開し、このホームページ上で会員を募り、また各充電施設から会員を募って、会員に二次電池を供給できるようにしている。
【００１８】
図１は、二次電池供給システム１のシステム構成を示すシステム構成図であり、図２は、情報提供装置５１の構成を示すブロック図である。
【００１９】
本発明は、総合管理センター８と複数の充電施設Ａ，Ｂ，Ｃ，・・・と、利用者が所有する電気自動車５０が主たる構成要素であり、前記総合管理センター８に設置された総合管理装置（管理サーバ）３０と、充電施設に設置された二次電池管理装置１０と、電気自動車５０に設けられた情報提供装置５１とが、インターネット３により通信可能に接続されて、二次電池供給システム１が構成されている。
【００２０】
また、利用者の所有する電気自動車の位置を検出するためにＧＰＳ衛星２が利用されており、情報提供装置５１と無線通信するための基地局４も設けられている。
【００２１】
さらに、利用者が電気自動車５０に乗車せずとも、各種情報を取得できるように、利用者の自宅や勤務先やインターネットカフェ等に設けられたパーソナルコンピュータ、あるいは携帯電話機やＰＤＡ等の携帯情報端末により構成される利用者端末（情報提供装置）７０が、インターネット３に通信可能に接続されている。
【００２２】
情報提供装置５１には、マイクロコンピュータ等が搭載されており、図２に示すように、タッチパネルへのタッチ入力や押下ボタンの押下といった利用者の操作により入力された入力信号を制御部６４に送信する入力部（入力手段）６１、道路地図と現在位置との情報のナビゲーション表示、及び二次電池１２が供給される充電施設の位置表示を行う表示部（出力手段、表示手段）６２、利用者を識別する利用者識別データ、利用者を認証する利用者認証データ、及び各種サービス用のポイントデータ等が記憶される識別情報記憶部６３や、各種制御動作を実行する制御部６４、識別情報記憶部６３に記憶されているデータを磁界通信装置１１に送信する磁界通信部６５、電波により基地局４と無線で通信する電波通信部６６、ＧＰＳユニット６７、及び車載されている二次電池１２の残容量を検出する残容量検出センサ６８により構成される。
【００２３】
前記識別情報記憶部６３に記憶されている利用者識別データは、電気自動車５０を識別する識別データとなり、これによって電気自動車５０単位で会員を識別できるようにしている。なお、前記識別情報記憶部６３と磁界通信部６５とにより、課金用の車載機と同様な機能が実現されている。従って、これらの識別情報記憶部６３と磁界通信部６５は、一般的なＥＴＣ車載機により構成しても良い。
【００２４】

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前記電波通信部６６は、制御部６４の制御に従って、二次電池１２の供給が可能な充電施設を問い合わせる充電施設問合せデータの送信、及び充電施設に二次電池１２の予約を依頼する予約依頼データの送信を実行する。これらのデータ送信に対する応答データを電波通信部６６が受信した際には、受信した応答データを制御部６４に送信する。

【００２５】

以上の構成により、情報提供装置５１は、総合管理装置３０に二次電池の供給が可能な充電施設を問い合わせること、総合管理装置３０により提供された情報に基づいて充電施設を道路地図上に表示して利用者に情報提供すること、及びこの情報に基づいて利用者が選択した充電施設に予約をすることができる。

【００２６】

なお、情報提供装置５１は、識別情報記憶部６３に代えて、挿入された記憶媒体からデータを読み取れる記憶媒体処理部を備えてもよい。この場合は、会員登録された利用者に会員カード等としての記憶媒体（例えば非接触ＩＣカード等）を発行し、この記憶媒体に前記利用者データを記憶させておくとよい。

【００２７】

これにより、挿入する記憶媒体を交換することができるため、利用者が複数台の電気自動車５０を所有しているような場合に、どの電気自動車５０を使用しても利用者の識別データを引き継ぎながら使用することが可能となる。

【００２８】

さらに、例えば利用者の支払い能力が消滅し、二次電池１２の供給を受ける際にエラーが出たような場合に、支払い可能な利用者の記憶媒体に交換して対応するといったこともできる。

【００２９】

次に、情報提供装置５１の表示部６２に表示する画面の構成について説明する。

【００３０】

図３は、情報提供装置５１の表示部６２に表示する画面の画面イメージ図を示す。この画面は、主に道路地図９１と、道路地図９１の一部に表示される一覧表示部８１により構成される。

【００３１】

道路地図９１には、充電施設の位置を示す充電施設マーク９２と、電気自動車５０の現在位置を示す現在位置マーク９４とを表示する。

【００３２】

一覧表示部８１には、充電施設を一覧表示すると共に、並べ替えボタンとして近い順ボタン８２と供給価格順ボタン８３とを表示する。

【００３３】

これにより、利用者は、図３（Ａ）に示すように、充電施設の位置と二次電池１２の供給価格とを確認することができ、現在位置から近い順や料金順で充電施設を検索することができる。そして、充電施設を予約する際には、利用者が一覧表示部８１で希望の充電施設を押下すれば、図３（Ｂ）に示すように予約ボタン８５が表示され、この予約ボタン８５を押下することで、情報提供装置５１によって充電施設に予約依頼データが送信されて二次電池１２を予約できる。

【００３４】

次に、図１に示す充電施設Ａ，Ｂ，Ｃ，・・・の構成および機能について説明する。

【００３５】

前記二次電池管理装置１０は、本実施の形態では、例えばＣＰＵ（制御手段）１５、ＲＯＭ、ＲＡＭ、ハードディスク、ＬＡＮボード等を有し、キーボードやマウス等の入力手段や液晶等のディスプレイ装置としての表示手段が接続されたパーソナルコンピュータであり、二次電池供給施設として機能する各充電施設Ａ，Ｂ，Ｃ，・・・にそれぞれ設けられている。また、該二次電池管理装置１０には、充電施設識別データ（充電施設識別情報）として、時期毎（例えば季節毎、月毎、日毎、曜日毎、時間帯毎等）の二次電池１２の

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供給価格設定と供給可否設定、各二次電池１２の現在の充電量、二次電池１２の利用用途（当該充電施設用あるいは電気自動車５０への供給用）、及び二次電池１２の予約状況等が記憶されている。

【００３６】

前記磁界通信装置１１は、電気自動車５０に設けられた磁界通信部６５と誘導電磁界により非接触でデータ通信し、利用者識別データ（利用者識別情報）及び利用者認証データ等のデータを取得する。この磁界通信装置１１は、例えばＥＴＣ（Electronic Toll Collection）に用いるゲート型のアンテナにより構成する。なお、識別情報取得手段は、この磁界通信装置１１に代えて、赤外線通信を行う赤外線通信装置、又は利用者の所持する記憶媒体の投入を受け付けてこの記憶媒体のデータを取得する媒体処理装置等、他の装置により構成してもよい。

【００３７】

前記充放電管理装置１３は、接続されている複数の二次電池１２について、個別に充放電を管理しており、二次電池１２を充電するものである。そして、充電完了した一部の二次電池１２が電気自動車に供給される。さらに、充電済みの二次電池１２の個数や充電状況等を、二次電池管理装置１０にデータ送信する。

【００３８】

次に、総合管理センター８が有する機能について説明する。

【００３９】

前記総合管理装置３０は、本実施の形態では、例えばＣＰＵ（制御手段）３５、ＲＯＭ、ＲＡＭ、ハードディスク、ＬＡＮボード等を有し、キーボードやマウス等の入力手段や液晶等のディスプレイ装置としての表示手段が接続されたサーバにより構成されている。この総合管理装置３０は、二次電池供給システム１に対して会員登録された利用者、及び二次電池１２を供給する充電施設を管理しており、該総合管理装置３０に記憶された管理データベース（ＤＢ）３１には、予め会員登録された利用者の利用者データと、予め会員登録された充電施設の充電施設データと、利用者と充電施設との間で二次電池１２が取り引きされた履歴である取引履歴データとが記憶されている。

【００４０】

前記利用者データは、利用者識別データ（例えば利用者ＩＤ）、利用者認証データ（例えばパスワード、共通鍵や秘密鍵や公開鍵といった鍵データ、または、指紋や虹彩による生体データ等）、及び利用者個人データ（例えば氏名、住所、電話番号、電子メールアドレス等）により構成される。

【００４１】

ここで、利用者識別データ及び利用者個人データは、会員毎に付与されるデータであり、これらと利用者個人データとで構成される利用者データは、原則として電気自動車５０単位で登録される。

【００４２】

また、前記充電施設データは、充電施設識別データ（例えば充電施設ＩＤ）、充電施設認証データ（例えばパスワード、または、共通鍵や秘密鍵や公開鍵といった鍵データ等）、及び充電施設固有データ（例えば充電施設位置、及び営業時間等）により構成される。

【００４３】

さらに、前記取引履歴データは、電気自動車の利用者に充電施設で二次電池１２を供給した際の取引データが蓄積されたものであり、この取引データは、利用者識別データ、充電施設識別データ、取引日時、及び取引金額により構成される。

【００４４】

また前記総合管理装置３０には、各種制御動作を実行するためのプログラムも記憶されている。このプログラムには、情報提供装置５１からの依頼を受けて、二次電池１２の提供が可能な充電施設についての充電施設情報を提供するプログラムが含まれている。

【００４５】

また、このプログラムには、利用者に各種サービスをホームページとして提供するため

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のＣＧＩ（Common Gateway Interface）プログラムも含まれている。このＣＧＩプログラムは、取引履歴データから各種条件によるデータ抽出を実行することができ、利用者端末７０でアクセスした利用者の操作に基づいて、二次電池１２の総合使用量を表示すること、及び月単位の使用量を表示すること等ができる。さらに、利用者による会員登録をホームページで受け付けて、利用者データを登録することや、充電施設の検索と予約を受け付けることもできる。

【００４６】

前記課金装置（課金サーバ）４０は、本実施の形態では、例えばＣＰＵ（制御手段）４５、ＲＯＭ、ＲＡＭ、ハードディスク、ＬＡＮボード等を有し、キーボードやマウス等の入力手段や液晶等のディスプレイ装置としての表示手段が接続されたサーバにより構成されている。この課金装置４０は、金融機関（例えば銀行や郵便局等）の預貯金口座に対する振込みシステムと接続されており、各充電施設Ａ，Ｂ，Ｃ，・・・で二次電池１２の供給を受けた電気自動車の利用者の預貯金口座に対して料金引き落としを行い、徴収した料金から所定の手数料を徴収し、残りを各充電施設の預貯金口座に振り込むものである。

【００４７】

この料金引き落としと振込みは、即時振替として課金の都度実行することや、クレジットカード決済により月単位で実行することができ、必要に応じて、引き落としと振込みの料金を相殺することもできる。

【００４８】

この課金装置４０に記憶される課金データベース４１には、会員登録を行っている利用者の利用者識別データ及び利用者課金用データ（例えば利用者に選択された決済方式、及び、決済方式が即時振替やクレジットカード決済であれば預貯金口座の口座番号）、会員登録を行っている充電施設の充電施設識別データ及び充電施設入金用データ（例えば充電施設の預貯金口座の口座番号）が事前登録により記憶されており、さらに、二次電池１２を実際に供給した取引履歴として、利用者識別データ、充電施設識別データ、取引金額、及び取引日時が随時記憶されている。また、この記憶部には、各種制御動作を実行するためのプログラムも記憶されている。

【００４９】

次に利用者端末７０の構成について説明する。

【００５０】

利用者端末７０は、利用者の自宅や勤務先やインターネットカフェ等に設けられたパーソナルコンピュータ、あるいは携帯電話機やＰＤＡ等の携帯情報端末により構成されている。この利用者端末７０は、ＣＰＵ（制御手段）７５、ＲＯＭ、ＲＡＭ、ハードディスク、ＬＡＮボード若しくは無線通信用アンテナ等を有し、キーボードやマウス若しくは押下ボタン等の入力手段や液晶等のディスプレイ装置としての表示手段が接続されている。

【００５１】

この利用者端末７０には、ＷＥＢブラウザや電子メールソフトがインストールされている。これにより、利用者端末７０は、インターネット３を介して総合管理装置３０と通信することができる。

【００５２】

ここで、利用者端末７０の表示部に表示する画面の構成について説明する。

【００５３】

図４は、検索画面３２の画面イメージ図を示す。この検索画面３２は、利用予定の位置を入力指定できるご利用位置３２１、利用予定の日時を入力指定できるご利用日時３２２、及び希望する供給価格を入力指定できる供給価格３２３の３項目によって構成されている。

【００５４】

これにより、利用者は、各検索条件を指定して検索実行ボタン３２４を押下することができ、この検索条件が利用者端末７０により総合管理装置３０へ送信される。

【００５５】

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図５は、検索結果表示画面３４の画面イメージ図を示す。この検索結果表示画面３４は、充電施設の地図表示と一覧表示とを行うものであり、検索条件を表示する検索条件表示部３４１、充電施設を地図表示する地図表示部３４２、会員登録を行う会員登録ボタン３４３、及び充電施設を一覧表示する充電施設一覧表示部３４４によって構成されている。

【００５６】

これにより、利用者は、前記検索条件に該当する１または複数の充電施設Ａ，Ｂ，Ｃ，・・・の位置を地図表示部３４２で確認し、また充電施設一覧表示部３４４で二次電池１２の供給価格や営業日時を比較することができる。そして、ある充電施設について詳細な情報を得たい場合には、詳細ボタン３４５を押下することで充電施設詳細表示画面３７に移行できる。

【００５７】

また、未入会の利用者が充電施設を検索して会員になろうと考えた場合に、会員登録ボタン３４３を押下してスムーズに会員登録できる。

【００５８】

ここで会員登録について説明すると、前記会員登録ボタン３４３が押下されると図示省略する会員登録画面を表示し、利用者に利用者個人データ（例えば氏名、住所、電話番号、電子メールアドレス等）を入力させ、これを受け付けた総合管理装置３０（図１）が、利用者識別データと利用者認証データを発行し、利用者の電子メールアドレスへの送信か郵送により、利用者識別データと利用者認証データを利用者に通知する。

【００５９】

なお、本二次電池供給システム１では、利用者が実際に二次電池１２の供給を受けるために、情報提供装置５１、特に識別情報記憶部６３が、利用者の所有する電気自動車５０に搭載されている必要がある。このため、会員登録する利用者には、情報提供装置５１を販売してもよい。

【００６０】

ただし、利用者が既に情報提供装置５１を所有している場合には、情報提供装置５１の識別情報記憶部６３に記憶されている利用者識別データ及び利用者認証データを総合管理装置３０に登録する作業を利用者に要求する。この登録作業は、まず会員登録の際に、利用者認証データと仮パスワードとを利用者に利用者端末７０で入力させて仮登録を行い、情報提供装置５１で、利用者認証データと仮パスワードとを入力させて利用者を認証した上で、情報提供装置５１の識別情報記憶部６３に記憶されている利用者認証データ及び利用者認証データを本登録するとよい。

【００６１】

図６は、充電施設詳細表示画面３７の画面イメージ図を示す。この充電施設詳細表示画面３７は、定休日や営業時間や二次電池供給価格といった充電施設の詳細な情報を表示する詳細表示部３７１、利用者に予約日時を指定させる予約日時指定部３７２、会員登録に移行する会員登録ボタン３７３、予約内容確認画面に移行する予約内容確認ボタン３７４、及び充電施設の位置を地図表示する地図表示部３７５により構成される。

【００６２】

これにより、利用者は、充電施設の詳細な情報を確認した上で、日時を指定して予約内容確認ボタン３７４を押下でき、この日時を含めた予約データが利用者端末７０により総合管理装置３０へ送信される。

【００６３】

以上のシステム構成により、二次電池管理装置１０は、充電が完了して供給可能になっている二次電池１２の個数や、二次電池１２を供給する供給価格（供給価格情報）等の情報を、総合管理装置３０に送信することができる。

【００６４】

電気自動車５０に設けられた情報提供装置５１は、利用者の操作によって、二次電池１２の供給を受けることができる充電施設を総合管理装置３０に問い合わせることができ、このときに充電施設側の都合や要望を反映させた充電施設情報の提供を受ける。このため

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、二次電池１２を供給できない状況の充電施設の情報が利用者に提供されるといったことを防止できる。そして、情報提供装置５１は、予約依頼データを総合管理装置３０に送信して二次電池１２を予約できる。

【００６５】

課金装置４０は、二次電池管理装置１０から二次電池１２の取引に関するデータを受信し、利用者に対して課金を実行することができる。

【００６６】

利用者は、この課金についてどのような決済方式によって行うのか、二次電池１２の供給を受ける際にその都度選択することができる。具体的には、利用者が現金以外の決済方式（例えば即時振替やクレジットカード決済）を登録していた場合は、利用者は、登録した決済方式と現金支払いとのいずれの方式により決済するか、その都度選択できる。決済方式として現金支払いを登録していた場合は、利用者は常に現金支払いを選択することとなる。

【００６７】

また、利用者は、総合管理装置３０によって提供されるホームページに利用者端末７０でアクセスして、会員登録、充電施設の検索、充電施設の予約、二次電池１２の総合使用量の確認、及び、月単位の使用量の確認といったことができる。

【００６８】

なお、前記情報提供装置５１による総合管理装置３０への充電施設の問い合わせと充電施設情報の提供は、情報提供装置５１が定期的に実行する、あるいは二次電池１２の残容量が一定の警告レベル以下となれば実行するなど、適宜のタイミングで実行する構成としてもよい。

【００６９】

次に、二次電池供給システム１の全体の動作として、利用者が事前に走行計画を立案して充電施設に予約するような場合に、利用者端末７０から充電施設情報を総合管理装置３０へ問い合わせ、利用者端末７０が充電施設に二次電池１２を予約するまでの動作について説明する。

【００７０】

図７は、二次電池供給システム１の動作を示すフローチャートであり、二次電池管理装置１０に設けられたＣＰＵ１５が実行する動作、総合管理装置３０に設けられたＣＰＵ３５が実行する動作、及び、利用者端末７０に設けられたＣＰＵ７５が実行する動作を示す。

【００７１】

利用者によって利用者端末７０のブラウザが起動され、利用者端末７０が総合管理装置３０により提供されるホームページ（ＨＰ）にアクセスすると（ステップＳ１）、総合管理装置３０は、利用者端末７０のブラウザに表示させる検索画面のデータを利用者端末７０に送信する（ステップＳ２）。

【００７２】

利用者端末７０は、受信した検索画面データにより、図４に示した検索画面３２を表示部に表示する（ステップＳ３）。

【００７３】

この検索画面３２で、検索条件が入力されて検索実行ボタン３２４が押下されると、利用者端末７０は総合管理装置３０に検索条件を送信して充電施設を問い合わせる問合せ処理を行い（ステップＳ４）、総合管理装置３０は、入力された検索条件を受け取り、この検索条件に該当する充電施設を管理データベース３１から抽出する（ステップＳ５）。このステップＳ５では、ご利用位置３２１から一定の範囲内にある充電施設を抽出する。

【００７４】

そして、総合管理装置３０は、抽出した充電施設に対して、二次電池１２を供給する条件である供給条件を問い合わせるデータを送信する（ステップＳ６）。ここで、供給条件とは、供給可能な日時や供給する価格といった条件を指し、二次電池１２の供給価格、定

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休日、及び営業時間等により構成される。

【００７５】

二次電池管理装置１０は、供給条件問合せデータを受信し、この問い合わせに応答する供給条件応答データを総合管理装置３０に送信する（ステップＳ７）。この供給条件応答データは、供給価格、定休日、営業時間、充電施設ＩＤ、及び充電施設位置により構成される。

【００７６】

総合管理装置３０は、複数の充電施設から供給条件応答データを受信し、前記ステップＳ５で受信した検索条件に基づいて充電施設を絞り込む（ステップＳ８）。

【００７７】

そして、総合管理装置３０は、絞り込んだ充電施設の情報を充電施設情報として利用者端末７０に送信する（ステップＳ９）。

【００７８】

利用者端末７０は、情報提供処理として、受信した充電施設情報に基づいて、図５に示した検索結果表示画面３４や図６に示した充電施設詳細表示画面３７に、検索条件に該当する充電施設を表示する（ステップＳ１０）。

【００７９】

この検索結果表示画面３４及び充電施設詳細表示画面３７により、充電施設が利用者に決定され、予約内容確認ボタン３７４が押下されると（ステップＳ１１）、利用者端末７０は、総合管理装置３０に予約データを送信する。

【００８０】

総合管理装置３０は、利用者にログインを求めるため、ログイン画面データを送信する（ステップＳ１２）。これを受けた利用者端末７０は、ログイン画面を表示し（ステップＳ１３）、このログイン画面で利用者に入力された利用者識別データと利用者認証データを総合管理装置３０に送信する（ステップＳ１４）。すでに利用者にログインされている場合には、前記ステップＳ１２～Ｓ１４を実行せず、次のステップＳ１５の処理を実行する。

【００８１】

総合管理装置３０は、受信した利用者識別データと利用者認証データにより利用者の認証を行い（ステップＳ１５）、認証結果が適合であれば予約内容を確認させる予約確認画面のデータを利用者端末７０に送信する（ステップＳ１６）。なお、認証結果が不適合の場合は、その旨を示すデータを利用者端末７０に送信して処理を終了する。

【００８２】

利用者端末７０は、受信した予約確認画面データに従って、図示省略する予約確認画面を表示し（ステップＳ１７）、画面上に表示した予約実行ボタンが押下されると、予約処理として予約データを総合管理装置３０に送信する（ステップＳ１８）。

【００８３】

総合管理装置３０は、受信した予約データに基づいて、利用者が予約するとして選択した充電施設の二次電池管理装置１０に、予約依頼データを送信する（ステップＳ１９）。このときの予約依頼データは、充電施設識別データ、利用者識別データ、利用者個人データ、供給希望日時、及び確認供給価格により構成される。ここで、確認供給価格は、利用者が確認した二次電池１２の供給価格であり、価格改定があった場合に、予約時と実際の供給時とで価格に差が生じることを防止するためのものである。また、これらの予約依頼データは、総合管理装置３０が利用者端末７０から受信した予約データと、管理データベース３１に記憶されている利用者データとに基づいて構成される。

【００８４】

二次電池管理装置１０は、予約依頼データを受信して予約を受け付け（ステップＳ２０）、受け付け可否を予約結果として総合管理装置３０に送信する。このとき、二次電池管理装置１０は、累計の予約個数が、希望日時に提供可能な個数を超えていないか等を基準に、充電施設側の都合を考慮して受け付け可否を判定する。

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【００８５】
総合管理装置３０は、受信した予約結果を、該当する利用者端末７０に転送し（ステップＳ２１）、この予約結果を受信した利用者端末７０は、予約結果を表示部に表示し（ステップＳ２２）、処理を終了する。
【００８６】
以上の動作により、図８に充電施設検索に関するデータ送受信の説明図を示すように、利用者は、自宅や勤務先など様々な場所で、パーソナルコンピュータや携帯情報端末といった利用者端末７０を用いて、二次電池１２の供給が受けられる充電施設を、総合管理センター８の総合管理装置３０に問い合わせることができる。
【００８７】
総合管理装置３０は、複数の充電施設に供給条件を問い合わせることができ、この問い合わせを受けた各充電施設の二次電池管理装置１０は、供給条件の応答を行うことができる。この供給条件には、充電施設側の都合や要望を反映することができる。
【００８８】
そして、各二次電池管理装置１０が供給条件を応答すると、これを総合管理装置３０が受信して統合し、利用者が指定した検索条件に合致する充電施設の情報を利用者端末７０に返信することができる。
【００８９】
このようにして、利用者端末７０は、二次電池１２の供給が受けられる充電施設情報を利用者に提供することができる。そして、利用者は、提供された複数の充電施設の情報に基づいて、走行予定の道路から行きやすい充電施設、あるいは供給価格の廉価な充電施設等を基準に充電施設を選択し、この選択した充電施設に予約することができる。
【００９０】
充電施設は、予約を受け付ける際に、充電施設側で設定した都合、つまり提供可能な日（定休日以外）であるか、提供可能な時刻（営業時間内）であるか、その日に提供を許容する個数を超えていないかといった都合を反映させて、予約の受け付けの可否を決定することができる。このため、充電施設の定休日に予約されるといったことを防止でき、利用者の満足度を向上させることができる。
【００９１】
次に、二次電池供給システム１の全体の動作として、二次電池１２を供給している充電施設を情報提供装置５１が総合管理装置３０に問い合わせ、情報提供装置５１が充電施設に二次電池１２を予約するまでの動作について説明する。
【００９２】
図９は、二次電池供給システム１の動作を示すフローチャートであり、電気自動車５０に設けられた情報提供装置５１の制御部６４が実行する動作、総合管理装置３０のＣＰＵ３５が実行する動作、及び二次電池管理装置１０のＣＰＵ１５が実行する動作を示す。
【００９３】
情報提供装置５１は、電気自動車５０に車載されて駆動電源として使用している二次電池１２の残容量を残容量検出センサ６８により検出すると共に（ステップＳ３１）、残容量が警告レベル（例えば残り１０％）に達するまでこの検出を繰り返す（ステップＳ３２：Ｎｏ）。
【００９４】
残容量が警告レベルに達すれば（ステップＳ３２：Ｙｅｓ）、情報提供装置５１は、二次電池１２の残容量が減少していることを表示部６２に表示する（ステップＳ３３）。なお、この表示は表示部６２に限らず、例えば電気自動車のインストルメントパネルにおけるメータ部に別途設けられた燃料計に表示する構成としてもよい。
【００９５】
情報提供装置５１は、表示部６２に充電施設の検索を促す画面を表示し、画面上の充電施設検索ボタンがタッチ入力されるまで待機する（ステップＳ３４：Ｎｏ）。なお、この充電施設検索ボタンは、常に画面上に表示して利用者が常時タッチ入力できるように構成

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してもよい。

【００９６】

前記充電施設検索ボタンがタッチ入力されると（ステップＳ３４：Ｙｅｓ）、情報提供装置５１は、問合せ処理として、充電施設を問い合わせる充電施設問合せデータを、電波通信部６６により総合管理装置３０に送信する（ステップＳ３５）。この充電施設問合せデータには、ＧＰＳユニット６７によりＧＰＳ衛星２から取得した現在の位置データと、電気自動車５０に車載されている二次電池１２の残容量と、利用者識別データとが含まれている。

【００９７】

総合管理装置３０は、前記充電施設問合せデータを受信するまで待機する（ステップＳ３６：Ｎｏ）。充電施設問合せデータを受信すると（ステップＳ３６：Ｙｅｓ）、受信した充電施設問合せデータから、電気自動車５０の位置データと、この電気自動車５０に車載されている二次電池１２の残容量とを取得し、この電気自動車５０が残容量で到着可能な範囲にある１または複数の充電施設を管理データベース３１から抽出する（ステップＳ３７）。このとき、営業時間内である充電施設を抽出するが、営業時間内であるか否かは、現在時刻が営業時間内か否かにより判定する。

【００９８】

なお、各充電施設が営業時間内であるか否かは、問い合わせのあった電気自動車５０がその充電施設に到着する到着予想時刻を、基準位置としての電気自動車５０の現在位置から充電施設までの距離と電気自動車５０の走行速度とに基づいて算出し、この到着予想時刻が営業時間内にあるか否かにより総合管理装置３０が判定する構成としてもよい。また、前記ステップＳ３７により抽出する充電施設は、到着可能な範囲にある充電施設のうち、電気自動車５０の現在の進行方向側または経路誘導方向側にあるものだけを抽出する構成としても良い。

【００９９】

そして、総合管理装置３０は、抽出した各充電施設の二次電池管理装置１０に、二次電池１２の供給が可能か否か問い合わせる供給可否問合せデータを送信する（ステップＳ３８）。

【０１００】

二次電池管理装置１０は、供給可否問合せデータを受信するまで待機する（ステップＳ３９）。供給可否問合せデータを受信すると、二次電池管理装置１０は、二次電池供給情報としての供給可否応答データを総合管理装置３０に送信する（ステップＳ４０）。この供給可否応答データには、二次電池１２の供給可能個数、供給価格、充電施設識別データが含まれており、時期による充電施設側の都合や要望が反映されている。

【０１０１】

総合管理装置３０は、二次電池管理装置１０から、供給可否応答データを受信する（ステップＳ４１）。そして、二次電池１２の供給が可能な充電施設を抽出し、その抽出した充電施設の充電施設識別データ、充電施設位置、及び供給価格により構成する供給可能充電施設データを情報提供装置５１に送信する（ステップＳ４２）。

【０１０２】

電気自動車５０に設けられた情報提供装置５１は、前記供給可能充電施設データを受信する（ステップＳ４３）。

【０１０３】

情報提供装置５１は、情報提供処理として、図３（Ａ）に示したように、受信した供給可能充電施設データに含まれている充電施設を、表示部６２の一覧表示部８１に表示すると共に、道路地図９１上に充電施設マーク９２として表示する（ステップＳ４４）。

【０１０４】

利用者によって画面上の並べ替えボタン（近い順ボタン８２または供給価格順ボタン８３）がタッチ入力されると（ステップＳ４５：Ｙｅｓ）、情報提供装置５１は、並べ替え処理として、指定された順序に充電施設表示を並べ替えて一覧表示部８１に表示する（ス

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テップＳ４６）。

【０１０５】

前記ステップＳ４６の後、あるいは前記ステップＳ４５で並べ替えが指定されなかった場合（ステップＳ４５：Ｎｏ）、情報提供装置５１は、図３（Ｂ）に基づいて説明したように利用者によって予約が行われるまで待機する（ステップＳ４７：Ｎｏ）。

【０１０６】

利用者によって予約が行われると（ステップＳ４７：Ｙｅｓ）、情報提供装置５１は、予約処理として、指定された充電施設を予約するための予約依頼データを総合管理装置３０に送信する（ステップＳ４８）。

【０１０７】

なお、予約依頼データを受信した総合管理装置３０は、予約依頼データに含まれている充電施設識別データを参照し、この充電施設識別データに該当する充電施設の二次電池管理装置１０へ予約依頼データを送信し、予約を完了させる。このとき、予約依頼データを受信した二次電池管理装置１０は、記憶部に記憶している予約状況のデータに予約依頼のあった利用者の利用者識別データを記憶する。

【０１０８】

情報提供装置５１は、予約した充電施設の充電施設マーク９２を道路地図９１上に表示し、他の充電施設の充電施設マーク９２は非表示として（ステップＳ４９）、処理を終了する。

【０１０９】

以上の動作により、図１０に充電施設通知に関するデータ送受信の説明図を示すように、電気自動車５０が走行用電源として使用している二次電池１２の残容量が一定量以下になると、情報提供装置５１は、充電済みの二次電池１２を交換用に供給している充電施設を、総合管理センター８の総合管理装置３０に問い合わせることができる。

【０１１０】

総合管理装置３０は、複数の充電施設に供給可否を問い合わせることができ、この問い合わせを受けた各充電施設の二次電池管理装置１０は、充放電管理装置１３により供給可能な二次電池１２があるか否かを判定することができる。この判定には、充電施設側の都合や要望を反映することができる。

【０１１１】

そして、各二次電池管理装置１０が供給可否の応答を行うと、これを総合管理装置３０が受信して統合し、供給可能な充電施設の情報を電気自動車５０の情報提供装置５１に返信することができる。

【０１１２】

このようにして、情報提供装置５１は、二次電池１２の供給が受けられる充電施設情報を利用者に提供することができる。そして、利用者は、提供された複数の充電施設の情報から、現在位置に近い充電施設、あるいは供給価格の廉価な充電施設といった任意の条件で絞り込むことができ、さらに、絞り込んで決定した特定の充電施設に予約することができる。

【０１１３】

これにより、利用者は、残容量の少なくなった二次電池１２を、充電済みの二次電池１２とスムーズに交換することができる。従って、二次電池１２の電力切れによる走行停止を防止することができる。

【０１１４】

次に、二次電池供給システム１の全体の動作として、電気自動車５０が充電施設で二次電池１２の交換を行って課金が完了するまでの動作について説明する。

【０１１５】

図１１は、二次電池供給システム１の動作を示すフローチャートであり、二次電池管理装置１０のＣＰＵ１５が実行する動作、総合管理装置３０のＣＰＵ３５が実行する動作、及び課金装置４０のＣＰＵ４５が実行する動作を示す。

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【０１１６】
二次電池管理装置１０は、磁界通信装置１１により信号送信を行い、電気自動車５０の磁界通信部６５から応答信号を磁界通信装置１１で検出するまで、すなわち電気自動車５０が存在することを検出するまで待機する（ステップＳ６１：Ｎｏ）。
【０１１７】
電気自動車５０を検出すると（ステップＳ６１：Ｙｅｓ）、二次電池管理装置１０は、磁界通信装置１１によって電気自動車５０の磁界通信部６５と通信し、識別情報記憶部６３に記憶されている利用者識別データ及び利用者認証データを取得する（ステップＳ６２）。
【０１１８】
二次電池管理装置１０は、取得した利用者識別データ及び利用者認証データが登録された会員のものであるか確認するため、総合管理装置３０に利用者の認証を依頼する（ステップＳ６３）。これにより、総合管理装置３０は、利用者識別データ及び利用者認証データによる認証処理を実行する。
【０１１９】
二次電池管理装置１０は、この認証依頼に対する総合管理装置３０の応答を受信し、認証結果が不適合であれば（ステップＳ６４：Ｎｏ）、正規会員であると確認できなかったことが原因で二次電池１２を供給できない旨を、適宜設けた表示装置（例えば液晶ディスプレイ）や音声出力装置（例えばスピーカ）により利用者に通知する（ステップＳ６５）。
【０１２０】
認証結果が適合であれば（ステップＳ６４：Ｙｅｓ）、二次電池管理装置１０は、記憶部に記憶している予約状況と前記利用者識別データとを照合して予約有りの利用者か否かを判定する。
【０１２１】
この判定の結果、予約有りの利用者であれば（ステップＳ６６：Ｙｅｓ）、予約の際に確保していた二次電池１２を交換用に供給する（ステップＳ６７）。
【０１２２】
前記判定の結果、予約のない利用者であった場合には（ステップＳ６６：Ｎｏ）、二次電池管理装置１０は、供給可能な二次電池１２があるか否か判定する。そして、供給可能な二次電池１２がなければ（ステップＳ６８：Ｎｏ）、二次電池１２を供給できない旨を適宜設けた表示装置や音声出力装置により利用者に通知し（ステップＳ６５）、処理を終了する。
【０１２３】
供給可能な二次電池１２があった場合には（ステップＳ６８：Ｙｅｓ）、二次電池管理装置１０は、予約されていない任意の二次電池１２を交換用に供給する（ステップ６９）。
【０１２４】
二次電池管理装置１０は、二次電池１２の供給が完了するまで、すなわち、電気自動車５０から残容量の少ない二次電池１２を回収し、充電済みの二次電池１２を電気自動車５０に供給し、この交換が完了するまで待機する（ステップＳ７０：Ｎｏ）。
【０１２５】
二次電池１２の供給が完了すると（ステップＳ７０：Ｙｅｓ）、二次電池管理装置１０は、識別情報記憶部６３に記憶されているポイントを磁界通信装置１１で読み取り、供給した電力量（若しくは走行距離）に対応するポイントを加算して識別情報記憶部６３に記憶させる（ステップＳ７１）。そして、取引情報送信処理として、二次電池１２を供給したことを示す取引データを総合管理装置３０へ送信する（ステップＳ７２）。
【０１２６】
なお、このとき総合管理装置３０へ送信する取引データは、供給した二次電池１２の充電量から回収した二次電池１２の残容量を減算した値に現在の供給価格の単価を乗算して

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得た取引金額、利用者の利用者識別データ、充電施設の充電施設識別データ、充電施設認証データ、取引日時、及び決済方式等により構成する。この取引データにおける決済方式は、二次電池１２の供給時に利用者に選択された決済方式である。

【０１２７】

総合管理装置３０は、取引データを受信するまで待機しており（ステップＳ７３：Ｎｏ）、取引データを受信すると（ステップＳ７３：Ｙｅｓ）、受信した取引データを確認する（ステップＳ７４）。

【０１２８】

総合管理装置３０は、取引データに含まれている充電施設識別データ及び充電施設認証データを、記憶部に記憶している充電施設識別データ及び充電施設認証データと照合し、認証を行う（ステップＳ７５）。

【０１２９】

認証結果が適合であれば（ステップＳ７６：Ｙｅｓ）、総合管理装置３０は、課金装置４０へ課金データの送信を行う（ステップＳ７７）。この課金データは、前記取引データのうち、利用者識別データ、充電施設識別データ、取引金額、取引日時及び決済方式により構成する。

【０１３０】

認証結果が不適合であれば（ステップＳ７６：Ｎｏ）、認証が不適合である旨をエラーデータとして二次電池管理装置１０へ送信する（ステップＳ７８）。

【０１３１】

課金装置４０は、総合管理装置３０から課金データを受信するまで待機し（ステップＳ７９：Ｎｏ）、課金データを受信すると（ステップＳ７９：Ｙｅｓ）、受信した課金データを確認する（ステップＳ８０）。

【０１３２】

課金装置４０は、利用者に選択された決済方式が即時振替であれば（ステップＳ８１：Ｙｅｓ）、即時振替を実行する（ステップＳ８２）。

【０１３３】

この即時振替では、課金データベース４１を参照し、利用者識別データが一致する利用者課金用データを抽出する。そして、課金装置４０は、料金徴収処理として、抽出した利用者課金用データの利用者の預貯金口座から料金（取引金額）の引き落としを実行する。

【０１３４】

さらに、課金装置４０は、料金支払処理として、課金データベース４１を参照し、充電施設識別データが一致する充電施設入金用データを抽出し、抽出した充電施設入金用データに含まれている充電施設の預貯金口座へ料金（取引金額から手数料を減算した料金）の振込みを実行する。

【０１３５】

利用者に選択された決済方式がクレジットカード決済であれば（ステップＳ８３：Ｙｅｓ）、課金装置４０は、クレジットカードによる決済を実行する（ステップＳ８４）。このクレジットカード決済では、料金支払処理として利用者の信用によってクレジットカード会社が充電施設に料金を支払い、料金徴収処理として月毎にまとめて利用者から料金を徴収する。このときのクレジットカード会社は、総合管理センター８であってもよく、また、他のクレジットカード会社であってもよい。

【０１３６】

利用者に選択された決済方式が即時振替ではなく（ステップＳ８１：Ｎｏ）、クレジットカード決済でもなかった場合には（ステップＳ８３：Ｎｏ）、現金決済がなされたと判定して処理を終了する。

【０１３７】

以上の動作により、図１２の課金に関するデータ送受信の説明図に示すように、充電施設の二次電池管理装置１０は、電気自動車５０を検出して利用者データを取得し、総合管理装置３０に利用者の認証を依頼して認証結果を得ることができる。そして、認証結果が

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適合であれば現在の供給価格で二次電池１２を供給（交換）して取引を行い、取引完了後に取引データを総合管理装置３０へ送信することができる。この取引データを受信した総合管理装置３０は、充電施設を認証した上で課金装置４０へ課金データを送信することができ、課金装置４０は、利用者に対して、二次電池１２が供給される際に選択された決済方式で課金することができる。

【０１３８】

従って、利用者がどの充電施設で二次電池１２の供給を受けても、課金装置４０は、当該利用者から料金を適切に徴収できる。また、充電施設が二次電池１２をどの利用者に提供しても、課金装置４０は、当該充電施設に料金を適切に支払える。

【０１３９】

以上詳述したように、本実施態様の二次電池供給システム１は、二次電池管理装置１０が、二次電池の供給可否または供給可能個数に関する供給可否応答データと、二次電池の供給価格とを、総合管理装置３０へ送信するものである。

【０１４０】

この構成によれば、充電施設では二次電池１２を供給するか否か、及び二次電池１２の供給価格を自由に決定することができ、充電施設側の都合や要望を自由に反映した充電施設情報を提供ことができる。

【０１４１】

これにより、二次電池１２を供給できない状況の充電施設についての情報が提供されるといったことを防止でき、利用者の満足度を向上させることができる。

【０１４２】

また、充電施設の位置と二次電池１２の供給価格とを表示部６２に表示し、表示した充電施設のうち、任意の充電施設の選択入力を入力部６１により許容し、選択入力された充電施設の二次電池１２を予約するものであるから、利用者は、二次電池１２の供給が受けられる充電施設の情報を容易に知ることができ、かつ予約することができる。

【０１４３】

また、利用者による入力部６１への指示入力により、電気自動車５０の現在位置から充電施設までの距離順または二次電池１２の供給価格順に充電施設の表示を並び替えるものであるから、利用者は、距離や価格が希望に沿う充電施設を容易に検索することができる。

【０１４４】

また、二次電池管理装置１０は、利用者を識別する利用者識別データを磁界通信部６５により取得し、二次電池１２を供給する際に、取得した利用者識別データと充電施設識別データと実際の取引金額情報とを送信し、これを受信した課金装置４０は、受信したデータに基づく課金を実行するものであるから、二次電池管理装置１０を設置した充電施設は、二次電池１２の供給による収入を確実に得ることができる。

【０１４５】

このようにして、利用者は二次電池１２を交換することができ、充電施設は交換した際の供給電力量に応じた課金を行うことができる。

【０１４６】

従って、充電施設では、電気自動車５０への供給用途と、充電施設で利用する充電施設用途との両用途に二次電池１２を活用することができ、二次電池１２の有効活用を図ることができる。

【０１４７】

また、利用者は二次電池１２の供給を受ける際に決済方法を選択することができ、課金装置４０はこの決済方法に従って課金することができる。そして、必要に応じて、振込額と引落額の相殺を行うことができる。

【０１４８】

また、総合管理装置３０は、取引データを蓄積しているため、どの充電施設の売り上げが良いか、立地条件や供給価格の影響はあるか等、営業分析を行うことができる。

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【０１４９】
なお、以上の実施形態では、電気自動車５０の情報提供装置５１から問い合わせを受けた時点で、総合管理装置３０が二次電池管理装置１０に供給可否や供給価格を問い合わせる構成としたが、二次電池管理装置１０が常に供給可否や供給価格を総合管理装置３０に送信し、この供給可否や供給価格を総合管理装置３０が記憶し管理する構成としてもよい。
【０１５０】
この場合、二次電池管理装置１０が総合管理装置３０に供給可否や供給価格を送信するタイミングは、１０分毎や３０分毎といった定期的なタイミング、または、二次電池１２の供給を行った時や充電完了した時、または、供給可否を切り替える時といった不定期なタイミングに設定することができる。
【０１５１】
この構成により、総合管理装置３０は、各充電施設における二次電池１２の供給可否及び供給価格を常時把握することができ、電気自動車５０の情報提供装置５１から問い合わせがあった時に、二次電池１２を供給可能な充電施設とその供給価格とを即座に応答することができる。
【０１５２】
また、二次電池１２の供給価格は、電気自動車５０の利用者に関係なく、充電施設側の都合や要望のみで決定したが、例えば、ある充電施設に対して特別会員となっている利用者には、その充電施設について別途設定した特別会員価格で二次電池１２の情報を提供して、二次電池１２を取り引きする構成としてもよい。
【０１５３】
この場合、利用者が二次電池供給システム１に会員登録する際に、どの充電施設を中心に利用するか予め選択させ、この選択された充電施設の特別会員として利用者データを構成し、この利用者データを管理データベース３１に記憶すればよい。
【０１５４】
これにより、各充電施設のサービス性向上を図ることができ、充電施設間の競争を促し、電気自動車５０のさらなる普及を促進することができる。
【０１５５】
また、電気自動車５０に情報提供装置５１を搭載しなければ、利用者は二次電池１２の供給を受けられない構成としたが、情報提供装置５１を搭載しなくとも、会員登録がなされると利用者識別データ（例えば利用者ＩＤ）及び利用者認証データ（例えば暗証番号）を利用者に通知しておきこれらの入力を充電施設の二次電池管理装置１０で受け付ける、あるいは利用者に会員カード等として発行した記憶媒体から二次電池管理装置１０が利用者識別データ及び利用者認証データを読み取ることで、二次電池１２を供給できる構成としてもよい。
【０１５６】
また、充電施設における二次電池１２の供給は、利用者を認証した後に実行する構成としたが（図１１のステップＳ６１～Ｓ６４）、識別情報記憶部６３なしで走行した場合や、特殊な事情により識別情報記憶部６３が壊れた場合を想定し、充電施設を管理する者への連絡により、現金払いまたは請求書・信用などで、二次電池１２の供給を許容する構成としてもよい。この場合は、該当する充電施設の管理者の責任において行えばよい。
【０１５７】
また、デビットカードによる決済等、さらに多くの決済方式を利用者が選択できるように構成してもよい。これにより、利用者の利便性が向上する。
【０１５８】
（他の実施の形態）
上記の第一の実施の形態は、特に、広い範囲に亘る公道を運行する車に車載する二次電池の管理を扱う二次電池供給システムとして、本発明の適用を考えたものである。
【０１５９】

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しかし、このような広い不特定空間を移動する車だけでなく、範囲地域が定まっている場合、ルートが定まっている場合、一部公道を使うことがあるにしても私用地内を主として循環するような場合等の特定空間（閉空間とも言える）に適用する場合も考えられる。

【０１６０】

例えば、牧場や農場、リゾートランド、リゾート島、食品を取り扱う市場（いちば）、宅配また郵便等の配送車及び集配車の巡回地域、さらに、コンビニエンスストア、ベンディングマシンへの集配車などの巡回地域への適用である。自動車の騒音、排気ガスによる汚染や、食品、牧草、家畜、住宅地への悪影響の解決のため、二次電池を用いた電気自動車の導入は緊急に必要とされている。

【０１６１】

このような特定空間（閉空間）おいては、その特定空間の具体的な性格により、例えば、市場（いちば）では現在位置の情報を知らせるＧＰＳユニットなどが不要となる、牧場や農場では料金処理が不要となる、などのより簡素なシステム、あるいは、その空間独特の季節による一部充電施設の閉鎖又は移動などの機能を加えたものとして適用することも可能である。また、特定空間（閉空間）における充電施設は、完全無人化とすることが望ましい。

【０１６２】

ここで、本発明を、特定空間に適用した他の実施の形態例を複数説明する。

【０１６３】

（第二の実施の形態としての、農場・牧場への適用）

図１３は、本発明を適用した農場・牧場の平面図を示す。これは、かなり広い敷地内に、農地、牧場、ふれあい広場、貸キャンプ場を持つ農場・牧場への適用例である。ここでは、母屋と同棟或は母屋に近接して総合管理装置３０と充電施設Ａ１、基地アンテナ４を、農機具の機器管理舎近接して充電施設Ｂ１を、キャンプ場の管理舎に充電施設Ｃ１を、ふれあいセンターに近接して充電施設Ｄ１を、配設している。それぞれの充電施設は二次電池管理装置を有する。農地、牧場、ふれあい広場、貸キャンプ場などに用事のある車或は巡回する管理車、警備車等は、それぞれ交換可能な二次電池を載備した電気自動車５０で、情報提供装置５１も車載している。第一の実施の形態で示したように同名称の構成要素は、同様な通信連絡を相互に行い適宜二次電池の充電管理、情報管理を行う。

【０１６４】

この第二の実施の形態は、リゾートランド、リゾート島へも同様に適用できることを示している。

【０１６５】

（第三の実施の形態としての、魚・青果市場への適用）

図１４は、本発明を適用した魚・青果市場の平面図を示す。これは、魚市場と青果市場、ここでは卸売市場を想定、とが、一緒の敷地内にある場合の適用例である。関連事業者棟と同棟或は近接して総合管理装置３０と充電施設Ａ２、基地アンテナ４を、市場の各コーナーには充電施設Ｂ２、Ｃ２，Ｄ２及びＥ２を、配設している。それぞれの充電施設は二次電池管理装置を有する。市場用の車或は市場を巡回する管理車、警備車等は、それぞれ交換可能な二次電池を載備した電気自動車５０で、情報提供装置５１も車載している。第一の実施の形態で示したように同名称の構成要素は、同様な情報の通信連絡を相互に行い適宜二次電池の充電管理、情報管理を行う。

【０１６６】

このような生鮮食品を扱う市場の場合、騒音、排気ガス、炭酸ガスの排除は重要事項であり、本発明の適用は意義が大きい。また、市場の場合、面積はそれほどの大きさでないため、ＧＰＳは不要となることが多い。充電施設は、充電施設の規模、市場の広さや車の数に応じて設ければよい。１つの充電施設で１０台位の同時期の二次電池交換は可能である。第二と第三の実施の形態のような特定空間では、１日に走行する車の数、走行距離の推定が可能であり、二次電池の容量を配慮して、用意する１日の充電済み二次電池の個数把握を可能とできる。

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【０１６７】
（第四の実施の形態としての、宅配便システムへの適用（地域巡回システムへの適用））
図１５は、本発明を適用した宅配便システムの巡回地域の平面図を示す。これは、単位巡回地域（宅配地域）の隣接した集合からなる場合の適用例である。１単位の宅配地域には、宅配集配基地に総合管理装置３０Ａと充電施設Ａ３と基地アンテナ４Ａを、有する。さらに、その宅配地域の南西コーナーには、充電施設Ｂ３を配設している。その南側に隣接する１単位の宅配地域には、宅配集配基地に総合管理装置３０Ｂと充電施設Ｃ３と基地アンテナ４Ｂを、市場の南西コーナーには充電施設Ｄ３を、配設している。それぞれの充電施設は二次電池管理装置を有する。同様に、東側、北側の隣接する各１単位の宅配地域に総合管理装置と充電施設と基地アンテナを、さらに、その宅配地域の南西コーナーには、充電施設を配設している。図１５には、コーナーの充電施設Ｆ３，Ｅ３，Ｇ３，Ｈ３のみが示されている。各単位の宅配地域巡回する宅配集配車である電気自動車管理車５０は、それぞれ交換可能な二次電池を載備し、情報提供装置５１も車載している。第一の実施の形態で示したように同名称の構成要素は、同様な情報の通信連絡を相互に行い適宜二次電池の充電管理、情報管理を行う。
【０１６８】
この例は、郵便等の配送車及び集配車の巡回地域、さらに、コンビニエンスストア、ベンディングマシンへの集配車などの巡回地域への同様な適用が可能であることも示している。特に、郵便局を基地とするポストを回っての郵便物の収集や、集配局を基地とする担当局への、また、からの郵便物の集配は、予め決められた地域で、予め決められた場所にあるポストや局を集会するパターンであり、同様な適用に適している。これらは、限られた地域のみの巡回であるため、基地にて一回二次電池を搭載したら何キロまたは、何周走行できるかの把握は可能である。
【０１６９】
図１５では、各地域のコーナーに充電施設を設けた例を示しているが、地域がそれほど大きくなければ、二次電池の充電と交換は、集配基地に設けた充電施設で十分である。この場合、二次電池の交換は、基地の充電施設のみとなり、他の二次電池の交換処点である充電施設を通知することも必要ないが、地域を巡回する車の所在地を確認したいことも多く、ＧＰＳユニットは必要となろう。第一の実施の形態の場合と異なり、充電施設が分からないことはなく、また、予約及び確認の必要なこともない。車両の管理も基地で行われることとなろう。この場合総合管理装置３０Ａ，３０Ｂは二次電池の供給が可能な充電施設に関する充電施設情報を応答するとしても、緊急時を除き、選択せずに主要な充電施設に関する充電施設情報を応答すればよい。
【０１７０】
さらに、図１６は、第四の実施の形態における情報提供装置５１と充電施設Ａ３との関係を説明するブロック図で、第一の実施の形態における図２とその説明に示すものと同符号を付したブロックの機能は同じである。図１６に示すように、情報提供装置５１を持つ車両から充電施設Ａ３に対し、情報提供装置５１の残容量検出センサ６８で検出された残容量データを送信することとすれば、充電施設Ａ３での円滑な電池交換の対応が可能となる。また、情報提供装置５１のＧＰＳユニット６７からの信号を電波通信部６６を通して充電施設Ａ３で受け、距離測定部１６で測定し、車までの距離と二次電池残量とにより、通知時期を算出し、車のドライバーに通知部１７を通して通知することとして、二次電池の容量が無くなり車が立ち往生する機会をなくすことを可能とできる。図１６では、磁界通信部６５が省略されているが、他の電子キーなどで代用できる場合、利用者を識別する利用者識別データを特に取得しなくてもよい場合が考えられるからである。
【０１７１】
地域が大きい場合には、図１５で示したような、各地域のコーナーに充電施設を設けた例が有効になる。すなわち、図１５の例では、充電施設を各宅配地域の南西に一つ加えて設けているが、この各単位の宅配地域が、四方を他の単位の宅配地域に囲まれているとす

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れば、四方の単位の宅配地域のコーナーの充電施設で囲まれることとなり、このコーナーの充電施設を隣接する宅配地域の総合管理装置が共通に管理でき、使用可能とすることにより、充電施設の数を増やすことなく極めて利便性の高い二次電池供給システムとできる。

【０１７２】

なお、この発明は、上述の実施の形態の構成のみに限定されるものではなく、多くの実施の形態を得ることができる。

【産業上の利用可能性】

【０１７３】

この発明にかかる二次電池供給システム及び二次電池供給方法は、電気自動車等の二次電池の利用者に充電施設の情報を提供するシステム又は方法として有用で、多くの産業上の利用可能性がある。

【図面の簡単な説明】

【０１７４】

【図１】本発明の第一の実施の形態としての二次電池供給システムのシステム構成図。

【図２】第一の実施の形態における情報提供装置の構成を示すブロック図。

【図３】第一の実施の形態における情報提供装置に表示する画面の画面イメージ図。

【図４】第一の実施の形態における利用者端末に表示する検索画面の画面イメージ図。

【図５】図４の利用者端末に表示する検索結果表示画面の画面イメージ図。

【図６】図４の利用者端末に表示する充電施設詳細表示画面の画面イメージ図。

【図７】第一の実施の形態における二次電池供給システムの利用者端末を中心とした動作を示すフローチャート。

【図８】図７における充電施設情報の提供に関するデータ送受信の説明図。

【図９】第一の実施の形態における二次電池供給システムの情報提供装置を中心とした動作を示すフローチャート。

【図１０】図９における充電施設情報の提供に関するデータ送受信の説明図。

【図１１】第一の実施の形態における二次電池供給システムの課金装置を加えた動作を示すフローチャート。

【図１２】図１１における課金に関するデータ送受信の説明図。

【図１３】本発明を適用した第二の実施の形態としての、農場・牧場の平面図。

【図１４】本発明を適用した第三の実施の形態としての、魚・青果市場の平面図。

【図１５】本発明を適用した第四の実施の形態としての、宅配便システムの平面図。

【図１６】本発明を、特定空間に適用した場合の第四の実施の形態における情報提供装置と充電施設との関係を説明するブロック図。

【符号の説明】

【０１７５】

１　二次電池供給システム、１０　二次電池管理装置、１１　磁界通信装置、１２　二次電池、１３　充放電管理装置、１５　ＣＰＵ、１６　距離測定部、３０　総合管理装置、３５　ＣＰＵ、４０　課金装置、４５　ＣＰＵ、５０　電気自動車、５１　情報提供装置、６１　入力部、６２　表示部、６４　制御部、７０　利用者端末、７５　ＣＰＵ、Ａ，Ｂ，Ｃ，Ａ１，Ａ２，Ａ３　充電施設、Ｓ４，Ｓ３５　問合せ処理、Ｓ１０，Ｓ４４　情報提供処理、Ｓ１８，Ｓ４８　予約処理、Ｓ４６　並べ替え処理、Ｓ７２　取引情報送信処理、Ｓ８１～Ｓ８４　料金徴収処理、料金支払い処理。

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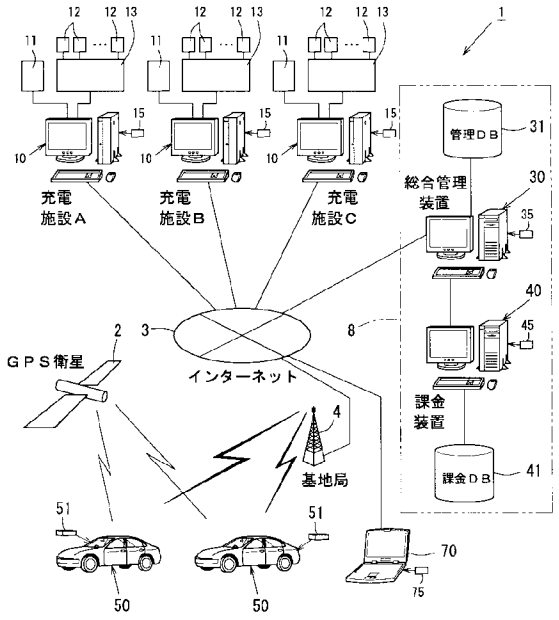
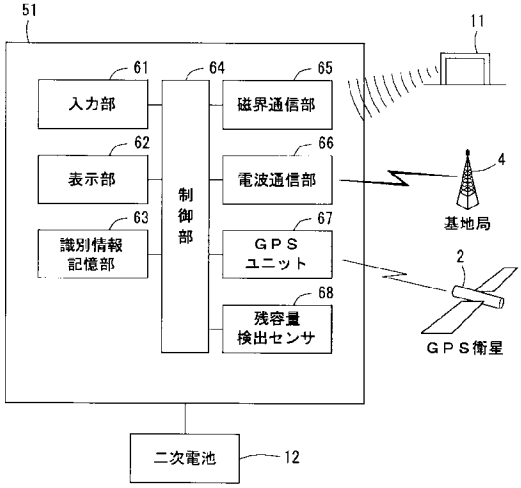
【図１】



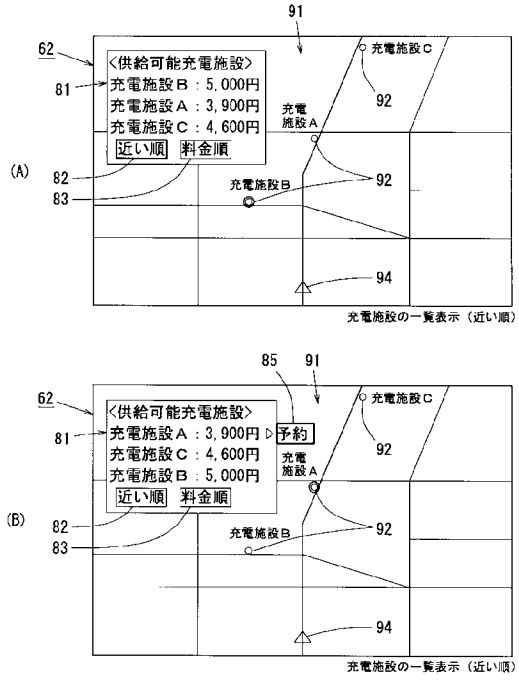
1…二次電池供給システム　12…二次電池　50…電気自動車
10…二次電池管理装置　13…充放電管理装置　51…情報提供装置
11…磁界通信装置　15, 35, 45, 75…ＣＰＵ　70…利用者端末

【図２】



11…磁界通信装置
51…情報提供装置

【図３】



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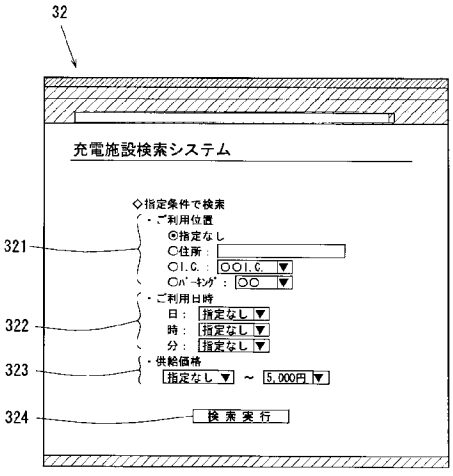

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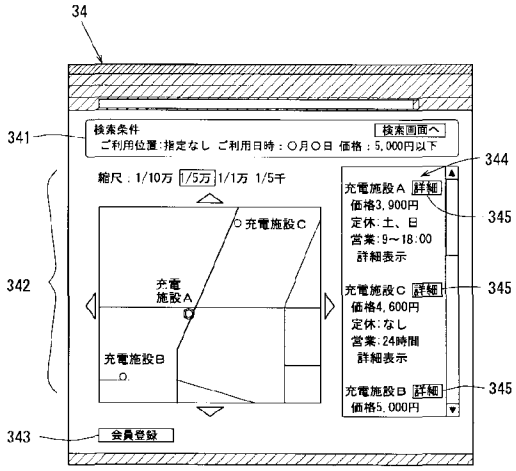
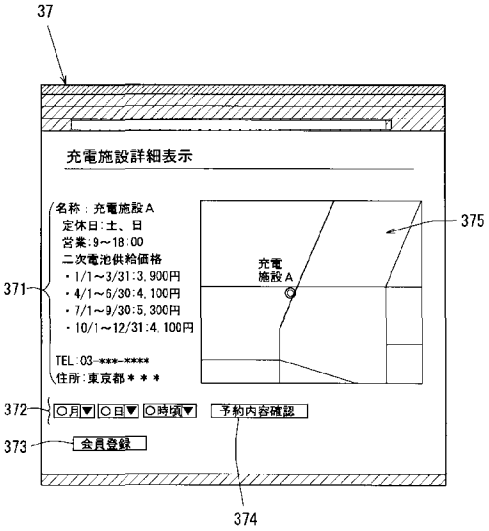
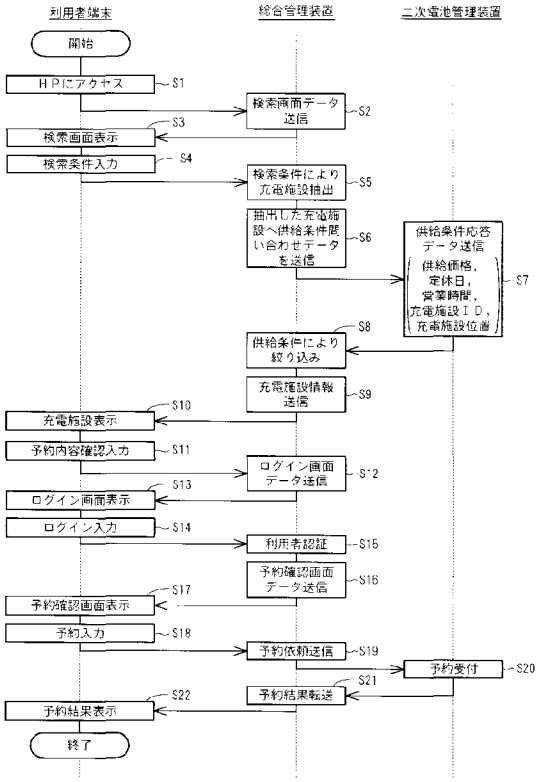
【図５】


34
検索条件
ご利用位置：指定なし ご利用日時：○月○日 価格：5,000円以下
検索画面へ
341
縮尺：1/10万 1/5万 1/1万 1/5千
342
○充電施設C
充電施設A
充電施設B
343
会員登録
344
充電施設A 詳細
価格3,900円
定休：土、日
営業：9～18:00
詳細表示
345
充電施設C 詳細
価格4,600円
定休：なし
営業：24時間
詳細表示
345
充電施設B 詳細
価格5,000円
345

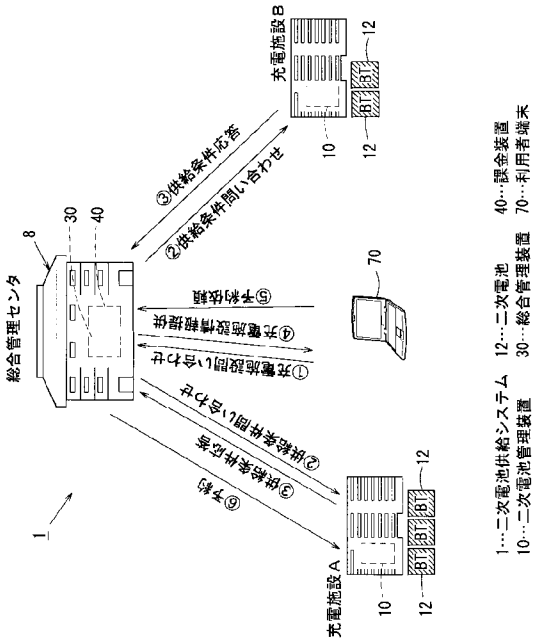
【図６】


37
充電施設詳細表示
名称：充電施設A
定休日：土、日
営業：9～18:00
二次電池供給価格
・1/1～3/31：3,900円
・4/1～6/30：4,100円
・7/1～9/30：5,300円
・10/1～12/31：4,100円
TEL：03-****-****
住所：東京都＊＊＊
371
充電施設A
375
372
○月 ○日 ○時頃
予約内容確認
373
会員登録
374

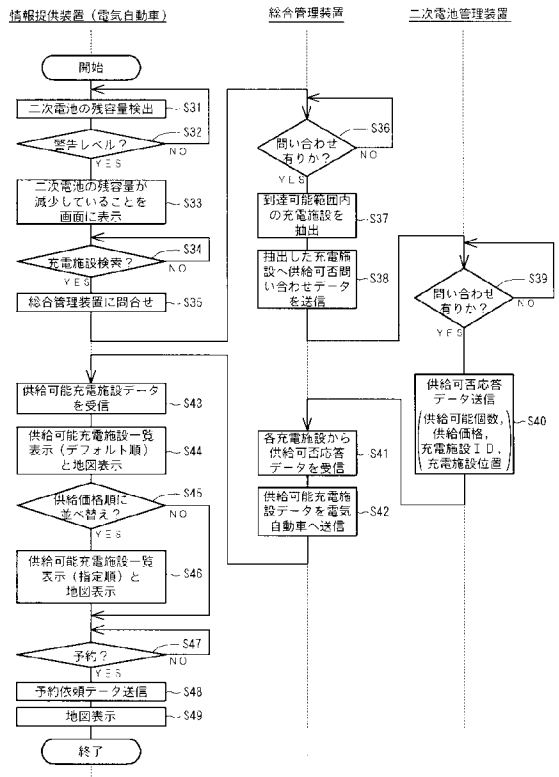
【図７】


利用者端末
総合管理装置
二次電池管理装置
開始
HPにアクセス S1
検索画面データ送信 S2
検索画面表示 S3
検索条件入力 S4
検索条件により充電施設抽出 S5
抽出した充電施設へ供給条件問い合わせデータを送信 S6
供給条件応答データ送信
供給価格，定休日，営業時間，充電施設ＩＤ，充電施設位置 S7
供給条件により絞り込み S8
充電施設情報送信 S9
充電施設表示 S10
予約内容確認入力 S11
ログイン画面データ送信 S12
ログイン画面表示 S13
ログイン入力 S14
利用者認証 S15
予約確認画面データ送信 S16
予約確認画面表示 S17
予約入力 S18
予約依頼送信 S19
予約受付 S20
予約結果転送 S21
予約結果表示 S22
終了

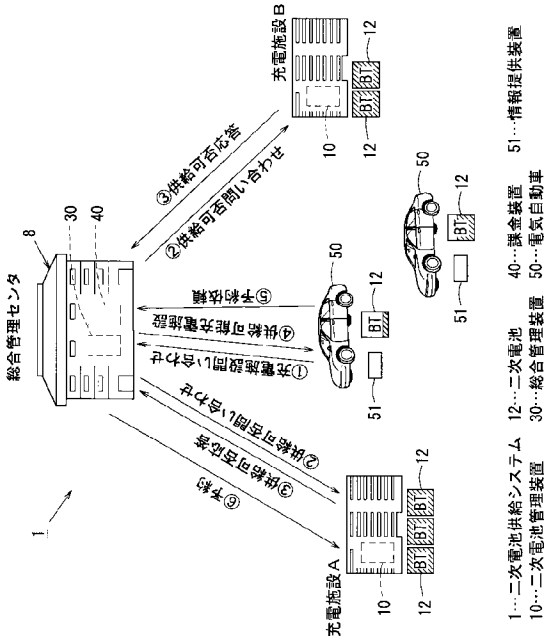
【図８】


充電施設B
充電施設A
総合管理センタ
①充電施設問い合わせ
②供給条件問い合わせ
③供給条件応答
④充電施設情報提供
⑤予約依頼
⑥予約
1…二次電池供給システム
10…二次電池管理装置
12…二次電池
30…総合管理装置
40…課金装置
70…利用者端末

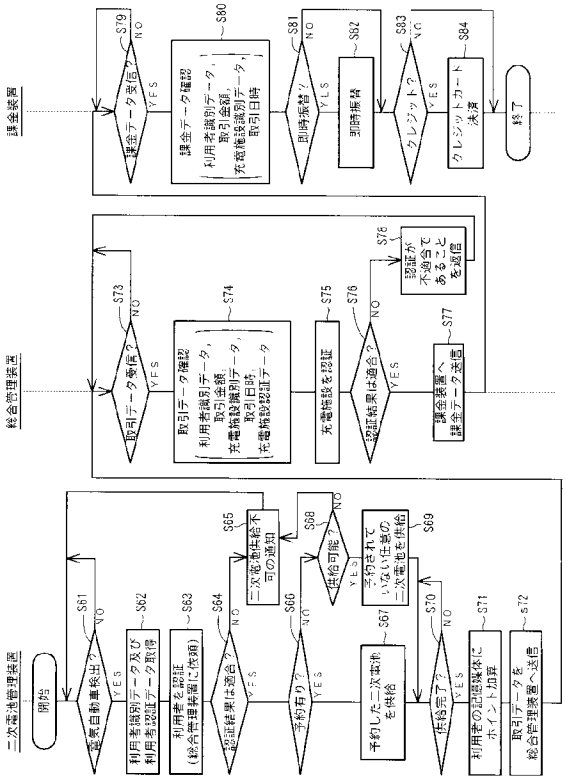
【図９】



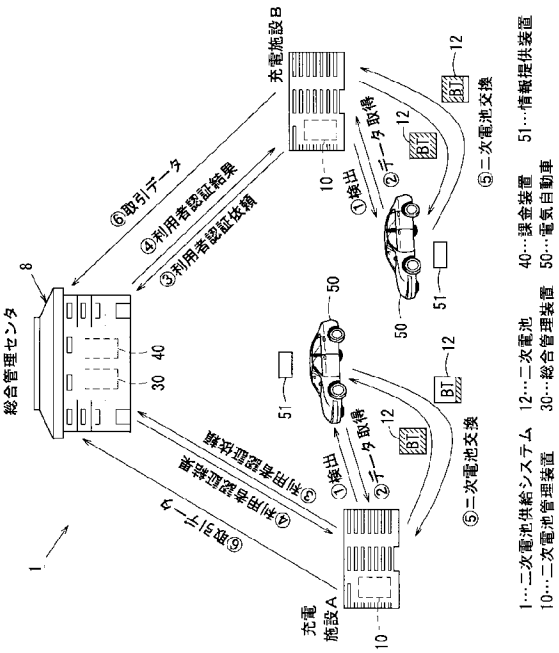
【図１０】



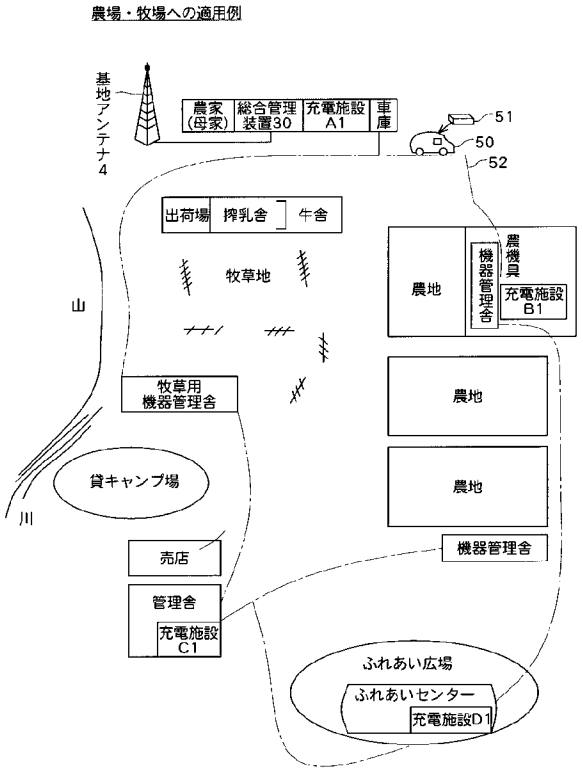
【図１１】



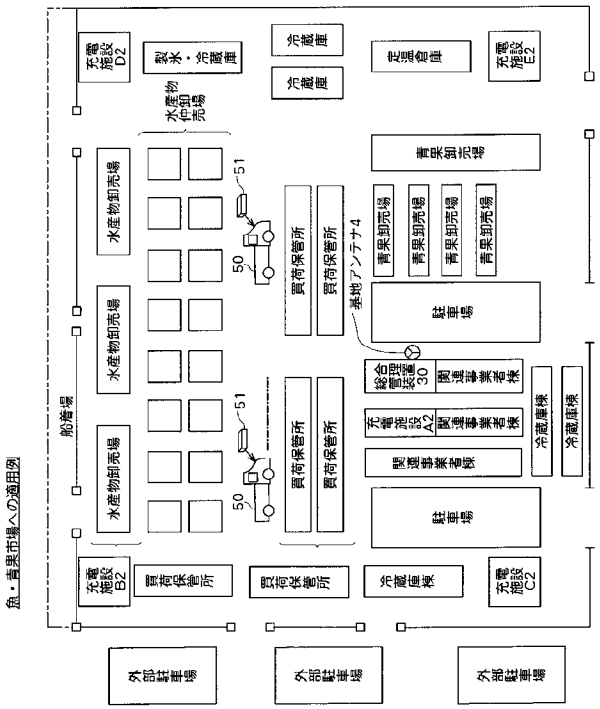
【図１２】



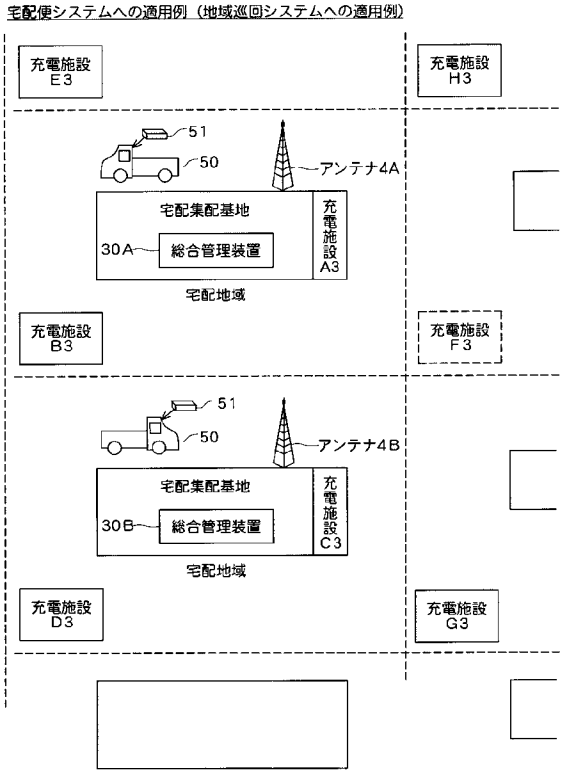
【図１３】



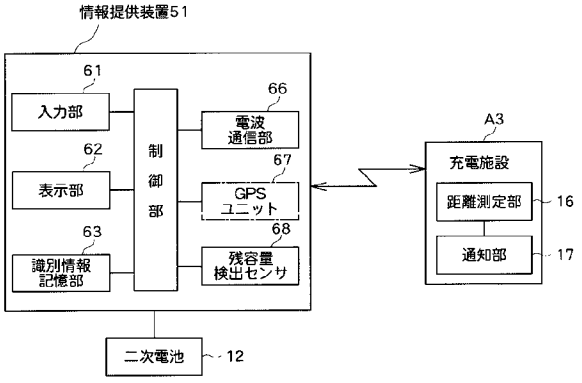
【図１４】



【図１５】



【図１６】



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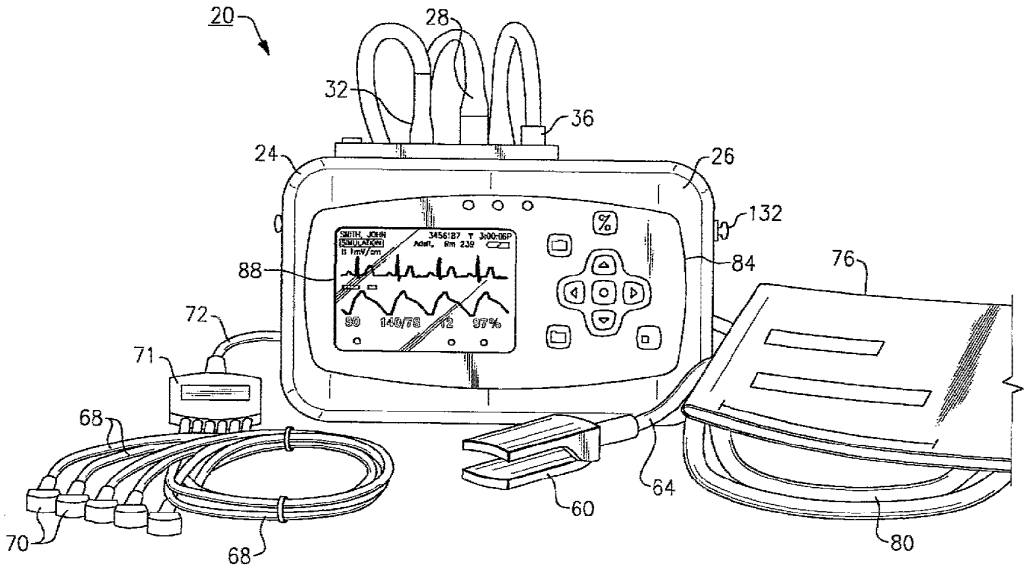

(57) Abstract: A multi-parametric vital signs monitoring device configured for use as an ambulatory and a bedside monitor wherein the device can be patient-wearable and is battery powered. The monitoring device can be used with a charging cradle to provide power to the device in lieu of the battery as a power source for bedside applications, in which the cradle further serves as an intermediary device to enable a data link with a PC or other peripheral device. The monitoring device can include a wireless radio to enable bi-directional transfer of patient-related data to a separate remote station.

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VITAL SIGNS MONITOR

Cross Reference to Related Applications

[0001] The following patent application is based upon a provisional application, USSN 60/643,636, filed January 13, 2005, the entire contents of which are herein incorporated by reference.

Field of the Invention

[0002] The invention relates to the field of medical diagnostic instruments and in particular to a portable, battery powered, multi-parametric, vital signs monitoring device that can be used for both ambulatory and transport applications as well as bedside monitoring. The device can be used with an optional charging cradle that supplies power and charges the contained battery. The charging cradle can additionally serve to provide an isolated data link to an interconnected portable computer allowing snapshot and trended data from the monitoring device to be printed automatically and also allowing default configuration settings to be downloaded to the monitoring device. The monitoring device is capable of use as a stand-alone unit as well as part of a bi-directional wireless communications network that includes at least one remote monitoring station.

Background of the Invention

[0003] A number of vital signs monitoring devices are known that are capable of measuring multiple physiologic parameters of a patient wherein various sensor output signals are transmitted either wirelessly or by means of a wired connection to at least one remote site, such as a central monitoring station. U.S. Patent No. 5,319,363 describes a wired version of such a device and network, while U.S. Patent Nos. 6,544,173 and 6,544,174 each describe a multi-parametric vital signs monitoring device that is linked by means of a bi-directional wireless communications network with at least one central monitoring station, usually located at a nurse's station on a hospital floor or Intensive Care Unit (ICU). Such monitoring systems have dramatically improved the manner in which patients can be monitored during a hospital stay. However, there is a perceived need in the field to

provide a patient monitoring device that is truly versatile, such that the device can be selectively used for bedside as well as ambulatory applications in order to more effectively cover the varied number of situations a monitored patient may encounter, but without a loss in device (e.g., monitoring) connection with that patient or in obtaining required physiologic data.

[0004] There are additional concerns that exist in the field of patient vital signs monitoring. For example, the nature of monitoring devices that continuously monitor SpO_2 (blood oxygen saturation) levels of a patient can cause false or nuisance alarms, particularly those patients who are of lower acuity or are ambulatory. Traditional continuous monitors of this type are found in ICU, OR, ED, PACU and other specialty beds, for the most part. The majority of hospital beds, on the other hand, are found in medical-surgical and/or general care areas in which non-continuous, spot-checking monitoring devices are primarily used. It is believed that present hospital healthcare dynamics, such as the general shortage of nurses, has increased pressure for regulatory compliance, rising costs, and higher acuity in patient census. The latter, it is further believed, could cause a convergence of continuous monitoring and spot-checking to the un-monitored beds of the hospital. A very large challenge or barrier to this trend is that clinical staff members on medical surgical floors are generally ill-trained or adequately skilled in the use of continuous medical monitoring devices.

[0005] There is yet another general need in the field of patient vital signs monitoring to improve the level of alarm management with regard to existing physiologic monitoring devices. Most known devices of this type include at least one visual and/or audible alarm that is produced, typically both at the monitoring device (e.g., bedside) as well as at the central monitoring station. According to one currently known monitoring system, the preset upper and lower alarm limits for all physiologic parameters can be automatically changed simultaneously a single time by a user simultaneously by a specified percentage (e.g., 20 percent). While this form of management/updating is often suitable for certain parameters, such as heart rate, it is not practicable for other parameters (e.g., SpO_2). Though some monitoring

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devices further permit manual adjustment of alarm limits, this adjustment can be a somewhat time consuming and tedious process. As a result, there is a general desire to improve alarm management over presently known patient monitoring devices.

[0006] Additionally, there are also a number of patient monitoring devices that can indicate when an electrode assembly, such as those used for ECG electrode assemblies, has already reached failure or has become detached from the patient, such as those described by U.S. Patent No. 5,819,741 to Karlsson et al. It would be even more desirable, however, to provide a patient monitoring device that can in addition to the above features proactively detect the onset of failure in at least one leadwire/electrode such that the at least one electrode or leadwire could be retrofitted in advance of having the ECG electrode assembly fail during examination or during rounds.

[0007] It is a desirable function of any cardiac monitoring device to provide sufficient information so that a clinician can discern if an implanted cardiac pacemaker is operating properly. Basically, it is desirable to include in the ECG waveform a highly visible indication each time the pacemaker fires. As the technology for implanted pacemakers and implanted pacing electrodes has evolved, the magnitude and duration of the pulses that result at the body surface have reduced, making these pulses more difficult to detect. Furthermore, the observed pacer pulse amplitude is smaller in some ECG vectors than in others. Which ECG vectors have the strongest pacer pulse signals is dependent on body surface ECG electrode placement and the location of the implanted pacemaker electrodes, and therefore the detection issues vary from patient to patient. Making the pacer pulse detector in an ECG monitoring device be able to detect smaller amplitude, shorter duration spikes unfortunately causes the detector to trigger more often on the electrical noise spikes that often occur in the patient's vicinity. Faulty incandescent light dimmers, fluorescent lights, electronic power supplies, and other assemblies generate electromagnetic interference (EMI) and other sources of electronic noise may generate such noise spikes, these spikes occurring at a rate that is twice the frequency of the power line. If a pacer pulse detector is triggered this rapidly, it is extremely difficult for the monitoring device to calculate an accurate heart rate. The extent to which these noise spikes affect a pacer pulse detector is further affected by

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the contact impedance of the body surface ECG electrodes – higher impedance connections make it more likely that these noise spikes will trigger the pacer pulse detector. For each of the foregoing reasons it is therefore desirable to be able to select as an input to a monitor's pacer detector, an ECG vector that contains real pacer pulses whose amplitude is sufficiently above the detection threshold, and which also contains environmental noise spikes whose amplitudes are sufficiently below the detection threshold. To that end, it would be desirable to be able to identify localized areas or sources of electrical noise, in order to permit the clinician to move the patient and/or noise source and thereby avoid instances of premature alerts or other similar situations.

[0008] It is yet another general desire in the field of remote monitoring to provide a multiple physiologic parameter monitoring device that is more user-friendly than previous devices of this type; that is, a device that can be more easily and effectively used by staff of varying skill levels.

[0009] Still further, there is a general need to provide a more rugged and durable patient monitoring device, given that such devices are finding increased uses, for example, in military field applications, requiring devices of this type to be much more tolerant to shock and environmental loads than those found in classical hospital environments.

Summary of the Invention

[0010] According to an aspect of the present invention, there is herein described a portable, lightweight and battery powered vital signs monitoring device that is capable of being used as an ambulatory or transport monitor and which is optionally patient-wearable. In spite of its lightweight design defined by a compact profile for ease of transport and handheld use, the device is defined by a rugged design that is intended to withstand shock, impact and/or other loads that could be present in literally any patient-related setting or application.

[0011] The herein-described monitoring device can also be used in connection with a charging cradle, permitting use of same as a bedside monitor, wherein the charging cradle provides power for the monitoring device in lieu of the contained battery and provides charging for same. In addition, the monitoring

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device and cradle further permit mounting of same, for example, to either a bed rail and/or a fluid (IV) pole, as needed, or to a large display connected as a peripheral to the device as mounted in the cradle with the cradle having a data port permitting the pass through of data.

[0012] The monitoring device further optionally includes an integrated wireless transceiver and antenna, permitting communication bi-directionally with at least one remote station, such as a central monitoring station, over a wireless network. The monitoring device can operate to transmit patient data whether the device is connected to the charging cradle or while in use as a stand-alone unit.

[0013] The charging cradle according to one aspect of the present invention further can permit a data-link connection between the monitoring device and a portable computer (PC). According to one version of the invention, the PC can be equipped with configuration utility software and used in order to custom configure the monitoring device for specified usage in a hospital or facility; for example, a neonatal ward. According to another version, the monitoring device is storing "snapshot" data and trended data to be manually or automatically transmitted for printing using the PC with the connected charging cradle acting as an intermediary or pass through device. Alternatively, the charging cradle permits the monitoring device to transmit patient data in a real-time fashion, such as to a large display via the serial connection.

[0014] The monitoring device according to another aspect of the present invention is connectable to a plurality of physiologic sensor assemblies wherein multiple patient parameters can be measured, including, for example, blood pressure, SpO_2, ECG, pulse/heart rate and respiration. The monitoring device includes an integrated display to indicate the status of the measured physiologic parameters, as well as a user interface, including a keypad, that permits the user to selectively display various output or display modes, including both tabular and graphical data trending of at least one monitored physiologic parameter, as well as to view status of the monitoring device, including connectivity with the wireless network, available power to operate the monitoring device, and other features.

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[0015] According to yet another aspect of the present invention, the user interface of the monitoring device permits navigation using a series of embedded menus using the keypad (user interface), thereby minimizing the time required for the clinician to obtain relevant data and further permitting highly skilled as well as less skilled clinical staff to equally and effectively utilize the monitoring device. The device further includes security features wherein the buttons of the user interface and/or the display can be locked out or disabled in order to prevent any unauthorized use and power-saving features wherein the display is automatically powered down based on a lack of activity or in which certain assemblies are made inoperative (i.e., NIBP) when a low battery condition exists. In addition and in a wireless version in which the herein described monitoring device is out of range, the wireless data transmission feature can selectively be deactivated until the device is again in range of the network.

[0016] According to still another version of the present invention, the user interface is additionally configured to assist the user in terms of alarm management. According to this version of the present invention, upper and/or lower alarm settings or limits for specified measured parameters can be selectively incremented by preset percentage amounts, as needed, during the occurrence of an existing alarm. Additionally, all parameters can be similarly adjusted simultaneously, as needed.

[0017] According to yet another aspect of the present invention, the monitoring device permits continuous measurement of certain physiologic parameters, including pulse oximetry. The device, however, can be selectively configured by the user such that the remaining physiologic parameters, such as ECG, can continue to be monitored in the usual manner while SpO_2 readings of a patient can be selectively random or spot checked by the user of the monitoring device.

[0018] An advantage of the present invention is that a multi-parametric monitoring device is provided that can be used in literally any patient setting, allowing the device to be used for monitoring a patient on hospital medical-surgical, telemetry and intermediate floors, hospital emergency departments, transport,

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emergency medical services and/or other health-care applications. As such, the herein described monitoring device can be used for and/or between bedside, ambulatory, transport or other similar applications seamlessly.

[0019] Moreover, the rugged construction, compact design and adaptability between various bedside and transport applications make the herein described monitoring device extremely useful for military and other similar purposes.

[0020] Another advantage of the present invention is that the herein described monitoring device can be custom configured to enable the device to be used in a specific facility. The device can also be temporarily configured for a current patient, wherein settings can be selectively retained for the patient or deleted along with stored data upon power down of the device, thereby facilitating use between patients.

[0021] These and other aspects, features and advantages will become readily apparent from the following Detailed Description as well as the accompanying drawings.

Brief Description of the Drawings

[0022] Fig. 1 is a front view of a vital signs monitoring device in accordance with an embodiment of the present invention;

[0023] Fig. 2 is a front perspective view of the vital signs monitoring device of Fig. 1;

[0024] Fig. 3 is a top plan view of the vital signs monitoring device of Figs. 1 and 2;

[0025] Fig. 4 is a front perspective view of a charging cradle that is used in connection with the vital signs monitoring device of Figs. 1- 3;

[0026] Fig. 5 is a front view of the vital signs monitoring device of Figs. 1 - 3 as mounted in the charging cradle of Fig. 4;

[0027] Fig. 6 is a schematic block diagram of a patient monitoring system including the vital signs monitoring device of Figs. 1-3 and the charging cradle of Fig. 4;

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[0028] Fig. 7 is another front view of the vital signs monitoring device of Figs. 1-3 as mounted in the charging cradle of Figs. 4 and 5, illustrating the user interface thereof;

[0029] Fig. 8 is a front view of the vital signs monitoring device of Figs. 1-3 with an attached strap permitting hand-held operation thereof;

[0030] Fig. 9 is a alternative view of the vital signs monitoring device of Figs. 1-3 using a patient-wearable harness;

[0031] Fig. 10 depicts the vital signs monitoring device of Figs. 1-3, as used in a patient transport application;

[0032] Fig. 11 depicts the vital signs monitoring device of Figs. 1-3 as mounted to a bed rail and attached to a large display;

[0033] Fig. 12 depicts the vital signs monitoring device of Fig. 11 as attached to a charging cradle and an interface housing for the large display;

[0034] Fig. 13 depicts the vital signs monitoring device of Figs. 11 and 12 as mounted in a charging cradle and directly attached to the large display;

[0035] Fig. 14 illustrates two sample display screens indicative of the information that can be captured by the vital signs monitoring device of Figs. 1-3 and displayed by the large display;

[0036] Fig. 15 illustrates an example of a display screen of the vital signs monitoring device of Figs. 1-3 according to one display mode;

[0037] Fig. 16 depicts another example of a display screen of the vital signs monitoring device according to another display mode for the vital signs monitoring device of Figs. 1-3;

[0038] Fig. 17 depicts yet another exemplary display screen according to yet another display mode for the vital signs monitoring device of Figs. 1-3;

[0039] Fig. 18 depicts yet another example of a display screen according to yet another display mode for the vital signs monitoring device of Figs. 1-3 showing trended tabular data;

[0040] Fig. 19 depicts the toggling between various display modes using the vital signs monitoring device;

[0041] Fig. 20 illustrates another display screen showing how the display cursor is used to highlight a displayed item to permit navigation;

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[0042] Fig. 21 illustrates another example of a display screen of the vital signs monitoring device of the present invention and illustrating how the SELECT button is used to select a highlighted item for navigation;

[0043] Fig. 22 is an exemplary control menu accessed through selection of the highlighted item of the display screen of Fig. 21;

[0044] Fig. 23 depicts another exemplary control menu for the vital signs monitoring device in accordance with the present invention;

[0045] Fig. 24 depicts side by side examples of display screens presented to a user of the vital signs monitoring device upon powering up of the device, depending upon whether patient-related data and settings have been previously stored by the device;

[0046] Fig. 25 is an exemplary set-up menu for the vital signs monitoring device;

[0047] Fig. 26 is an exemplary set of information display windows for the vital signs monitoring device;

[0048] Fig. 27 is a configured data display screen of the vital signs monitoring device in which patient information is being entered;

[0049] Fig. 28 is another display screen depicting a patient information entry panel of the display screen of Fig. 27;

[0050] Fig. 29 depicts an exemplary change patient mode menu for the display screen of the vital signs monitoring device of Figs. 1-3;

[0051] Fig. 30 depicts a confirmation display screen that is displayed by the vital signs monitoring device in accordance with the invention when a patient mode is changed by the user;

[0052] Fig. 31 is an exemplary display screen of the vital signs monitoring device of the present invention including a time/date control menu;

[0053] Fig. 32 is an exemplary display screen of the vital signs monitoring device of the present invention including a waveform source menu;

[0054] Fig. 33 is another exemplary display screen of the vital signs monitoring device depicting a different waveform source;

[0055] Fig. 34 is another exemplary display screen of the vital signs monitoring device including a waveform size menu;

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[0056] Fig. 35 is a display screen of the vital signs monitoring device depicting an ECG set-up menu in accordance with an aspect of the present invention;

[0057] Fig. 36 is another example of a function performed in the ECG set-up menu of Fig. 35;

[0058] Fig. 37 is an exemplary respiration waveform as displayed by the vital signs monitoring device;

[0059] Fig. 38 depicts a portion of an exemplary display screen of the monitoring device and in particular an SpO_2 control menu;

[0060] Fig. 39 is a flow chart relating to a SpO_2 spot checking feature of the vital signs monitoring device of Figs. 1-3;

[0061] Fig. 40 is an exemplary display screen of the vital signs monitoring device of the present invention, including a primary vital signs display screen with the SpO_2 icon highlighted after SpO_2 has been turned off;

[0062] Fig. 41 is a drop down pulse oximeter spot check menu accessed through the window navigation of Fig. 40;

[0063] Fig. 42 is an exemplary display screen detailing portions of the SpO_2 spot-check feature in accordance with the present invention;

[0064] Fig. 43 is a later version of the display screen of Fig. 42 illustrating pulse oximetry data;

[0065] Fig. 44 is an exemplary display screen of the vital signs monitoring device illustrating a digital manometer feature;

[0066] Fig. 45 is the display screen of Fig. 44 at a later time during an NIBP reading, in progress;

[0067] Fig. 46 is the display screen of Figs. 44 and 45 at a later time following the NIBP measurement including depicting markers/indicators for the user with respect to systolic, diastolic and mean pressure values;

[0068] Fig. 47 is an exemplary Power Off display screen of the vital signs monitoring device;

[0069] Fig. 48 is an exemplary display screen of the vital signs monitoring device depicting in part, a wireless mode drop-down menu;

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[0070] Fig. 49 is a display screen accessed and displayed by the vital signs monitoring device when the device is disconnected from the wireless network;

[0071] Figs. 50-52 depict examples of an exemplary display screen according to yet another display mode for the vital signs monitoring device of Figs. 1-3 illustrating snapshots of vitals signs data captured by the device;

[0072] Fig. 53 depicts a snapshot display screen similar to Figs. 50-52, but further including a trends data selection menu;

[0073] Figs. 54-56 depict various exemplary display screens of tabular trended patient data as displayed by the vital signs monitoring device of the present invention;

[0074] Fig. 57 depicts yet another example of a display screen according to yet another display mode for the vital signs monitoring device of Figs. 1-3, showing trended graphical data;

[0075] Fig. 58 depicts an exemplary alarm display screen of the vital signs monitoring device of Figs. 1-3;

[0076] Fig. 59 depicts an exemplary equipment alert display screen of the vital signs monitoring device of Figs. 1-3;

[0077] Figs. 60 and 61 illustrate exemplary display screens for the vital signs monitoring device, including an alarms set-up menu in which audible alarms can be enabled or disabled;

[0078] Fig. 62 illustrates examples of display screens in accordance with the present invention, including a parameter control menu wherein alarm limits can be temporarily customized for an individual patient;

[0079] Fig. 63 is a signal output indicating how electrical noise can be discriminated from pacer signals as detected by the device from a selected ECG vector; and

[0080] Fig. 64 and 65 depict portions of an exemplary configuration worksheet used for configuring individual alarm limit settings to predetermined percentage amounts for the monitoring device in accordance with one version of the invention.

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Detailed Description

[0081] The following description relates to a specific embodiment for a multi-parametric, vital signs monitoring device that can be used universally for a number of different patient-related applications, including ambulatory, bedside, transport, procedure, and handheld operations. It will be readily apparent, however, from the discussion that follows to those of sufficient skill that numerous variations and modifications are possible within the intended scope of the invention. In addition and throughout the text, a number of terms are used in order to provide a suitable frame of reference with regard to the accompanying drawings, including "top", "bottom", "front", "rear", "back", and the like. These terms are not intended to be over limiting of the present invention, except in those instances where specifically indicated.

[0082] Referring to Fig. 1, the herein described patient monitoring device 20 is defined by a housing 24 that receives input from a plurality of sensors, each forming part of physiologic sensor assemblies 28, 32 and 36, in this instance ECG, SpO2 (pulse oximetry) and blood pressure (NIBP) assemblies. The housing 24 includes a display 88 for vital sign numerics, waveforms and other patient data, as well as a user interface 92, Fig. 2, that permits operation of the monitoring device 20.

[0083] Referring to Figs. 1-3, the display 88 is provided on a front facing side of the housing 24, as well as a plurality of adjacent actuable buttons defining the user interface 92. According to the present embodiment, the display 88 is a quarter (QVGA) color display, the display according to this embodiment being approximately 3.5 inches (measured diagonally). More particularly and according to this embodiment, the display 88 is an LCD having a pixel count of 240 by 320. The herein described display 88 preferably includes a backlight (not shown) to improve readability of the display under low ambient light conditions.

[0084] As to the profile of the herein described device 20, the housing 24 according to this specific embodiment is approximately 5.3 inches in height, 7.5 inches in width, and 2.0 inches in depth. In spite of the lightweight design, however, the herein described monitoring device 20 is extremely durable and rugged wherein the device is equipped to handle various loads that may be encountered in a patient-

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related setting. For example, the housing 24 includes a center or intermediate rubberized bladder 26 disposed between a front housing half and a rear housing half that is disposed peripherally therebetween about the device housing 24 in order to assist in cushioning the monitoring device 20 from impact or shock loads and to retain the interior of the device from dust or other contaminants. To further assist in cushioning the monitoring device 20, each of the corners of the housing 24 are curved to provide an effective contour. A battery compartment (not shown) is also formed within the housing 24, the cover of the battery compartment being essentially flush with the rear facing side 61 of the housing such the compartment does not protrude from the overall profile of the monitoring device 20. The rear facing side 61 of the housing 24 further includes a set of rubberized pads or feet 58, enabling the monitoring device 20 to be placed on a flat surface, as needed. In addition, each of the buttons comprising the user interface 92, discussed in greater detail below, are elastomerized to aid in the overall durability and ruggedness of the monitoring device 20, the buttons being positioned so as not to overly protrude from the facing surface 84 of the housing 24 and allowing the device to maintain a relatively compact profile.

[0085] The compact profile of the device housing 24 enables the monitoring device 20 to be patient wearable. A pair of tabs 132, Fig. 2, provided on opposing lateral sides of the device housing 24 enable the monitoring device 20 to be secured to a patient-wearable harness 135, such as shown in Fig. 9, or alternatively a strap 137 can be attached to the side tabs 132, as shown in Fig. 8, permitting hand-held and portable operation of the monitoring device 20. The strap 137 can be used additionally for transport operations along with a transport belt 139, such as shown in Fig. 10, with respect to a gurney 138 or other transport apparatus. Otherwise and as noted above, the herein described monitoring device 20 can be suitably positioned upon a table or other flat surface using the rubberized pads 58 provided on the rear facing side 61 of the device housing 24.

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[0086] In addition to being compact and durable, the herein described monitoring device 20 is extremely lightweight. The entire assemblage shown in Fig. 1 weighs approximately two pounds.

[0087] As noted above and according to this embodiment, a plurality of physiologic sensor assemblies are tethered to the housing 24, including an ECG sensor assembly 28, an SpO_2 sensor assembly 32 and a non-invasive blood pressure (hereinafter NIBP) sensor assembly 36, respectively, the sensor assemblies being shown in Fig. 1 only for the sake of clarity.

[0088] A brief treatment of each tethered physiologic sensor assembly 28, 32, 36 is now provided for the sake of completeness. More particularly and in brief, the SpO_2 sensor assembly 32 is used to noninvasively measure oxygen saturation of arteriolar hemoglobin of a peripheral measurement site of a patient, such as the wrist, a finger, a toe, forehead, earlobe or other area. Reusable or disposable sensor probes can be used. In this instance, a finger clamp 60 is shown in Fig. 1, the clamp having a light emitter and a light detector that can be used to detect pulse/heart rate as well as blood oxygen saturation through pulse oximetry. The finger clamp 60 is tethered by means of a cable 64 extending to a pinned connector that mates with a corresponding female connecting port 44, Fig. 3, that is provided on the exterior of the device housing 24. The concepts relating to pulse oximetry in general are commonly known in the field and do not form an inventive part of the present invention.

[0089] In brief, the ECG sensor or monitoring assembly 28 includes a lead wire assembly, wherein either a three-lead or a five-lead ECG can be utilized according to the present embodiment. More particularly and by way of example, the herein pictured ECG sensor assembly 28 of Fig. 1 comprises a set of lead wires 68, each having electrodes 70 at the ends thereof to permit attachment, in a conventionally known manner, to the body of a patient, the lead wire assembly comprising a harness 71 that is attached to a connection cable 72 having a connector which is matingly attachable to the connection port 40 of the device housing 24. The ECG sensor assembly 28 is further utilized herein with respect to a respiration channel of the herein-described monitoring device 20 in order to determine the rate or absence (apnea) of respiration effort through the determination of ac impedance

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between selected terminals of ECG electrodes 70, thereby determining the respiration rate of a patient using impedance pneumography based upon movements of the chest wall using a designated reference lead wire. Heart rate according to the present embodiment is detected for the herein described device 20 using the ECG sensor assembly 28.

[0090] The ECG sensor assembly 32 creates a waveform (ECG vector) for each lead and further includes a QRS detector that can be adjusted depending upon the patient mode selected. The ECG sensor assembly 28 is further configured to determine heart/pulse rate, if selected, according to the present embodiment as well as mark pacer spikes in the resulting ECG waveforms by way of a pacer detection circuit. The ECG sensor assembly 28 according to the present embodiment further includes selectable notch filters of 50 Hz and 100 Hz, 60 Hz and 120 Hz, respectively.

[0091] In brief, the NIBP sensor assembly 36 according to this embodiment indirectly measures arterial pressure using an inflatable cuff or sleeve 76, which is attached to the limb (arm or leg) of a patient (not shown). The remaining end of a connected hose 80 includes an attachment end that can be screwed into a fitted air connector fitting 48 that is provided on the top facing side of the housing 24. The air connector fitting 48 is connected to a pump (not shown) disposed within the monitoring device housing 24 in order to selectively inflate and deflate the cuff 76 to a specified pressure, depending on the type of patient, using the oscillometric method. Pressure changes are detected by means of circuitry in order to determine systolic, diastolic and mean arterial pressure (MAP). The NIBP sensor assembly 36 according to this embodiment is capable of performing manual, automatic and a turbo mode of operation, as described in greater detail below. The assembly 36 can also be equipped, in this embodiment, when ECG is also being monitored, with a motion artifact filter if ECG is also being monitored. The filter according to the present embodiment employs a software algorithm that can be used to automatically synchronize the process of NIBP measurement to the occurrences of the R-wave of the ECG waveform, thereby increasing accuracy in cases of extreme artifact and diminished pulses. An example of a suitable NIBP artifact filter is described in U.S Patent No. 6,405,076 B1, the entire contents of which are herein incorporated by

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reference. Examples of NIBP and ECG sensor assemblies useful for incorporation into the herein described monitoring device 20 are manufactured by Welch Allyn Inc., of Skaneateles Falls, New York, among others. With regard to each, the form of sensor assembly can be varied depending on the type of patient, (i.e., adult, pediatric, neonatal) by selective attachment to the connection ports 40, 48 that are provided on the monitoring device 20. Each of the foregoing sensor assemblies according to the present embodiment further include electrosurgery interference suppression. As noted, pulse rate can be detected from either the SpO_2 or the NIBP channels of the monitoring device 20.

[0092] It is contemplated for purposes of the present invention, however, that other means for connecting the above-noted sensor assemblies 28, 32 to the monitoring device 20 other than through the connection ports 40, 44, including wireless means, such as for example, IR, optical, RF, and other nontethered connections could also be employed for purposes of the present invention. It should be further noted that the number of types of physiologic sensor assemblies used with the herein described device 20 can be varied and that those shown are intended to only be exemplary of the present invention. The invention contemplates both multiple and single physiologic parameter monitoring of a patient using the monitoring device 20 and therefore such variation is purposely intended.

[0093] Referring to Figs. 1 and 6, each of the above physiologic sensor assemblies 28, 32, 36 according to this embodiment are internally connected electrically to a CPU 174 that is contained within the housing 24 of the monitoring device 20. According to this embodiment, signal processing for each of the physiologic sensor assemblies 28, 32, 36 is performed internally through resident processing circuitry; for example, the SpO_2 sensor assembly 32 of the present embodiment utilizes the Nellcor Puritan MP506 architecture while the NIBP sensor assembly 36 is based upon a design, such as those used presently in the Micropaq and Propaq vital signs monitors, including, for example, an NIBP Module, Part 007-0090-01, manufactured and sold by Welch Allyn, Inc. Though not shown in Fig. 6, the resident circuitry for each of the sensor assemblies 28, 32, 36 are all integrated into a single logic board wherein the ECG and respiration parameters utilize a common processor, such as a Motorola MPC 823 processor of the CPU 174.

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Despite being integrated into a single logic board, the remaining physiologic parameters (SpO_2 and NIBP) are implemented in a more modular fashion, as shown in Fig. 6, and utilize their own processors. It should be readily apparent, however, that the electronic packaging of the various processing elements of the physiologic sensor assemblies 28, 32, 36 of the monitoring device 20 can easily assume various configurations for purposes of the present invention and other versions could easily be contemplated.

[0094] Still referring to the schematic diagram of Fig. 6, the contained battery pack 170 is interconnected to the CPU 174, the latter including a microprocessor, memory, and resident circuitry, wherein each are connected to the tethered sensor assemblies 28, 32, 36 in order to enable processing storage and selective display of the signals provided therefrom as well as perform power conversion between the charging circuit of an optional charging cradle 140 and the contained battery pack, including circuitry to prevent overcharging of the contained battery pack 170 (i.e., 12 volts to 5 volts), as described in greater detail below. The CPU 174 according to this embodiment includes available volatile and non-volatile storage for patient data, in the form of Flash memory and SRAM, though other form as are also possible, the CPU 174 being further connected to the display 88. As noted above, the CPU 174 according to this embodiment is presented on a single logic board along with the processors for the physiologic sensor assemblies 28, 32, 36. The CPU 174 is intended to handle device-specific aspects, such as alarm limits, display generation, and enabling and disabling of certain features, wherein the physiologic sensor assemblies 28, 32, 36 predominantly only relate data for use by the CPU 174. It should be noted that portions of the processing function, for example, the ECG processing algorithms, can also reside in CPU 174, though this can be varied appropriately depending, for example, on the extent of processing power required or packaging concerns. The CPU 174, predominantly controls the operation of the device 20, including patient modes, pressures, voltages and the like, either as a factory default setting, or configured, as described below either through the user interface 92, a remote monitoring station 184, Fig. 6, and/or a connected PC 192, Fig. 6.

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[0095] In addition to the preceding, the monitoring device 20 as schematically represented in Fig. 6 further optionally includes a wireless radio card/transceiver 180, enabling bi-directional wireless communication with at least one remote monitoring station 184, such as, for example, the Acuity Monitoring Station manufactured and sold by Welch Allyn Inc., using the radio card as inserted in an internal PCMCIA expansion slot (not shown). The radio card 180 according to this embodiment is an IEEE 802.11 compliant radio card that connects to an antenna 182 that is also disposed within the housing 24 of the monitoring device 20 for transmission over a 2.4 GHz frequency hopping spread spectrum (FHSS) wireless local area network (WLAN) using access points 186. Additional details relating to an exemplary wireless interconnection, including networking therewith, is provided in U.S. Patent No. 6,544,174, the entire contents of which are herein incorporated by reference. Additional discussion of device-specific details relating to the wireless connection of the herein described monitoring device 20 is provided in a later portion of this description.

[0096] As most clearly shown in Fig. 2, a lower or bottom facing surface 120 of the device housing 24 includes a latching member 124, Fig. 2, as well as an electrical port 128, Fig. 2, each of which are used in conjunction with an optional charging cradle 140, Fig. 4, described in greater detail below. As previously noted, the battery pack 170, only shown schematically in Fig. 6, is contained in the rear of the device housing 24 within a rear compartment (not shown). The battery pack 170 provides portable power for the monitoring device 20 wherein the battery life is dependent upon certain operational modes of the device, as described below. The battery pack 170 is rechargeable by means of charging circuitry contained within the optional charging cradle 140, Figs. 4, 5. According to this embodiment, the battery pack 170 includes at least one rechargeable lithium-ion battery, such as those manufactured by Sanyo Corporation. In this instance, the battery pack 170 includes two rechargeable batteries. According to the present embodiment, the monitoring device 20 is capable of operation in a stand-alone mode using the contained battery 170 as a power source, the battery according to this embodiment having an average runtime of up to approximately 24 hours, depending on the usage of the device.

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[0097] Referring to Figs. 4-6, details relating to the charging cradle 140 and its optional connection with the monitoring device 20 are herein described. The charging cradle 140 permits DC power from a wall adapter 171, shown only schematically in Fig. 6, or other source to be supplied to the contained rechargeable battery pack 170 through charging circuitry contained in the cradle and power conversion circuitry contained in the monitoring device. The use of the optional charging cradle 140 permits the monitoring device 20 to be operated regardless of the status of the contained battery (i.e., charged or uncharged), therefore enabling use of the monitoring device 20 as a stand-alone or networked bedside monitor. That is, the foregoing operation can permit both the internal display of patient data as well as wireless transmission of stored patient data to the central monitoring station 184.

[0098] Structurally, the charging cradle 140, according to the present embodiment, is defined by an open-topped receptacle 144 having a molded or otherwise defined internal cavity that is sized to receive the lower half of the monitoring device 20. The receptacle 144 is designed to allow operation of the monitoring device 20 via the user interface 92, as shown in the attached view of Fig. 5, when the device is attached thereto. A monitor release button 148 is provided on a front facing side 152 of the receptacle 144. The monitoring device 20 is engaged by aligning the bottom facing surface 120, Fig. 2, of the device housing 24 with the internal cavity of the receptacle 144 and more specifically aligning the latching member 124 provided thereupon with a pivotally movable locking or latching element 156 that is disposed within the bottom of the internal cavity of the receptacle 144. A pinned electrical connector 160 adjacent the latching element 156 mates with the corresponding electrical connector 128, Fig. 2, provided on the bottom facing side 120, Fig. 2, of the device housing 24, Fig. 2, and thereby provides electrical connection between the monitoring device 20 and the charging cradle 140, as schematically shown in Fig. 6. Engagement of the latching member 124 with the latching element 156 locks the monitoring device 20 in place wherein depression of the monitor release button 148 causes the latching element 156 to be pivoted out of contact with the latching member 124, allowing release of the monitoring device 20 from the charging cradle 140.

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[0099] A rear engagement portion 164 of the charging cradle 140 includes a curved hanging bracket 166, permitting the charging cradle and attached monitoring device 20 to be attached to a bedrail, as shown, for example, in Fig. 11. Alternatively, the hanging bracket 166 can further include at least one other mount (not shown) that permits attachment to separate apparatus, such as a fluid-IV pole (not shown). In one version, the hanging bracket 166 can include both attachment modes (bedrail, IV pole). The hanging bracket 166 is separably removable by way of threaded fasteners (not shown) or other means from the rear engagement portion 164 to permit other attachment arrangements, such as those discussed below with reference to Figs. 11-13. The bottom surface of the charging cradle 140 according to this embodiment further includes a plurality of support feet 149, Fig. 5. According to this embodiment, the support feet 149 are provided at each corner of the bottom surface in order to permit placement onto a flat surface, such as a table 203, Fig. 12.

[00100] A pair of indicators 167, 168 are provided on the front facing side 152 of the charging cradle 140 wherein according to this embodiment indicator 167 is a status indicator and indicator 168 is a power indicator. The power indicator 168, in this instance, a green LED, indicates that power is connected to the charging cradle 140. The status indicator 167, in this instance, a multi-colored LED, is used to indicate the charging status of the monitoring device 20. For example and if the monitoring device 20 is in the charging cradle 140 and power is properly connected to the charging cradle from the wall adapter 171, Fig. 6, the status indicator 167 will be illuminated (e.g., either green or yellow) or will be off. When the status indicator 167 is green, charging is proceeding normally. The status indicator 167 is turned off when the battery pack 170 reaches full charge. When the status indicator 167 is yellow, the indicator indicates that a fault has occurred and the battery pack 170 is not charging properly. Such faults may occur, for example, as those caused by a severe discharge of the battery 170, a cradle logic fault, incorrect seating of the monitoring device 20 within the charging cradle 140, improper engagement of the connectors or other similar anomaly.

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[00101] In spite of most charging faults, as noted above, power will not be interrupted to the monitoring device 20. That is, the power indicator 168 may be illuminated (e.g., green), indicating power is capable of being delivered to the monitoring device 20 in spite of the fact that a charging fault (yellow) has occurred. Each time the monitoring device 20 is placed into the charging cradle 140 according to this embodiment, the cradle attempts to charge the contained battery pack 170. If the battery pack 170 is fully charged when the monitoring device 20 is inserted into the charging cradle 140, the status indicator 167 turns green momentarily and upon sensing of a full charge, the indicator is turned off. In the instance that the battery is overcharged at the device 20, however, no power for charging the battery pack 170 will be delivered to the device.

[00102] Typically, the herein described monitoring device 20 is shipped to a user/facility with a preset factory configuration for each setting and behavior of the device. It is desirable for most facilities to reconfigure any received patient monitoring device 20 to conform the device to local protocol and adapt the device to the clinical environment to which the device will be used. For example, the monitoring device 20 might be used in a neonatal unit although the factory calibration/configuration is preset for adult patients. Although the user could custom configure the monitoring device 20 upon each use to allow the device to be used for neonatal patients, as described in greater detail herein, it may be preferable to have neonatal mode installed as the default patient mode for a monitoring device.

[00103] According to the present invention, a PC 192, Fig. 6, can be used in conjunction with the charging cradle 140 to download a new configuration file to the monitoring device(s) 20 prior to use in a facility for service. According to the present embodiment, the charging cradle includes a USB data port 165, Fig. 4, provided on the exterior of the charging cradle 140 that provides an isolated serial data-link connection between the attached monitoring device 20 and the personal computer (PC) 192, Fig. 6, through a USB cable.

[00104] Using a configuration utility supplied through the data link with the PC 192, the charging cradle 140 serves as an intermediary or pass through to the monitoring device 20 to configure the monitoring device prior to use in a facility by creating a configuration file that includes a plurality of setting choices that can be

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completed, for example, by the bioengineer of the hospital, to adapt onto or to replace pre-existing factory settings initially provided with the device 20 that are stored or programmed within the CPU 174. According to this embodiment, the PC 192 includes utility software that enables the creation of a utility configuration worksheet into which default settings and limits can be entered. The worksheet is then converted into the new configuration file that is downloaded into the CPU 174 of the monitoring device 20 through the intermediary charging cradle 140. As many as approximately 60-70 different settings, depending on the device, can be preset using the downloaded configuration file wherein some of these features, if not enabled, cannot be controlled by the clinician/user. These settings can include, for example, the default language of the monitoring device 20, the default patient mode of device operation, forms of display available to the user and/or their ordering, the enablement of device specific features, such as, for example, lockout of the user interface 92 and display 88, time limits on alarms and alerts, data trending, and the enablement of alarm and alert tones. All or certain of the factory settings can be adjusted by appropriate entries provided on the configuration worksheet created at the PC 192 and communicated through the data link between the CPU 174 and the PC 192. Therefore, this PC configuration results in a set of revised default settings and monitoring device behaviors.

[00105] A portion of an exemplary configuration worksheet is shown in Figs. 64 and 65 with regard to one specific feature that can be enabled with regard to alarm management. Specifics relating to this feature are described in greater detail in a later section. The worksheet 198 shown is a paper version that is completed by a user in advance to using the configuration utility, the latter providing a PC worksheet version that provides similar entries. The user completes the paper configuration worksheet 198, Fig. 64, to organize the features for configuration or can directly input selections into the utility worksheet provided at the PC 192, Fig. 6. Once all entries have been made, the configuration file is created with instructions to override the factory settings when the file is downloaded to the monitoring device 20 through the serial data link provided by the charging cradle 140.

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[00106] As will be described in greater detail below, the PC 192, Fig. 6, also permits stored data to be printed automatically when the monitoring device 20 is activated and attached to the charging cradle 140, also using the associated USB data port 165, Fig. 4. In this instance and referring to Fig. 6, the PC 192 is connected to a suitable peripheral printer, in this instance, a laser printer 195, also schematically shown in Fig. 6, wherein the monitoring device 20 and PC are programmed to automatically permit data transfer to occur. According to this embodiment, the data that is stored is in the form of trended data and "snapshots", the latter term referring to numeric and waveform data covering a predetermined time period that is electively taken by a user using the snapshot button 116. Pressing the snapshots button 116, Fig. 7, located on the device housing 24, Fig. 2, causes data occurring a predetermined time period prior to pressing the button and a predetermined time period after pressing the button to be stored by the CPU 174. Details relating to stored trend and snapshot data are provided in a later portion of this description.

[00107] Referring to Figs. 6 and 11-14, the charging cradle 140 can alternatively serve to provide an intermediary interconnection between the herein described monitoring device 20 and a large display 200. This form of interconnection permits all processed data in the monitoring device 20 to be transmitted in real time in order to permit viewing of the data substantially as though users were at the central monitoring station 184, as opposed to the smaller and constricted device display 88. That is, a series of waveforms can be displayed for viewing, for example, as shown in Fig. 14. The large display 200 according to this embodiment includes a VGA card and suitable attachment bracketry in the form of an interface box or housing 202. Several embodiments for interconnection of the monitoring device/charging cradle assembly to the large display 200 through the interface box 202 are illustrated in Figs. 11-13. In each embodiment, the monitoring device 20 is already attached to the charging cradle 140 in the manner described above. According to Fig. 11, the charging cradle 140 is attached to a bedrail using the hanging bracket 166. A VGA cable 205 is then connected from the USB data port 165, Fig. 4, to connectors that are provided on the interface box 202. As such, the charging cradle 140 serves as an intermediary for data transfer from the patient

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monitoring device 20. As shown in Fig. 12, the curved bracket 166, Fig. 4, can be removed from the rear engagement portion 166, Fig. 4, of the charging cradle 140 and the monitoring device 20/charging cradle 140 can be placed on a table 203 adjacent the large display 200, the latter being attached in each instance to a wall. In the latter example, the interface box 202 is directly attached to the rear of the charging cradle 140. Finally and as shown in Fig. 13, the monitoring device 20 and charging cradle 140 can be attached to the interface box 202 directly on the large display 200 through the display bracketry and bracketry that is provided on the charging cradle 140, respectively. A sample data output of the large display 200 is shown in Fig. 14, this output substantially replicating that seen by the remote monitoring station 184, Fig. 6, and considerably an increased amount of data than is viewable on the integrated display 88.

[00108] It is further contemplated within the spirit and scope of the present invention that the charging cradle 140 can include additional features to provide a level of adaptability for a system incorporating the herein described monitoring device 20. For example, an additional physiologic parameter assembly could be attached to the charging cradle 140 in lieu of or in addition to the monitoring device 20 wherein physiologic data could still be uploaded to the monitoring device 20 when the device is attached to the charging cradle for wireless transmission to the central monitoring station 184, Fig. 6. Similar configurations should be readily apparent. For example, the charging cradle 140 can be equipped with at least one physiologic sensor assembly (not shown) wherein data collected by the at least one sensor assembly can be inputted to the CPU 174 of the monitoring device 20 for display and transmission.

[00109] With regard to running time available on the monitoring device 20 when the device is not mounted in the charging cradle 140, the life of the battery pack 170 is highly dependent on the use mode of the device. As noted above and according to this embodiment, about 24 hours of runtime is possible. The level of battery charge is displayed by the monitoring device 20 according to this embodiment, as described below.

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[00110] Referring to Fig. 7, the user interface 92, Fig. 2, according to this specific embodiment includes five (5) closely arranged buttons forming a keypad. In brief, a center button, referred to throughout as a SELECT button 96, is generally used to select a highlighted item that is displayed by the device, as discussed in greater detail below, or to confirm a choice. Four buttons 100 immediately surrounding the SELECT button 96 are generally used (up, down, left or right) in order to directionally guide a display cursor in order to highlight an item, for example, or to increase or decrease a selected parameter value. A number of additional actuable buttons are also provided, according to this embodiment, on the front facing side 84 of the housing 24, these buttons being used for specified or dedicated purposes, including a display button 104, permitting the user to cycle between a plurality of varied display formats, such as those shown in Figs. 15-19, an alarm silence/resume button 108 permitting the user to temporarily and manually silence or resume an existing patient alert/alarm tone, an NIBP start/stop button 112 for manually starting or stopping an NIBP measurement, and finally the above referred to snapshots button 116 that automatically stores a predetermined time period of vitals-signs data in both tabular and waveform format, an exemplary snapshot display screen being shown in Fig. 50. Each of the above-described buttons further include a visual representation of their function for ease of use by the clinician; for example, the directional control buttons 100 include specific directional arrow indicators, the display button 104 includes a display icon, the NIBP start/stop button 112 includes a depiction of a blood pressure cuff, the snapshots button 116 includes a camera icon and the SELECT button 96 depicts a circle thereupon. Additional details concerning the functions defined by each of the above-listed buttons, and the implementation and operation of the user interface 92 of the herein described monitoring device 20 will be described in greater detail in a succeeding section of this description.

[00111] Referring to Figs. 2, 5 and 7 and in addition to the above user interface 92, a series of visual status indicators are also provided on the front facing side 84 of the monitoring device 20. Three status indicators 169 are arranged in linear fashion above the display 88 at the center of the front facing side 84 of the device housing 24, and are electrically connected to the CPU 174, Fig. 6. Among

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the purposes of the visual status indicators 169 according to this embodiment are to apprise the user of the operational status of the monitoring device 20; that is, whether the monitoring device 20 is operating normally, confirmation of the connection of the monitoring device 20 and the proper patient being connected to a network or to a remote monitoring station 184, Fig. 6, and/or whether the herein monitoring device 20 is subject to an alarm and/or alert condition. It should be readily apparent that the number and location of these indicators can be suitably varied.

[00112] More specifically and according to the present embodiment, each of the status indicators 169 are illuminated with a specific colored light (e.g., red, yellow or amber, and green), indicating an alarm condition, an alert condition, and normal operation of the monitoring device 20, respectively. For purposes of definition herein, an "alarm" is indicative of a patient condition, such as vital signs reading(s) that is outside of acceptable limits. When an alarm condition occurs, for example, the red indicator 169 is illuminated. An "alert" condition, by comparison, is not as serious as an "alarm" condition and is typically indicative of a device-operational problem, such as a low or discharged battery or a detached lead. The yellow status indicator 169 is illuminated when this type of condition is indicated. Normal operation is signified by illumination of the green indicator 169. The status indicators 169 can further either illuminate steadily or flash in order to indicate the severity of the problem. For example and according to this embodiment, this severity can be defined between an equipment alert and an alarm condition. The monitoring device 20 further includes a speaker 161, shown only schematically in Fig. 6, for signifying audible tones, as needed, for example, that may be sounded during an alarm or alert condition. Additional details relating to alarm and alert management using the herein described monitoring device 20 are described in a later portion.

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[00113] Each of the tethered sensor assemblies 28, 32, 36 provide physiologic parameter data in the form of analog signals and the like to the CPU 174 of the monitoring device 20. The herein described monitoring device 20 is capable of continuously monitoring each of the physiologic parameters (NIBP, pulse rate, 3 and 5 lead ECG, respiration, SpO_2) depending on the number and type of sensor assemblies that are connected therewith.

[00114] As depicted in the operational block diagram of Fig. 6 and as previously noted herein, each of the SpO_2 sensor assembly 32 and the blood pressure (NIBP) sensor assembly 36 according to this embodiment include their own individual processors contained within the monitoring device 20 that operate the sensor assemblies with regard to the acquisition of and processing of data (that is, each of the above sensor assemblies include appropriate algorithms and resident circuitry for processing the acquired signals). The ECG/respiration sensor assembly 28 according to this embodiment includes attendant circuitry within the CPU 174. As previously noted, any or all of the sensor assemblies can include modular processors or the processing can be carried out within a single integrated logic/CPU board. The signals then being processed are stored into the memory of the CPU 174 for display and for wireless transmission using the contained transceiver 180 and antenna 182 to the central monitoring station 184 using the communications network, as described in the previously incorporated U.S. Patent No. 6,544,174. Additional data, such as patient demographics, can be added for storage and display by the user, as discussed below, or may alternately be uploaded to the monitoring device 20 from a list of available patients from the remote station 184. The monitoring device 20 can transmit patient information, once configured with the network, for display of all stored parametric data at the remote monitoring station 184. The monitoring device 20 is also connectable through the USB port 165, Fig. 4, of the charging cradle 140, enabling operation as a bedside monitor in which serial attachment to the PC 192 through the USB port 165 enables interconnectivity to a peripheral device, such as a printer 195, as previously described or alternatively, to the larger display 200. In the meantime, the monitoring device 20 can also transmit wirelessly to the remote monitoring station 184 using the connected radio 180 and antenna 182.

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[00115] The versatility of the herein described monitoring device 20 therefore provides a number of distinct advantages. First, the herein described monitoring device 20 can be used as a transport monitor in that the device is battery powered. Second, the use of the rubberized back feet or pads 58, the rear interior loading of the battery pack 170 and general packaging and compactness of the profile of the monitoring device 20 present a lightweight and extremely versatile unit that allows for both wired and wireless connectivities enabling the device to work in either a stand-alone or a networked capacity. The charging cradle 140, Fig. 4, permits the monitoring device 20 to be used for bedside applications by providing a source of power for the contained battery pack 170 as needed and for charging same. In addition and through use of the data port, the charging cradle 140 serves as an intermediary device that enables data transfer to either a large display 200 or printing to a locally connected computer 192. The locally connected computer 192 can also be used to selectively modify factory programmed configuration settings of a monitoring device 20 through new default settings that can be downloaded to the monitoring device 20.

[00116] The following discussion relates to the operational aspects of the monitoring device 20. Reference is made throughout to numerous exemplary display screens that are generated by the CPU 174 of the herein described monitoring device 20. Each display screen is defined by a stored preformatted template consisting of a number of discrete panels with each panel including a number of elements that are defined by various combinations of textual, numeric, waveform, graphical and/or other forms of data, as described herein that are obtained from the CPU 174 and generated onto display 88.

[00117] Upon powering up the herein described monitoring device 20 using the Power On/Off button 56, an audible tone from the contained speaker 61, Fig. 6, is sounded. With each activation of the monitoring device 20 according to this embodiment, a self-diagnostic or operational test is initiated. If the self test is unsuccessful, at least one of the status indicators 169 of the monitoring device 20 is illuminated, depending on the error. In terms of a general overview and if the self test is successful and following this diagnostic, a start-up display screen 400(a), 400(b), Fig. 24, appears on the display 88, Fig. 1, with the display screen having

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user-selectable options to continue monitoring a patient (in the event patient data has been saved), start monitoring a new patient, obtain system information, or enter a demonstration mode.

[00118] Referring to Fig. 24, the stored template format of each of the generated start-up screens 400(a), 400(b) is similar whether or not patient data has previously been stored by the monitoring device 20. That is, each start-up display screen 400(a), 400(b) commonly includes a customer ID panel 404, a notice panel 408, a bottom message panel 412 and a context menu panel 416, respectively, as read from the top of the display screen. In the instance that no patient data has previously been saved by the monitoring device 20, the notice panel 408 of start-up display screen 400(a) indicates by way of a textual message that no data has been saved. The notice panel 408 of the other version of the display screen 400(b), on the other hand, indicates that specific patient data has been previously stored by the monitoring device 20. In the instance that a patient's data was stored prior to the time the monitoring device 20 was last turned off, monitoring can be resumed for that patient when the monitoring device 20 is powered up again. When the patient data is saved by the monitoring device 20, the settings of the monitoring device 20 are also saved into the nonvolatile memory of the CPU 174. In this instance, a decision must be made by the user as to whether the data is to be saved and monitoring will continue with the same patient or whether the stored patient data should be deleted and a new patient monitoring mode should be initiated.

[00119] The customer ID panel 404 provides information about the facility and device that have been previously entered and stored in an information screen, such as shown in Fig. 26, shown as 420(a), 420(b). The information screen 420(a), 420(b) can be accessed from the Info option of the context menu panel 416. Each of the information screens 420(a), 420(b) also include a context menu panel 416 at the bottom thereof, including the same options as the start-up screens 400(a), 400(b), respectively. Typically, this information can be added to the memory of the device 20, such as during the creation and downloading of the configuration file using PC 192, Fig. 6, as described previously.

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[00120] In general, the context menu panels 416 provide a means for navigation between various control screens of the herein-described monitoring device 20. Each context menu contains a number of menu options disposed along the length of the panel 416. The user interface 92 and in particular, the directional buttons 100 and the SELECT button 96 are used to highlight and select a highlighted option by movement of the display cursor. To that end, selection of one of the context menu options executes a new mode of the monitoring device 20 or creates a new display screen, as described in greater detail below. The content and options available in context menus vary depending on the display screen which utilizes them. Examples of various context menus 416 that are used in the operation of the monitoring device 20 are provided in Figs. 25, 28 and 47, each of which are detailed in a later portion of this description.

[00121] Referring back to Fig. 24, and to the specifics of the context menu panel 416 of the start-up display screens- in the instance in which no previous patient data has been stored by the monitoring device 20, the context menu panel 416 indicates the following available user-selectable options; namely, a Start New Patient option, an Info option, and a Demo option. The Start New Patient option permits the user to enter a patient monitoring mode. The Info option reverts the user to an information screen, such as either 420(a), 420(b) shown in Fig. 26, while selection of the Demo menu option provides access to a demonstration mode for the monitoring device 20.

[00122] In the instance that patient data has been saved by the monitoring device 20, the above three (3) user-selectable options are provided in the context menu panel 416 of display screen 400(b), as well as a Continue Patient option. To resume monitoring on the same patient and upon powering up the monitoring device 20, the "patient data stored" display screen, 400(b), Fig. 24, is displayed. The user then verifies that the displayed name and patient ID match that of the current patient and upon verification, and highlights the Continue Patient option in the context menu panel 416 at the bottom of the display screen 400(b). If the latter option is selected through use of the directional arrow buttons 100 and pressing the SELECT

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button 96, then any stored data is loaded and the monitoring device 20 is ready for monitoring, including the continued implementation of any previous custom configuration settings that are particular to the patient.

[00123] If, however, the Start New Patient option (onto which the display cursor is highlighted in the display screen 400(b)) is elected and the SELECT button 96 is pressed, then all previous data (and custom configuration settings) are deleted and a new patient monitoring mode is initiated.

[00124] Upon election of the Start New Patient option, a first configured data display screen 430 appears, as shown in Fig. 27. In this data display screen 430, a unique auto ID is provided in a status panel 320, and more specifically in a device ID field 434 that is highlighted using the SELECT button 96, accessing a Patient Information Entry screen 440, as shown in Fig. 28, the latter consisting of a table of alphanumeric characters 444 that can be highlighted and sequentially entered into the proper field 448 to create entries. The name of the new patient is then entered as well as the patient ID and the patient room number. Alternatively, this data can be entered using the remote monitoring station 184, Fig. 6, through an enabled wireless connection as opposed to the above-described local entry of information. When all of the above information is entered, a Confirm option provided in the context menu panel 416 of the display screen 440 is highlighted and the SELECT button 96 is pressed. All information entered is then stored into memory of the CPU 174 and is used by the device in various display screens throughout the operation of the monitoring device 20. The mode of the patient is then confirmed and the sensor assemblies 28, 32, 36 are attached to the patient and the monitoring device 20 (if not already attached to the device). The monitoring device 20 is now ready to begin monitoring wherein readings are displayed on a formatted default data display screen, such as shown in Fig. 27, in predetermined fields on a display screen adjacent to text identifiers that are preformatted on the generated screen template. The screen format shown in Fig. 27 is that of a large numerics display screen, discussed in greater detail below.

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[00125] For purposes of the following discussion, it is assumed that each of the sensor assemblies 28, 32, 36 have been suitably attached to a patient (not shown) and the monitoring device 20 and that the patient has been monitored for an extended period of time by the device. A number of specifically configured display screen template formats are stored in memory of the CPU 174 and are available for viewing at the user's option, these templates including associated vital signs data in the form of either current or trended data. An exemplary default display screen 210, Fig. 15, for purposes of this discussion is enabled by way of the configuration settings of the monitoring device 20, this screen being the current display screen displayed to the user during monitoring. The format of this particular display screen 210 includes a status panel 320, a large waveform panel 324 and a parameter panel 328, respectively, as read from the top of the display screen.

[00126] The displayed data that is shown in Fig. 15 as contained in the various fields of the status panel 320 includes the following elements: the patient's name, if available, shown as 204, the patient ID 208, and the patient room number 209. Each of the preceding elements were manually added to the internal memory of the monitoring device 20 and added at start-up as previously described above with regard to Figs. 27 and 28 by the clinician or alternatively in the case of a network-enabled monitoring device 20, by the remote monitoring station 184, Fig. 6, prior to monitoring of the patient over a wireless communications link. In the former instance, this information as entered in the Patient Entry Information display screen 440, Fig. 28, by the CPU 174 is used to populate the status panel 320 of each display screen of the herein described monitoring device 20 for the patient currently being monitored, for so long as power is maintained to the device, unless the user elects to specifically maintain these settings prior to turning the device off, as described in greater detail below.

[00127] Referring to Fig. 15 and in addition to the patient information, the status panel 320 further includes a communication status icon 212 (if the device includes a wireless transceiver 180, Fig. 6, and antenna 182, Fig. 6) and a time display 216, as well as a battery status indicator or icon 220, the latter providing an indication of available battery power. The battery status icon 220 can provide an indication as to whether the contained battery pack 170 is full, partially full

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indicating that the battery is not fully charged, but not fully discharged, partially full and charging, low battery wherein the battery has approximately 30 minutes of runtime remaining, low battery and charging, very low battery wherein the battery has approximately 5 minutes of run time remaining and very low battery but charging. In the instances in which low battery is indicated by the icon 220 (as indicated by a depiction of a half-filled battery) and in addition to the icon, an alert (not shown) can be provided by the monitoring device 20. The battery status icon 220 would remain after acknowledgement of the alert. Alerts and their management are discussed in a later portion of this description.

[00128] According to this embodiment, the CPU 174 is programmed to automatically disable the NIBP sensor assembly 36 upon a low battery indication being determined wherein a status message is displayed to the user if the manual NIBP start/stop button 112 is pressed. If the monitoring device 20 is charging in the charging cradle 140 and a low battery and charging indication appears via icon 220, then the NIBP sensor assembly 36 is enabled.

[00129] In addition to the above, the mode (adult, neonatal, pediatric) of the patient 224, as well as the mode of the device 228 (simulation, monitoring) are each applied within separate fields that are provided in the status panel 320 of the display screen 210. Each of the foregoing are typically based upon default settings of the herein described monitoring device 20, unless modified by the user, as described in greater detail below.

[00130] With regard to the waveform panel 324, the depicted waveform 240 is current and can originate from a number of sources. The panel 324 further provides text identifiers relating to the specific waveform source 232 and waveform size (display scale) 236. In this example, a waveform representative of an ECG vector is represented. The waveform depicted, including its size and source as displayed, are also typically based upon a default setting of the monitoring device 20, wherein each setting may be changed locally by the user or remotely by the remote monitoring station 184, as described below.

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[00131] Beneath the waveform panel 324 and in the formatted parameter numerics panel 328, current or live parameter numeric values are displayed for heart rate/pulse rate 244, respiration rate 252, and pulse oximetry 256, as well as a separate dynamic indicator for the pulse amplitude of the pulse oximeter sensor in the form of a blip bar 260. Text identifiers are also provided beneath each above-noted parameter. In addition, the most recent NIBP measurement 248 is also displayed, with a corresponding text identifier and time stamp, the pressure measurement being displayed in terms of systolic over diastolic numerics with mean pressure being expressed in parenthetical terms. Since each of these physiologic parameters, except NIBP, are continuously monitored, their numeric values will change and be updated with stored data being trended by the CPU 174, Fig. 6. Finally, a series of alarm status indicators 268 are also represented in the parameter numerics panel 328 at the bottom of the display screen 210 for each listed parameter. These alarm indicators 268, represented herein by bell icons indicate whether the upper and lower limits for each physiologic parameter are on, the upper alarm limit is on but the lower alarm limit is off, the upper limit is off but the lower limit is on, or all alarms are off through an appropriate representation of an alarm symbol, whether in blank or solid, and combinations thereof. Alarms are described in greater detail in a later portion of this description.

[00132] Each of Figs. 16-19 depict additional exemplary display screens that can be selectively displayed by the user in addition to the single waveform display screen 210 depicted in Fig. 15. Each of these additional display screens include a specifically defined template format that is stored into memory for generation by the CPU 174 onto the display 88. According to this specific embodiment, these additional user-selectable display screens include a dual waveform display screen 332, shown in Fig. 16, a large numeric display screen 336, shown in Fig. 17, which is similar to that shown also in Fig. 27, and a single waveform with tabular trended data display screen 340, as shown in Fig. 18. For purposes of discussion herein, each of the same reference numerals are used to label similar data and symbology herein for the sake of convenience and clarity. The above-noted display screens permit live monitoring of vital sign numerics, waveforms and/or trend information in various user-selectable formats as now described.

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[00133] The dual waveforms display 332 screen of Fig. 16 is a variation upon the single waveform display screen 210 of Fig. 15. This display screen 332 provides patient and monitoring device information as well as two waveforms and available parameter numerics. To that end, the defined format of this display screen 332 includes a status panel 320 that includes each of the elements of the single waveform display screen 210 referred to above including patient name 204, patient ID 208, patient room number 209, communication status indicator 212, time display 216, battery status indicator 220, patient mode indicator 224, and display mode indicator 228. Two small waveform panels 344 are provided in lieu of the single panel of the display screen 210, Fig. 15, the display screen further including a live or current parameters numerics panel 328, similar to that of the single waveform display screen 210, Fig. 15. Each of the waveform panels 344 are smaller than that of the single waveform data display screen 210, but contain similar information including waveform source 232 and size indicia 236. The waveforms presented in the panels 344 can be from two different sources or can be provided alternatively as a cascaded waveform from one source that is presented on two adjacent waveform panels. In the example shown in Fig. 16, separate ECG and SpO_2 waveform 240, 242, respectively, are depicted. The live parameter numerics panel 328 like the preceding includes a heart rate/pulse rate numeric and text identifier 244, the most recently taken NIBP numeric 248 including the systolic/diastolic and mean (parentheses) numerics and text identifiers as well as a corresponding time stamp, a respiration numeric and text identifier 252, and an SpO_2 numeric and text identifier 256 including a dynamic blip bar 260 showing pulse amplitude. Alarm icons 268, in the forms of bell icons, are also provided for each of the preceding parameters in this panel 328.

[00134] The large numerics display screen 336 shown in Fig. 17 is similar to that depicted in Fig. 27, labeled as 430 (but without data or patient information entered). This display screen 336 is defined by a format that includes a status panel 320, also similar to that described for the display screens of Fig. 15 and 16, and a large numerics panel 352 provided in lieu of waveform panels. The large numerics panel 352 contains the same information provided in the panel 348 discussed with regard to Fig. 16 other than that the icons and associated text identifiers are

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significantly larger and disposed in differently assigned fields in the display screen 336. More specifically, the live or current parameters panel for this display screen includes a large HR/PR numeric element 244 as well as a text element and an alarm icon 268, a large SpO_2 numeric element 256 along with an associated text element, alarm icon 268 and blip bar 260, a large NIBP numeric element 248 representative of the most recent measurement as well as a text element and time stamp of measurement and alarm icon 268 and a large respiration numeric element 252 along with an associated text element and alarm icon 268. With regard to the alarm icons 268, these provide an indication of those alarms that are currently enabled and those alarms that are currently disabled. For purposes of this discussion, the left half of each alarm icon 268 relates to the lower alarm limit and the right hand side of the icon refers to the upper alarm limit. A solid bell, shown herein as white, indicates that the alarm is enabled while a blackened portion of the bell indicates that the alarm is disabled. Alarms are provided (upper and lower limits) for each of heart rate/pulse rate, respiration, NIBP (systolic, diastolic and mean) and SpO_2. As seen in the depicted example, the lower limit of the mean NIBP is currently disabled while the remaining alarm limits are each currently enabled. The alarm icons 268 further permit the user to access menus, as described in greater detail below, by which the alarms can be enabled or disabled, upper and lower limits can be set, and volume controls for audible tones can be adjusted.

[00135] The herein described monitoring device 20 can not only display current or recent numerics and waveforms, but is also storing data for trend analysis. To that end, several display formats relate to trended data, wherein this data can be reproduced either graphically or tabularly. Snapshot data is also stored in addition to any periodic or randomly taken measurement data and data stored by the device 20 based upon continuous monitoring. To that end, Fig. 18 illustrates a combination waveform/tabular trend display screen 340. In this example, a waveform as well as live parameter numerics and tabular list of trend data are depicted in a generated template format on the display 88 pertaining to a monitored patient. The pre-defined format of this display screen 340 includes a status panel 320, similar to that described with regard to Fig. 15, a single waveform panel 344 including a waveform

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and text identifiers relating to the waveform source 232 and size 236, respectively, similar to those described in Fig. 16, a trends live numeric panel 356 and a trends data panel 360, respectively.

[00136] The trends live numerics panel 356 includes a data display header 364 relating the form of data presented (tabular, graphical, or other) followed by a linear set of current heart rate, respiration and SpO_2 parameter numerics and the most recent NIBP measurement, as well as text identifiers beneath each corresponding parameter numeric and the current blip bar 260 for SpO_2. A "Time" table heading is also provided beneath the data display header 364.

[00137] The trends data panel 360 of this display screen 340 includes a tabular (in this instance) arrangement of stored numerics arranged in a table, allowing the user to navigate through a predetermined period (e.g., 24 hours) of stored trends with entries for time, heart rate/pulse rate, NIBP, respiration and pulse oximetry provided beneath each corresponding text identifier. According to this embodiment, trend data is listed in one minute intervals for each of time, heart rate/pulse rate, respiration, and SpO_2, respectively, when any NIBP readings are successfully made using the NIBP start/stop button 112 or through automated mode, or when an SpO_2 spot check reading is made. Each of the latter features are described in a later portion herein. As will also be detailed in a later portion of this description, the time interval between trend entries is a configuration setting of the monitoring device 20 that can be selectively adjusted by the user, for example, depending on the patient.

[00138] The exemplary display screen 340 is configured to list seven (7) entries in the display panel 360 according to the present example, although this parameter can be varied. For example, and as shown in Figs. 19 and 54-56, a twelve (12) entry table is provided on a tabular trend data display screen 470. No waveform data is provided on this screen 470, which is defined by a status panel 320, a trends live numerics panel 356, similar to that shown in Fig. 18, and a trends data panel 474. As noted, up to 24 hours or other predetermined time period of trend data can be stored into memory. A scrolling navigation icon 374 is also provided next to the time listing in order to permit the user to access any of the stored data, as needed.

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[00139] In addition to tabular data, the herein described device 20 can display trended data in a graphical form. An exemplary graphical trend data display screen 380 is shown in Fig. 57. This display screen 380 is defined by a format that includes a status panel 320, as described above, a live trends numerics panel 356, and a graphics display panel 384 with graphical trend data 294 having a time scroll 388 at the bottom thereof. The data shown pertains to a single parameter (in this example, heart rate), wherein the parameter data being displayed can be varied, as described in greater detail below.

[00140] Referring to Figs. 18, 19 and 56, user-captured snapshots are identified separately in the tabular listing of trend data with a camera icon 477. A sample snapshots viewing screen 298 is shown in Fig. 50. Reviewing of snapshot data is discussed in a later portion of this description.

[00141] The display button 104 according to the herein described embodiment is used to cycle through the configured display formats. As shown in Fig. 19, the display modes can be toggled between large numeric display screens, waveform/numeric display screens, and trend data display screens. According to this example, pressing the display button 104 allows the user of the monitoring device 20 to toggle between a large numerics display screen 336, a single waveform display screen 210, and a tabular trend display screen 470, respectively. Depending on the configuration settings of the herein described monitoring device 20, the display button 104 could be used to navigate between each of the display screens shown in Fig. 15, 17 and 18, respectively, wherein a default version of each type of display screen can be determined.

[00142] In terms of overall navigation with regard to any of the above primary display screens and in general according to this embodiment, the display cursor, as referred to above, is always highlighted. Referring to Fig. 21, and looking at an exemplary display screen, in this case a dual waveform display screen 332, each and every display screen according to this embodiment includes a single element – the current context – labeled herein as 407, that is shown by a first colored field (e.g., blue) in order to highlight the element.

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[00143] Using the user interface 92 of the herein described monitoring device 20, pressing the SELECT button 96 causes the monitoring device 20 to replace the current display screen with another display screen that is related to the current context. By way of example, if the SpO_2 text identifier is highlighted in the display screen 332 of Fig. 21, and the SELECT button 96 is pressed, the monitoring device 20 is programmed to then display a SpO_2 control menu 402, having a specified format and shown in Fig. 22, onto the primary display screen. The directional buttons 100 can be used to scroll the display cursor in order to highlight the item to be selected by the user.

[00144] In addition, there are at least some display screens that also contain elements - parameter values – that are highlighted by a second colored field (e.g., green). In the case of the second color highlighted areas, the current values of multiple parameters are identified within a given context. For example and in the control menu display screen of Fig. 22, the current context of the SpO_2 monitoring menu option 403 is highlighted in the primary or first color (e.g., blue), while the current settings 404 of the SpO_2 parameters according to this embodiment are highlighted in the second color (e.g., green). Control menus and other menus are discussed in a later portion of this description.

[00145] In passing, other forms of indications can be provided on a display screen to a user using various colors or are provided with separate indicators in accordance with this embodiment. For example, items listed in red as shown in the display screen of Fig. 20 indicate readings 396 that exceeded a given alarm limit (either an upper or a lower limit) in addition to the current context 392, for example. Other examples are provided. For example, the trend tabular display screen 470 presented in Fig. 56 depicts a number of readings 475 that have been compared to known limits and have been suitably identified.

[00146] In addition to the display button 104, the herein described monitoring device includes a set of embedded menus that are used for at least two purposes. First, certain menus (e.g., context menus) permit the user to navigate between various modes of the monitoring device 20. Second, other menus permit adjustments to be made to the monitoring device 20. These adjustments are intended to be temporary and typically relate to the specific patient being monitored.

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As previously noted, device settings are typically configured through factory default settings. A technique using a configuration file using the charging cradle 140 as an intermediary relative to a portable computer 192, Fig. 6, has also been discussed as an option to permit at least some of the factory settings to be overridden. The monitoring device 20 further permits custom configuration at the user level using a variety of display menus that can be accessed through the user interface 92. For purposes of explanation herein, two (2) main types of menus can be accessed, pop-up (also referred to throughout the discussion as drop-down) menus and control menus. Each of these menus will now be described with regard to the present embodiment. Other menus assist in navigation through and between various display screens in addition to the herein described display button 112. These menus have been alluded to with regard to the start-up display screens, Fig. 24, and information screens, Fig. 27, noted above and are referred to as context menus.

[00147] First, pop-up or drop down menus are provided to allow a user to temporarily make configuration settings for the herein described monitoring device 20 as well as to vary certain formats, for example, for display. The menus also affect various modes of the device, among other features, as will now be described. In brief, the display cursor is used to highlight an item in any primary display screen 210, 332, such as shown in Figs. 15, 16, using the directional buttons 100 of the user interface 92 and the SELECT button 96 is pressed to access a corresponding drop-down menu. As shown, for example, in Fig. 53, the resulting pop-up or drop down menu appears as an overlay onto the primary display screen 590 wherein the format of each corresponding menu includes a header text and a plurality of listed menu items or options. According to this embodiment, there are at least ten (10) drop down menus available for the herein described monitoring device 20, each of which enable certain settings of the device to be temporarily altered for a particular patient.

[00148] A patient mode drop down menu 540, Fig. 29, is accessible by highlighting the displayed patient mode field 224 as provided on any primary vital signs display screen 210, Fig. 15, in the status panel 320 thereof and pressing the SELECT button 96. The current or default patient mode 544, in this case, an Adult mode, is highlighted and the directional arrow buttons 100 of the user interface 92, Fig. 2, enable the mode to be changed to pediatric mode, shown as 556. When a

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patient mode is changed according to this embodiment, all stored vital signs data, including any snapshot and trended data, for the patient is deleted automatically from the CPU 174 and all monitoring device settings revert to the default settings for the new patient mode that is selected. Therefore and when changing a patient mode, a confirmation screen 550, see Fig. 30, appears as an overlay on the display screen, shown herein as 554, indicating that parameter values will be changed to default settings for the mode now selected and further indicating that all stored information will be lost if the patient mode is changed. Confirmation is then required before any new mode selection can be implemented by the user wherein confirmation changes the patient mode and removes the confirmation message panel 550 from the display screen 554. The resulting display screen (not shown) then indicates pediatric in the patient mode field 224 thereof.

[00149] As noted previously and referring to Fig. 6, the monitoring device 20 includes a wireless RF radio card 180 and internal antenna 182 which when enabled, automatically establishes a wireless communications link between the monitoring device 20 and the central monitoring station 184. While within the confines of a wireless LAN (Local Area Network), this connection is suitable within range of a suitable access point 186. The communication status indicator or icon 212 located on the status panel 320 of any primary display screen 210, such as those shown in Fig. 15, is configured to provide an indication of the status of the wireless connection with the remote monitoring station 184, which is limited, for example, given the distance between the monitoring device 20 and an access point 186 on the network. For example, if the status indicator 212 is blank, according to this embodiment, then the monitoring device 20 is not enabled for communication with the remote monitoring station 184. This status indicator 212 can provide certain information concerning the connection as follows according to this embodiment: If the communication status indicator 212 flashes, this is an indication that the monitoring device 20 is associated with an access point 186, but the device is not communicating with the remote monitoring station 184. If the communication status indicator 212 has a line appearing through it, the indicator being presented as shown in Figs. 15-18 as an antenna symbol, then the monitoring device 20 is not communicating with an access point 186, Fig. 6, and is not communicating with the

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remote monitoring station 184. As previously noted, the communication status indicator 212 according to this embodiment is located at the upper right hand corner of the status panel 320 in any primary display screen. Similar indications can be made using the status indicator 212 when the monitoring device 20 is communicating with a PC 192 and not with the network, and whether the monitoring device is associated with the network and is communicating with the remote monitoring station 184.

[00150] Due to battery constraints it is desirable when the monitoring device 20 moves out of range of the access point 186, that the user can selectively disconnect the monitoring device 20 from the wireless network and place the device in a disconnected wireless mode. This selective disconnection is highly desirable given the considerable drain to the battery resources that occur when attempting to restore communications with the remote monitoring station 184, Fig. 6, as the device would continue to attempt to restore communications even when the device is out of range. According to one version according to the present invention, this selective disconnection is achieved through software wherein the user highlights the communications status indicator 212 of primary display screen 210, Fig. 15, or any display screen having a status panel 320 using one of the directional arrow buttons 100 pressing the SELECT button 96.

[00151] According to this embodiment and referring to Figs. 48 and 49, a disconnected wireless icon popup or drop-down menu 560 (if the device is enabled with a wireless transceiver 180 and antenna 182) is accessed by which the user is permitted to selectively toggle into and out of a disconnected wireless mode.

[00152] The pop-up menu 560 includes a set of menu options, including a disconnect option 564 which the user can elect to disconnect the monitoring device 20 from the wireless network by scrolling using the appropriate directional arrow buttons 100 and highlighting the disconnect menu option. This election is further indicated to the user by one of the status indicators 169, Fig. 2, provided on the front facing side 84 of the monitoring device 20. During the time that the monitoring device 20 is disconnected from the network, the device provides only local respiration, NIBP, HR/PR and SpO_2 alarms or equipment alerts. During that time, a Disconnect message 568 is also displayed to the user next to the communication

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status indicator 212 on the display screen 210, the latter having a symbol indication of disconnection, as shown in Fig. 49. The use of the disconnect feature provides an advantage in that battery/device power is conserved while the monitoring device 20 is out of range. During the time the above wireless disconnect feature is utilized, trended vital signs data continues to be stored within the memory of the CPU 174, as per normal operation.

[00153] When the monitoring device 20 is again within range of the network, the communication status indicator 212, Fig. 15, provides a signal that the monitoring device 20 is within range and network connection can be restored by again highlighting the communication status indicator 212 to access the wireless mode menu 560, highlighting a Reconnect menu option (not shown), and pressing the SELECT button 96. This selection automatically causes a prompt that is displayed to the user for information concerning the patient and the network. A similar message is displayed at the remote monitoring station 184. Reconfiguration and handshaking of the herein described monitoring device 20 with the wireless network is as described in the previously incorporated U.S. Patent No. 6,544,174. At the time network connection is restored, all trended data stored during the time the monitoring device 20 was disconnected is transmitted to the remote monitoring station 184, Fig. 6, over the wireless network.

[00154] While the wireless version of the herein described monitoring device 20 is connected over the network, patient data gathered by the monitoring device is continuously stored at the remote monitoring station 184. At the remote monitoring station 184, patient information can be accessed and administrative functions can be performed including admitting, transferring and discharging the patient from the remote central monitoring station unit, editing the patient description (name, primary care physician), and reviewing and printing patient data, including trends and waveforms.

[00155] Other pop-up or drop-down menus are provided according to this embodiment for temporarily configuring other settings of the monitoring device 20 include a waveform source popup menu 580, see Figs. 32, 33, that provides user selections for determining which waveform is being displayed (e.g., resp, ECG including choice of vector) and for switching, for example, between a single

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waveform display screen 210 and a dual waveforms display screen 332, Fig. 16. This latter menu 580 is accessed by the user by highlighting the waveform source field 232 on the display screen 210 and pressing the SELECT button 96. According to the present embodiment and for all waveforms, except respiration, the monitoring device 20 further includes means for cascading a display in order to sweep a single waveform through two panels, thereby showing or presenting a waveform covering a 2x time period (e.g., 6 seconds to 12 seconds). Fig. 32 illustrates an example ECG waveform having a default menu option 584, with Fig. 33 depicting a user option 588 for a respiration waveform using the menu 580.

[00156] Similarly, a waveform size drop-down menu 600, Fig. 34, permits user selection relating to the size of displayed ECG, SpO_2 or respiration waveforms relative to any display screen 332 by highlighting the waveform size text identifier 236, located in the waveform panel 344 and selecting a menu option 604. A sample respiration waveform 608, Fig. 37, is shown that is augmented by this size menu.

[00157] A trend display pop-up menu 640, Fig. 53, permits selection between various forms of trended data (tabular, waveform, snapshot) by highlighting the data display header 364, Fig. 52, in the trends live numerics panel 356, Fig. 52, of a trended display screen, in this instance, a snapshots display screen 590. As previously noted, tabular screens are shown in Figs. 54-56 and a graphical trend display screen 380 is depicted in Fig. 57.

[00158] Similarly, a trend view interval popup menu 660, Fig. 55, is accessed by highlighting the Time heading in the data display panel 474, the menu permitting the time intervals between trended data listed to be selectively varied by the user.

[00159] Additional pop-up menus according to this embodiment include a snapshot waveform source popup menu, a graphical source pop-up menu and a snapshot selection pop-up menu. Each of these embedded menus are similarly accessed by highlighting the appropriate text identifier and pressing the SELECT button 96 to affect temporary configuration setting changes for the device 20. In addition, an SpO_2 spot check or random pop-up menu 620, Fig. 41, is also provided, details being provided for this latter feature in a succeeding section.

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[00160] A "control" menu for purposes of this embodiment includes a topic name for the current context (for example, SpO_2, in Fig. 22), each menu being defined by a stored formatted template comprising a first display panel having a column of parameters with one of the parameters highlighted (for example, SpO_2 Monitoring), and a column of options, with one item in the set of options being highlighted (for example, Standby, On, 100, On, 90, Low). The primary (e.g., blue) highlighted item indicates the parameter that is currently enabled for modification, while secondary (e.g., green) highlighted items indicate each of the current settings for all parameters in the control menu. Each control menu further includes a context menu at the bottom of the control panel in order to enable navigation as well as permit confirmation or cancellation of a choice/option selected by the user, such as in the instance of the start-up display screens 400(a), 400(b), Fig. 24. Presently, the monitoring device 20 described herein includes at least nine (9) control menus that are accessible by the user.

[00161] As noted, each control menu can provide customization of the configuration of the monitoring device 20 for the current patient and to confirm choices. As in the preceding, each control menu can be accessed using the directional arrow buttons 100 to locate and highlight the item to be controlled and pressing the SELECT button 96, as previously described. It will be readily apparent that the number and arrangement of these menus is exemplary and that other variations and modifications are possible within the intended ambits of the invention. Additionally, it should further be noted that each of the following controls can be similarly modified from the remote monitoring station 184 over the wireless connection with the monitoring device 20.

[00162] First, a time setup control menu 700, Fig. 31, allows the time, date and time format used by the monitoring device 20 to be locally modified by the user. More particularly and according to this embodiment, the time format (12 hour/24 hour), hour, minute, month, day, year, year and year format can be selectively adjusted by the user. The time and date can also be confirmed for correctness as the monitoring device 20 is capable of displaying time in either 12 hour (AM/PM) or 24 hour format, and displays the date in either a month/day/year, day/month/year, or other suitable format. According to this embodiment, the date does not appear in the

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primary display screens but does appear in both a snapshot list and associated snapshot data, details of which are described below. Highlighting the time display 216 (located in the upper right corner of a primary vital signs display screen 210 or any display screen having a status panel 320) and pressing the SELECT button 96 to accesses the Time/Date control menu 700, the screen allowing changes to be made and stored into memory by the monitoring device 20.

[00163] Additionally, a number of parameter control menus are accessible, including an NIBP control menu, an SpO_2 control menu, a HR/PR control menu and a respiration control menu, respectively. Each of these parameter control menus can be accessed by either selecting the parameter text identifier in any primary display screen such as 210, Fig. 15, or by selecting the alarm bell icon 268.

[00164] More specifically, the NIBP control menu permits the setting of upper and lower alarm limits for each of the systolic, diastolic and mean pressures as well as the selection of a digital manometer, the selection of a specific NIBP mode and the time interval used when an automatic mode is enabled. An exemplary NIBP control menu 720 is shown in Fig. 23. The NIBP control menu 720 is defined by three panels according to the present embodiment. The uppermost panel 722 includes a listing of menu options that can be elected by the user. The second field 724 includes a listing of submenu options associated with each menu option from the first panel 722. The third panel is a context menu panel 416 that includes a series of navigational options.

[00165] More specifically with regard to the herein described monitoring device 20, NIBP measurements can be taken through a user-selected automatic mode in which blood pressure readings are taken at prescribed time intervals. Following the correct positioning of a proper sized cuff 76, Fig. 1, on a patient, and screwing the hose end into the NIBP air connector fitting 48, Fig. 3, provided on the top facing side 52 of the device housing 24, Fig. 3, the automatic NIBP mode can be enabled by highlighting the NIBP text identifier in the primary vital signs display screen 210, Fig. 15, and pressing the SELECT button 96. The above selection accesses the NIBP control menu 720, shown in Fig. 23, wherein the NIBP Mode option is scrolled to and the Auto menu suboption in the second panel 724 is selected using the directional control buttons 100 to highlight the desired mode and

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pressing the SELECT button 96. An appropriate time interval can then be selected by highlighting the Auto Time Interval (min) suboption in the panel 724 that will provide automatic blood pressure measurements at the prescribed intervals (e.g., 3 min, 5 min, 15 min, 30 min, 60 min, etc). It should be noted that the incorrect placement or failure to place the cuff 76 on the patient will still enable automated mode, but an equipment alert will be sounded by the monitoring device 20.

[00166] The automatic NIBP mode can be disabled by highlighting the NIBP text identifier on the primary vital signs display screen 210 using the directional control buttons 100, pressing the SELECT button 96 to access the NIBP control menu, Fig. 23, and then highlighting NIBP mode from the NIBP control menu 720 and selecting the Manual menu option using the appropriate directional control buttons 100.

[00167] Otherwise, any blood pressure reading can be taken manually after positioning the correct cuff 76, Fig. 1, and hose 80, Fig. 1, relative to the patient, screwing the hose end into the NIBP air connector fitting 48, Fig. 3, provided on the top facing side 52, Fig. 3, of the housing 24 and pressing the NIBP start/stop button 112. As previously noted, all manual and other NIBP mode measurements are stored as trended data by the monitoring device 20.

[00168] In addition, an enhanced blood pressure measurement mode (herein referred to as "Turbo" mode) is provided in which the monitoring device 20 automatically initiates a blood pressure measurement reading in a conventional manner and then takes as many readings as is possible within a predetermined time period (e.g., 5 minutes), provided this option is enabled by way of default configuration settings such as through the downloaded configuration file. Turbo mode, as defined herein, can be set through the user interface 92 by highlighting the NIBP text identifier in any primary vital signs display screen 210 and pressing the SELECT button 96 to access the NIBP control menu 720, Fig. 23, as previously described. The NIBP Mode menu option can then be highlighted with the Turbo suboption then being selected using the appropriate arrow button 100. Selecting the NIBP start/stop button 112 or highlighting the NIBP Mode Manual menu option from the NIBP control menu 720 will restore the monitoring device 20 to a manual NIBP measurement mode.

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[00169] As noted generally above, the patient monitoring device 20 according to the present embodiment further includes a digital manometer that can be selectively displayed for the user during a blood pressure measurement procedure. This feature is enabled through the NIBP control menu 720 which is accessed in the manner previously described above from any of the primary vital signs display screens. In the NIBP control menu 720, Fig. 23, the Manometer option listed therein in the top panel 722 is highlighted using the directional arrow buttons 100. Pressing the SELECT button 96 causes a manometer menu 730 to appear as an overlay on the display screen 210, as shown in Fig. 44. Pressing the NIBP start/stop button 112 starts the NIBP measurement cycle as previously described. When the attached cuff 76, Fig. 1, is inflated, a manometer pressure indicator bar 734 located at the bottom of the display screen 210 dynamically displays the pressure reading, as shown in Fig. 45. When the blood pressure measurement cycle is completed, measurement numerics 742 appear below the waveform grid of the display screen 210 and each of the systolic, diastolic and MAP values for the measurement are displayed as markers 738, if valid readings are obtained for each along a defined manometer scale, as shown in Fig. 46.

[00170] Adjustment and enablement of the alarm limits and the remaining options on the control menu 720 are selected in the same manner described above. As to the context menu panel 416 options for parameter control menus and referring for example to Fig. 44, the Exit menu option, if selected by the SELECT button 96, reverts the user back to the previous primary vitals signs display screen, the Trends option changes the display screen to a trends viewer screen that causes a tabular or waveform history to be displayed, the Snapshots menu option causes a series of 21-second waveform snapshots of the current patient's vital signs to be selectively viewable, and the Setup menu option accesses the setup control menu.

[00171] The SpO_2 control menu 402, Fig. 22, permits setting of either continuous or a random (herein also commonly referred to as a spot-check) SpO_2 measurements, the setting of alarm limits and setting of the pulse tone. According to the present embodiment, continuous measurement of at least one physiologic parameter other than SpO_2, such as ECG, is enabled through the CPU 174 and the tethered physiologic parameter sensor assemblies, while permitting the user, by

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means of the user interface 92, to manually "spot check" SpO_2. That is to say, SpO_2 can be periodically or randomly checked on the patient (not shown) while simultaneously maintaining continuous monitoring of at least one other physiologic parameter.

[00172] When continuous SpO_2 is enabled, an alert is generated each time that SpO_2 readings are interrupted, such as when the sensor is disconnected from the patient after the monitoring device 20 has begun to take SpO_2 readings. Using the random monitoring or "spot check" feature, any number of randomly taken readings can be taken, attaching and detaching the sensor repeatedly without generating any alarms.

[00173] Referring to Fig. 39, a flowchart generally describes the herein referred to random or spot checking monitoring feature. Initially, the SpO_2 monitoring function of the monitoring device 20 is turned off. The user can turn the continuous SpO_2 monitoring function off manually with the user interface 92 by scrolling to the primary vital signs display screen, Fig. 21, and highlighting the SpO_2 text identifier 407 and pressing the SELECT button 96. The preceding accesses the SpO_2 control menu 402, Fig. 22. This control menu 402 is defined by two panels; a first panel 746 that includes a list of menu options and suboptions and a context menu panel 416 permitting navigation out of the spot-check mode. Highlighting the SpO_2 Monitoring menu option 403, using the left arrow button 100 to highlight the Off suboption and pressing the SELECT button 96 then turns off the continuous monitoring function and turns the spot checking feature.

[00174] When the SpO_2 monitoring function has been deactivated, it can then be reactivated by the user, either for continuous monitoring or for a one-time spot check reading. When a spot check is desired according to this embodiment, the pulse oximeter sensor 60, Fig.1, is attached to the monitoring device 20 and to the patient. The user then highlights SpO_2 on the primary vitals sign display screen, Fig. 40, and presses the SELECT button 96. Upon pressing same, the user then highlights SpO_2 @ XX:XX and presses the SELECT button 96 accessing a SpO_2 drop-down menu 620 , Fig. 41. This menu 620 that appears as an overlay onto the display screen (not shown in this view) includes On, Off and Spot Check options. The On option 622 permits the user to reenable the continuous SpO_2 monitoring

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feature. The Off option 624 disables the continuous monitoring feature and enables spot checks. The Spot check option 626 is highlighted in this instance, since the SpO_2 continuous monitoring function has already been disabled. The spot checking feature of the herein described monitoring device 20 is controlled through logic contained within the monitoring device 20 that allows the SpO_2 hardware to first initiate the sensor assembly 32, Fig. 1, and acquire a stable SpO_2 measurement from the patient as sensed by the apparatus. According to this embodiment and referring to Fig. 42, the primary vital signs display indicates SpO_2 Spot Check with a text identifier "SEARCH" 628 displayed above a Spot Check text identifier 629 to indicate that the monitoring device 20 is waiting for pulse oximetry data from the patient. After a few seconds, the SpO_2 indicator (if SpO_2 is used to determine pulse rate begins to display pulses and after approximately 30 seconds, the SEARCH text identifier 628 disappears and a pulse oximetry reading 256 appears, Fig. 43. Once a stable measurement has been acquired, the SpO_2 subsystem is powered down automatically. The stable SpO_2 reading that has been obtained is then displayed for a predetermined period of time or until a new spot check reading of SpO_2 is acquired. For additional spot checking, the preceding steps are then repeated wherein the SpO_2 sensor assembly 28 is initiated; a stable reading is acquired and then displayed for a predetermined period of time. In the meantime, any other parameters that are continuously monitored, such as ECG, are unaffected by the spot-checking functionality feature.

[00175] Each of the HR/PR and respiration control menus as well as the NIBP and pulse oximeter control menus permit the setting of upper and lower alarm limits. The HR/PR control menu (not shown) further permits adjustment of volume or enablement of the heart tone, and the preferred source (either SpO_2 or ECG) for heart rate wherein the current source is also highlighted. The respiration control menu (not shown) also permits the selection of the reference leadwire used from the ECG monitoring assembly.

[00176] In addition to the above parameter control menus and the time setup control menu, set-up control menus are also provided to the user in order to define the behavior of the herein described monitoring device 20. A typical set-up menu can be accessed according to this embodiment from any main display screen, such as

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those depicted in Figs. 15-19, by performing the steps of: highlighting the battery indicator icon 220, HR/PR text identifier, SpO_2 text identifier, NIBP text identifier, respiration text identifier or the alarm icon 268; pressing the SELECT button 96 thereby accessing a parameter control menu; highlighting the setup option located in the context menu panel 416 at the bottom of the display screen 210; and pressing the SELECT button 96 again.

[00177] Among the items that can be configured in the respective set-up control menus according to this embodiment are the suspension and enablement of the audible alarms and adjustment of alarm tones, permitting management of same in a patient context. As previously noted, an "alarm" warns of a patient condition, such as a vital-sign reading that is outside of acceptable limits. When an "alarm condition" occurs according to the present embodiment, the red light status indicator 169, Fig. 2, on the front facing side 84 of the monitoring device 20 flashes and the numerics of the violating alarm limits shown on the display 88 turn red, such as depicted in Fig. 20. In addition, the display cursor moves automatically to the displayed item that caused the alarm and if not suspended, an audible alarm tone also may sound. A sample alarm condition 850 is shown in Fig. 58 in a single waveform display screen 210. In this instance, the heart rate for the monitored patient has exceeded a predetermined limit, as highlighted by 854. In addition to the above and in the instance that the monitoring device 20 is connected to a remote monitoring station 184, Fig. 6, notification of the alarm condition may also be transmitted to the remote monitoring station. Pressing the alarm silence/resume button 112 will silence current alarm tone for a predetermined period of time (e.g., 90 seconds).

[00178] An "alert" refers to an equipment or device condition, such as a low battery or a detached lead. When an "alert condition" occurs, the yellow light indicator 169 on the monitoring device 20 flashes and a message describing the condition appears on the display 88 in a message panel. An example of an equipment alert, in this instance, the disconnection of an ECG lead, is shown by the display screen of Fig. 59. Equipment alerts, according to this device embodiment, are indicated by a flashing yellow indicator 169 as well as a highlighted (e.g., yellow) alert message 306 provided conspicuously on the display screen of the

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monitoring device 20 and repeated sounding of an alert tone, in the instance that the alert is not acknowledged or the cause of the alert is not alleviated. The knowledgement is made through a context menu located at the alert window screen. Preferably, an alert tone will be distinguishable from an alarm tone to a user. In this specific instance, the depicted equipment alert is an ECG lead failure. Therefore and in addition, a diagram 302 is illustrated with an indication (in this instance a circled X) to indicate at least one disconnected lead. Alarm and alert conditions can also be detected by the remote monitoring station 184, Fig. 6, via the wireless network.

[00179] Examples of alert conditions detected by the herein described monitoring device 20 include, but are not limited to, the following: ECG Faults which can include Lead failure (single, multiple), excessive offset, or detection of unplugged ECG cable; NIBP Faults that can include an air leak, kinked hose, overpressure cuff condition, weak pulses to determine systolic/diastolic pressure, no pulses detected, detection of artifact prevents valid reading, or low battery; Network Communication Faults including the detection of a network communication problem, detection in attachment to charging cradle, low battery, or no SpO_2 detected; and respiration channel faults, such as a noisy signal or lead failure. Still referring to Fig. 59, acknowledgement of the alert by the user is made by highlighting the acknowledge option 864 at the bottom of the display screen and pressing the SELECT button 96, Fig. 2. Acknowledgement will remove the message panel and revert the display 88 to the previous display screen format.

[00180] Equipment faults for those situations in which the herein-described monitoring device 20 is operating on battery power as opposed to being mounted in the charging cradle have been discussed previously. In low battery conditions in which less than approximately 30 minutes of battery runtime remains, NIBP functions are disabled and the monitoring device 20 displays an appropriate message to the user that NIBP is disabled. Any attempt to press the NIBP start/stop button 112 or otherwise initiate a blood pressure measurement during a low battery condition will display an equipment alert with an appropriate message. However, placing the monitoring device 20 into the charging cradle 140 during a low battery condition will immediately enable all blood pressure monitoring features.

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[00181] There are two techniques according to the present embodiment in order temporarily silence an alarm tone. The first technique is through pressing the alarm/silence button 108, which will silence any current alarm(s) for a predetermined period of time (e.g., 90 seconds). It should be noted, that silencing the audible tone does not affect the remaining alarm or alert indicators. The alarm tone can also, according to this particular device embodiment, be suspended for all parameters, thereby preventing the alarm tone from sounding if an alarm condition occurs while monitoring a patient. Suspension is done by the user through accessing an alarms suspend menu 880 that is provided in the set up controls menu 800, as shown in Figs. 60, 61. If an alarm condition occurs while the alarm tones are suspended, the monitoring device 20 presents visual alarm indicators, but does not sound an audible tone.

[00182] As opposed to the interval for silencing an alarm tone, the suspension period of the alarm tone can be set during configuration of the monitoring device 20 to disable the tone for a predetermined period (i.e., 90 seconds – 60 minutes). In addition, the monitoring device 20 can be so preconfigured such that the alarm tone cannot be suspended by the user, for example, through use of the configuration file that is uploaded to replace the factory settings of the monitoring device using the PC 192, Fig. 6, as previously described.

[00183] Referring to Figs. 60, 61, and if the suspend feature is not disabled for the present monitoring device 20, the user can access the set-up control menu 800 by highlighting the text identifier of the parameter that is highlighted by the alarm. Once in the set-up control menu 800, the user can highlight the Alarms option, thereby accessing the Alarms set-up menu 880. As shown in Fig. 60 and upon accessing the Alarms setup menu 880, the display cursor highlights the Off menu option wherein a message panel appears in the display screen 210 to use the directional right arrow button 100 in order to highlight the On suboption. Once suspension has commenced, Fig. 61, a count-down timer 884 appears below the line in the set-up menu 880 as well as a highlighted indicator 888 in the upper portion of the display screen 210. When the suspension period expires, the alarm tone is again enabled. The alarms set up menu 880 further permits the volume of the alarm tone to be selectively adjusted by the user.

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[00184] Typically, each medical facility defines the patient alarm limits for adult, pediatric and neonatal patients and then configures the monitoring device 20 with those alarm limits prior to putting the monitoring device into service. As previously noted herein, it was noted that the user can locally or custom adjust certain configuration settings of the herein described monitoring device 20.

[00185] According to another feature of the herein described patient monitoring device 20 and referring to Fig. 62, upper and lower alarm limits can be temporarily customized for an individual patient while the monitoring device 20 is in use. This temporary customization feature can be implemented by the user by highlighting any vital sign of interest from a primary vitals signs display screen and pressing the SELECT button 96 so as to access the control menu for that parameter; in this instance, NIBP, 720. Upper and lower alarm limits can then be selected by highlighting the current value and using the left and right directional arrow buttons 100 to set the new alarm limit(s), 726, 728. These new limit values are then stored in volatile memory of the CPU 174, Fig. 6, of the monitoring device 20 and are erased when the monitoring device is powered down unless the user specifically maintains them as part of the current patient. Alternatively, however, the device could be configured to allow a user such that the settings could be retained by the user irrespective of the patient. The monitoring device 20 is further configured to permit alarm limits to be customized for a particular patient from the remote monitoring station 184, Fig. 6, over the bidirectional wireless network using the radio card 180 and antenna 182 to receive new limit values.

[00186] In addition to the above features, the herein described monitoring device can be further configured such that the user can perform alarm management on the monitoring device 20 by permitting the user to actuate a feature provided on the user interface 92 that creates a predetermined percentage change to the alarm limits for a single parameter each time the SELECT button 96 is depressed at the time of an existing alarm. The initialization and initial percentage settings for each of the alarm parameter settings is performed according to this specific embodiment as part of the configuration of the monitoring device 20 prior to use of the monitoring device 20 through the PC 192 using the configuration file to override factory configuration settings, the new settings being stored by the CPU 174. A

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portion of a sample worksheet 198 is shown in Figs. 64, 65 in which factory settings 199, shown in bold, can be adjusted for specific parameters, as listed in Fig. 64. Completing the worksheet 198 through the utility thereby provides means for completing the configuration file and assigning preset percentage amounts for adjusting alarm limits for any single parameter during a current alarm(s). The worksheet includes a menu choice 197 for enabling the alarm limit percentage option herein, also referred to as ParamSet. In essence, the user of this selective alarm management setting feature permits both upper and lower alarm limits to be preset accordingly and then used selectively by the clinician/nurse.

[00187] In summary, four (4) techniques are now provided in the present monitoring device 20 for handling or managing an existing alarm: First, the user can temporarily silence an alarm through use of the alarm silence/resume button 108 provided on the user interface 92. Turning the alarm off temporarily, however, in and of itself, does not change the limit. Therefore, if the patient's physiologic parameters are unchanged, the alarm will go off again momentarily depending on the default settings of the monitoring device 20 (e.g., 90 seconds). Second, the user can suspend the alarm tone for a patient for a predetermined period of time in the manner described above using the control menus 800. This feature also does not change any alarm limits. Third, the user can temporarily change or customize any of the alarm limits individually through features provided on the user interface 92, using the set-up control menus, as described above, such as 720 or other menu. As noted, this third technique can be accomplished by accessing the control menu for a specific parameter to highlight a specified parameter indicator (such as HR/min or NIBP, for example) and pressing the SELECT button 96. The corresponding parameter control menu, Fig. 62, is then displayed, permitting the user using the directional left and right cursor control buttons 100 to set appropriate alarm limits for the patient, the user then highlighting Exit to leave the menu window. Using the same pop-up menu or a similar menu, a fourth technique is provided by means of the presently described vital signs monitoring device 20 in which the user can also now automatically and selectively change a parameter alarm limit by a prescribed amount. Rather than incrementally changing the alarm limits, the user can change the alarm limits by a prescribed percentage amount each time the SELECT button 96

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for this option is actuated as entered using worksheet 198, Fig. 64, via the configuration file. The latter feature can be accessed only during a current alarm(s). For example, upper and lower alarm limits for HR/PR can initially be set to alarm at an upper rate of 90 and a lower rate of 60. Using the latter feature, each time the SELECT button 96 is actuated for the above feature in the control menu, the alarm limits can be incremented by a predetermined percentage (e.g., 5 percent, 10 percent, or other). For example, if a five percent change were configured for the herein described monitoring device 20, the alarm limits would change to 94 (upper)/57 (lower) the first time the SELECT button 96 is depressed, 99 (upper)/54 (lower) the second time the button is depressed, and so forth. Similarly, NIBP (systolic pressure, diastolic pressure and mean pressure), SpO_2 and respiration rate limits can be similarly adjusted wherein the amount from factory (default) preset value alarm limit values can be adjusted, depending on the patient mode, for individual parameters as part of the pre-configuration routine using the PC 192. A tabular listing 950 is shown in Fig. 65 for appropriate percentage changes to the alarm limits according to one example.

[00188] The ECG monitoring sensor assembly 28, Fig. 1, of the present embodiment includes a respiration circuit provided in the form of an ASIC, wherein breath signals using impedance pneumography supports measurement of respiration rate as well as central apnea. The herein described monitoring device 20 can monitor heart signs (ECG) and respiration rate using either a 3-lead or a 5-lead ECG cable. Using a 3-lead ECG cable, one signal waveform for lead I, II, or III can be displayed. Using a 5-lead ECG cable, either one or two signal waveforms can be displayed by the monitoring device 20 for leads I, II, III, V, and if enabled in the configuration, aVR, aVL, or aVF. The SpO_2 or Resp waveform can also be displayed in place of the ECG waveform.

[00189] To monitor ECG, the appropriate ECG cable is plugged into the device housing 24 and appropriate electrode sites are selected on the body of the patient. This selection process is commonly known and does not form a significant part of the present invention. At least three (3) electrode connections are required for ECG/Resp monitoring. The monitoring device 20 provides a graphic display

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302, Fig. 59, of a three or five lead ECG attachment with fixed locations being indicated. The locations of the circles shown in the diagram 302 in Fig. 59 do not indicate the exact placement of the electrodes on the patient.

[00190] The monitoring device 20 is adapted to indicate whether some lead wires are not connected and to indicate an "ECG Fault" equipment alert and a chest diagram such as shown in Fig. 59, indicating the general location of the disconnected lead or leads. If the disconnected lead(s) indicate that the waveform source (Lead) used for HR determination, then the monitoring device 20 automatically reassigns, if possible, the Lead used for heart rate (HR). If the reassignment succeeds, the monitoring device 20 then displays another equipment alert with the message "ECG Lead changed".

[00191] When all leads are properly connected, returning to the primary vital signs display screen will confirm that an ECG waveform is being displayed as well as heart rate and other patient data. The waveform source can be changed, for example, from Lead I to Lead II by highlighting the waveform source selection icon using the cursor control buttons 100 and pressing the SELECT button 96. The latter will access the waveform source menu 580, Fig. 32, wherein the appropriate option 584 can be highlighted. In passing and by scrolling to the bottom of the waveform source choice menu, a second waveform can be added (or deleted). The waveform size can also be suitably varied by the user by highlighting the current waveform scale and pressing the SELECT button 96. The waveform size pop-up menu 600, Fig. 34, is accessed through the latter selection and a desired scaling factor can be highlighted.

[00192] Respiration rate is also monitored using the ECG monitoring circuit, as noted above, based on impedance pneumography, wherein respirations can be sensed from the ECG electrodes. The respiration numeric is displayed in the lower right corner of the display screen. To view the respiration waveform, the waveform source identifier 232, Fig. 15, is highlighted and the SELECT button 96 is pressed in order to access the waveform source pop-up menu 580, Fig. 33. Respiration as a menu option 588 is then highlighted and selected. Waveform size can be adjusted in the same manner described previously for the ECG waveforms.

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[00193] In addition to monitoring the presence of the ECG waveform, the monitoring device 20 also detects the periodic signals emanating from an implanted pacemaker device. To that end, according to the present embodiment and referring to Fig. 35, if the patient being monitored has an implanted pacemaker device, the monitoring device 20 can indicate the occurrence of pacemaker or pacer signals by activation of the Pacer Indicator option 904 from the ECG set-up control menu 900, Fig. 36, if not already configured. When activated, the Pacer Indicator displays and prints vertical dashed lines to indicate pacemaker signals. If the Pacer Indicator option 904 is not enabled, the monitoring device 20 according to this embodiment continues to detect the pacemaker signals, but does not display or print the pacer markers. If the pacer signal is sufficiently strong, the monitoring device 20 displays this signal as a waveform spike, whether the Pacer Indicator option 904 is enabled or not. The present ECG circuit also detects when pacer signals/EMI pulses are occurring too frequently (outside of the periodicity of realistic pacer signals).

[00194] As previously noted, the detection of these pacer signals is commonly affected by electronic noise (such as EMI – Electromagnetic Interference) triggered, for example, from overhead lights that can hinder the ability to adequately detect a pacer signal from an implanted patient device (i.e., a pacemaker). Electrical noise from a power source can also cause an unclear or noisy waveform. According to one aspect, the invention provides the ability to select amongst the various ECG vectors, each of which has been processed for pacer pulse detection of both polarities and feeds both the pacer pulse detector and a peak/noise floor detector. An example is shown in Fig. 63. The latter detector generally captures a value 908 that is representative of the peak amplitude of real pacer pulses, and also captures a second value 912 that is representative of the peak amplitude of rapidly repetitive noise spikes, as shown in Fig. 63. Means allow selection of available ECG vectors and after obtaining a peak and noise floor level signal from each, shown as 915, 916, respectively, then picking an optimum ECG vector to continue feeding the pacer pulse detector. If the noise floor signal is made available to the user, the user can observe how the magnitude of the noise floor signal changes while moving the monitoring device 20 about in the vicinity of a possible noise source, the latter being shown magnified as 918. The reported signal level will generally increase as the

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monitoring device 20 is moved closer to the noise source and hence serves a directional aid in locating the source of electrical noise. Since it is already known at what level the noise spikes 912 would begin to trigger the pacer pulse detector, it may thus be determined whether a noise source was sufficiently large to cause false pulse detections. The principles described herein can be implemented by hardware, software or a combination of hardware and software.

[00195] The above circuit can further be used to validate a measurement in order to assess lead wire and electrode integrity for an ECG monitoring assembly. This measurement capability provides means for monitoring electrode performance as well as providing a means for proactively changing electrodes, as needed. As a matter of background and when lead wires of an ECG monitoring assembly are attached to a patient, the hardware drives a small current through each connected lead wire. This current is directed through the patient to a reference lead wire, also extending from the patient. As a result, each lead wire produces an offset voltage (with respect to the reference lead) based on Ohm's Law.

[00196] According to a variant of the present invention, each lead wire's offset voltage delta (that is, the voltage difference between each of its lead wires) can be determined, thereby providing a means for qualitatively "ranking" each of the lead wires and electrode assemblies. Software included within the monitoring device can then be utilized in order to provide an assessment of the electrodes and the lead wires based on the computed deltas, at least to determine the "qualitative state" of the electrodes, (e.g., if one lead wire has a much higher offset than the remaining leads, the most likely cause is an electrode contact issue such as a dry electrode or loss of contact with the patient). By comparing ratios of these voltage differentials, it is therefore possible to anticipate or become proactive relative to the life of portions of the ECG monitoring assembly.

[00197] In addition to the above, the monitoring device 20 also includes a power source filter that can be enabled from the ECG set-up control menu 900, Fig. 36. The settings for the power source filter should be applied depending on the power source in the facility. To that end, the power source filter option 906 according to this embodiment includes settings of 60 Hz and 50 Hz.

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[00198] Many factors can adversely affect a blood pressure (NIBP) measurement including cardiac arrhythmias, sudden changes in blood pressure, patient motion such as convulsions or shivering, sudden cuff movement, vibration, vehicle motion, or a weak pulse, among others. According to the present embodiment, and when NIBP and ECG are each being monitored with regard to a patient, the herein described monitoring device 20 can be further equipped with the selective use of a motion artifact filter, such as the Smartcuf artifact filter manufactured by Welch Allyn, Inc., in order to increase the measurement accuracy in the presence of moderate motion artifacts or diminished pulses. Specific details relating to the specific motion artifact filter utilized by this device are described in US Patent No. 6,405,076 B1, the entire contents of which have been previously incorporated by reference.

[00199] Enablement of an artifact filter feature would include the steps of mounting each of the ECG and NIBP assemblies to the monitoring device 20 and to the patient respectively and as previously described, and then simultaneously monitoring the patient using each of the above physiologic sensor assemblies. The set-up control menu 800 would be accessed in the manner described above from a primary vital signs display screen. Upon accessing the set-up control menu 800, the NIBP menu option would be highlighted to access the NIBP setup control menu and then a Smartcuf suboption (not shown) would be highlighted and selected. Under some conditions in which the artifact filter feature is enabled and motion artifacts are too severe that measurement accuracy is still affected, the blood pressure measurement could be marked with an identifiable symbol on the display screen and on printouts. During certain types of arrhythmias and other situations in which a valid ECG signal cannot be obtained, the motion artifact filter could also be selectively disabled by accessing the control menu in the same manner described above, highlighting the NIBP option and disabling the Smartcuf sub-option.

[00200] The buttons of the user interface 96 and the display and/or backlight of the herein described monitoring device 20 can be locked out to prevent unauthorized access or use. This lock out feature can be accomplished in several different ways. According to one technique and if the feature is initially enabled using the PC configuration utility, the user can simultaneously hold down the left

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arrow, the right arrow and the up button simultaneously for a continuous period of time (e.g., 5 seconds). All buttons, including the Power ON/Off button 56 are locked. The buttons are automatically unlocked when an alert or an alarm condition occurs. Similarly, the display 88 and/or backlight can also be locked out by the user using a selective combination of buttons if no operator activity (e.g., no buttons are pressed) has occurred for a predetermined amount of time. The backlight lockout and the display lockout features would again be disabled immediately after an alarm or alert condition occurs.

[00201] The remaining set up control menus that are available to the user according to this specific embodiment include that relating to the Demo Mode (Disabled, Low, High). In addition to the set-up control menus, the monitoring device 20 incorporates additional control menus according to this embodiment including a Device Status Control Menu; and a Message Control Menu. The Device Status Control Menu permits the user to see a displayed information screen 420(a), 420(b), such as shown in Fig. 26. The information screen 420(a), 420(b) includes separate panels 422, 424 including the facility name, department name, and other associated information. The Message Control Menu is used, for example, with regard to changing of ECG leads in the event of a lead failure, requiring the reassignment of channels. At the bottom of each of the control menus are context menu panels 416, allowing the user to navigate, the context menus for the set-up control menus being identical to those of the parameter control menus.

[00202] A more specific example of using a control menu is now herein described with reference to the display screen depicted in Fig. 22. In this example, it is desired to alter (i.e., raise) the SpO_2 lower alarm limit to 95 and to shut off the HR/PR tone. To perform the first step and with "SpO_2" highlighted, the down arrow button 100 is used to scroll to highlight Lower Limit and the right arrow button 100 is then pressed as many times as necessary in order to increment the limit to the intended limit value; in this instance 95. It should be pointed out the herein described monitoring device 20 is programmed such that the upper alarm limit cannot be decreased to a level that is lower than the lower alarm limit for the parameter. Similarly, a lower alarm limit cannot be raised to a level that is greater than or equal to the upper alarm limit.

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[00203] To adjust the HR/PR tone, the down arrow button 100 is pressed to scroll down to the HR/PR Tone field and the left or right arrow button is pressed as many times as is necessary in order to highlight OFF. Pressing the SELECT button or the display button 104 will exit the control menu screen and return the display to the previous vital signs display screen.

[00204] When the control menu is exited, the values that are displayed at the time the menu is exited are the new default values for the monitoring device 20. If a parameter is changed therefore, a decision must be made by the user prior to leaving the display screen whether or not to keep the previous setting values. If so, these parameters must be returned prior to exiting the control menu.

[00205] In summary and for purposes of menu and display navigation of the herein described monitoring device 20, the directional arrow buttons 100 are therefore used to perform any of the following functions: highlight an item on display, selection of options from a control menu, set-up menu or displayed "pop-up" menu, and changing the values of numeric parameters.

[00206] According to this embodiment, the display button 104 in addition to cycling though the configured display formats as shown in Fig. 19 can also be used to return to a primary vital signs display screen from a control menu and for closing a "pop-up" menu.

[00207] Finally, the SELECT button 96 is used to perform the following operations: display the control menu for a primary highlighted item, return from a control menu to a primary vital signs display screen, provide access to a set up menu when setup is highlighted by the display cursor, display of tabular and graphical trends when trends is highlighted, display of snapshots when snapshot is highlighted, turn on the display or the back light if either has been turned off by a power save feature of the monitoring device 20, and displaying a pop-up menu.

[00208] The herein described monitoring device 20 in addition to displaying current numerics and waveforms and the most recent measurements also stores a predetermined amount of patient data. According to this specific embodiment, up to 24 hours (at one-minute intervals) of trends (graphical and/or numeric) information for the patient being monitored can be stored, as well as NIBP and SpO_2 "spot checks" and "snapshots", as taken selectively by the user in connection with the

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patient and accessible from the Trends option of the context menu of any control menu, as described below. When data storage is at capacity, the data from each new reading overwrites the data from the oldest data stored. The features relating to the taking of SpO_2 and NIBP spot checks have previously been discussed at length.

[00209] As previously noted, a snapshot request is made by pressing the snapshot button 116, Fig. 7, which is provided on the front facing side 84 of the device housing 24. Upon depression of the snapshots button 116, the CPU 174 is programmed to provide a graphical display 298 of a default waveform (ECG, respiration) for a selected lead for a predetermined time period along with additional information, such as shown in the exemplary display screen of Fig. 50. In the sample snapshot display screen depicted in Fig. 50 and according to this embodiment, for example, 21 seconds of stored ECG data (7 seconds after the snapshot button 116 is pressed and 14 seconds before the snapshot button is pressed) is presented along with a time and data stamp for each waveform, the waveform source detected, the waveform scale (size) used and the corresponding number of the snapshot. According to the present embodiment, up to twenty (20) snapshots can be stored by the monitoring device 20 wherein any new snapshots overwrite the oldest stored versions thereof. It should be readily apparent that the number of snapshots can be suitably varied.

[00210] This data can be reviewed at the monitoring device 20. To review a snapshot and from any primary vital signs display screen, the user highlights any of the parameter text identifiers (HR/PR, SpO_2, etc) and then accesses a control menu for that parameter. The user then highlights the context menu panel 416 for that control menu and selects the snapshots option and confirms the selection by pressing the SELECT button 96. Highlighting the Snapshots option causes a Snapshots display screen to be displayed, examples of which is depicted in Fig. 51-53. Each of the up to twenty snapshots can then be viewed by the user. In the example shown in Figs. 51-53, five (5) snapshots were taken. The snapshot display screen 590 includes a status panel 320 at the top of the display screen, a live numerics panel 356 and a snapshot display panel 594, respectively. The snapshot display panel 594 displays the stored snapshot for viewing and includes controls for selecting the snapshot file, the data source, the scale of the display and scroll controls. A vertical

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line indicates the center of the display. The waveform and numeric vitals signs data during the 21 seconds can be viewed by the user by highlighting time interval provided at the bottom of the display screen 590 and using the directional (left/right) cursor buttons 100 to scroll the display to the desired time. An example is shown in Fig. 52, for five seconds after the trigger point of the snapshot as opposed to Fig. 51, which is taken one second following the trigger point. The waveform source and size of the snapshot can also be selectively changed by the user for any captured snapshot by highlighting the appropriate icon on the display screen and accessing an associated drop-down menu 580, 600, as shown in Fig. 32, 33. In this example, the user can optionally switch to another type of display or can exit and return to a primary vital signs display screen by highlighting Snapshots in the upper left corner of the display screen and pressing the SELECT button 96. The preceding accesses a Trends menu 640, Fig. 53, wherein highlighting the appropriate option allows the user to navigate to another display screen.

[00211] As noted, the monitoring device 20 also stores trend data that is viewable in a plurality of user selectable formats. Trend data can be reviewed in a manner similar to that of waveform data by highlighting any parameter icon from any primary vitals signs display screen, Fig. 53, and pressing the SELECT button 96. Highlighting Trends from the resulting pop-up menu and pressing the SELECT button 96 accesses the Trends display screen 470, an example of which is shown in Fig. 54. The trends display screen 470 displays tabular trend data as well as live numerics for the monitored patient, the screen having a format consisting of a status panel 320, a trends live numerics panel 356 and trends panel 474, respectively. The status panel 320 is similar to that previously described with respect to Fig. 15 and the live numerics panel is similar to that depicted in Fig.18. The trends panel 474 includes a tabular listing taken at one minute intervals with current vital sign readings for the monitored patient at the top of the display screen above the tabular list. As shown in this example, the reading time, HR/min, blood pressure (systolic/diastolic/mean), Respiration rate/min, and pulse oximeter (SpO_2) readings are provided. The user can scroll through the displayed tabular list using the directional (up/down) cursor buttons 100. The listing can include indications to show those readings that have already been captured in terms of snapshots, and any

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readings (if any) that are outside of permissible limits. Referring to Fig. 54, the user can selectively change the time interval for the displayed trend data by highlighting the Time text identifier 476 in the display screen 470 and accessing a view interval "pop-up" menu 660, permitting the user to selectively change the time (e. g., 5 minutes, 15 minutes, 30 minutes, 60 minutes) as needed by highlighting same and pressing the SELECT button 96.

[00212] Fig. 56 represents a sample display screen similar to Fig. 54, but indicating readings that have either exceeded alarm limits or appear suspect.

[00213] When attached to the charging cradle 140 and the PC 192, as shown in Fig. 6, all captured snapshots are caused to be automatically printed, if the monitoring device 20 is on for subsequent printing by the printer 195 through the USB data link with the PC 192 and the charging cradle 140. The data is uploaded to the PC 192, either manually or automatically through software loaded into the PC. According to the one version, all stored patient data is automatically printed when a powered monitoring device 20 is placed into a charging cradle 140. If the monitoring device 20 is off when placed in the charging cradle 140, then the autoprint feature is disabled. To enable the autoprint feature, the user must power up the monitoring device 20 and select Continue Patient in the start-up display screen 400(b), Fig. 24. Tabular trend data and snapshots stored within the monitoring device 20 are printed.

[00214] Pressing the Power On/Off button 56 accesses a Power Off display screen as shown in Fig. 47. The format of the Power-Off display screen 940 includes a status panel 320, a notice panel 408, a short message panel 412 and a context menu panel 416, as read from the top of the display screen. If there is an intent to monitor the same patient when the monitoring device 20 is turned on again, then it may be desired to save the stored vitals signs data and monitoring device settings. As such, two options are provided in the context menu panel 416 at the bottom of the display screen 940 – to either delete the stored data and settings and shut down or to save the stored data and shut down. Highlighting either of these options using the directional arrow buttons 100 and pressing the SELECT button 96 will cause the monitoring device 20 to shut down and either save or delete the stored

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data and settings. Alternatively, if the Power Off button 56 is pressed and the user wishes to continue monitoring the same patient, then a Cancel option is also provided in the Context menu panel 416 of the display screen 940. Failure to act within a predetermined time period according to this embodiment, as measured by an internal timer, will revert the display screen 940 to the previous screen or the default display screen as configured by the monitoring device 20.

[00215] Variations of the herein described monitoring device and associated hardware and software are possible within the intended scope of the inventive concepts in accordance with the following claims.

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What is claimed is:

1. A multi-parametric vital signs monitoring system, comprising:

a vital signs monitoring device, said monitoring device including a portable power supply enabling said monitoring device to operate in a stand-alone mode and a wireless transceiver enabling said monitoring device to operate in an alternative wireless networked mode with at least one remote station; and

a charging cradle adapted to receive said vital signs monitoring device, said charging cradle permitting said compact vital signs monitoring device to operate in a powered mode when said monitoring device is received by said charging cradle, said monitoring device being operable in said networked mode when said monitoring device is in said charging cradle.

2. A system as recited in Claim 1, including a computing device connected to said charging cradle through a serial connection, said portable computer being configured to automatically receive stored patient-related data from said monitoring device when said monitoring device is attached to said charging cradle.

3. A system as recited in Claim 2, including a printer connected to said computing device, said printer being configured to automatically print stored patient-related data from said monitoring device when said monitoring device is attached to said charging cradle.

4. A system as recited in Claim 1, wherein said charging cradle includes a data port, said data port being engageable with at least one peripheral device.

5. A system as recited in Claim 3, wherein said vital signs monitoring device includes a processor having memory and in which said data port is connected with a computing device, said computing device and said monitoring device being configured for automatically printing all data stored in said monitoring device when said monitoring device is attached to said charging cradle.

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6. A system as recited in Claim 5, wherein said vital signs monitoring device includes a selectively activated mechanism for capturing snapshots of patient related data, wherein stored snapshot data is automatically sent to the computing device for printing when said monitoring device is attached to said charging cradle.

7. A system as recited in Claim 3, wherein said vital signs monitoring device stores patient data as trended data and in which said stored trended data is automatically sent to the computing device for printing by said printer when said monitoring device is attached to said charging cradle.

8. A system as recited in Claim 2, wherein said vital signs monitoring device includes a processor having default settings for the operation of said device, said computing device including software for creating a configuration file that can be downloaded to said vital signs monitoring device when said device is attached to said charging cradle, said configuration file including a set of selectable instructions that replace at least one of the default settings of said device.

9. A system as recited in Claim 8, wherein said vital signs monitoring device permits temporary configuring of at least some of the settings loaded by said configuration file or through the initial default settings.

10. A system as recited in Claim 9, wherein the temporary settings can be deleted in favor of the default settings of said device when said vital signs monitoring device is powered down.

11. A system as recited in Claim 9, wherein the vital signs monitoring device includes a user interface having a set of user actuable controls enabling the user to apply temporary configuration settings to said monitoring device.

12. A system as recited in Claim 11, wherein temporary settings can be maintained when said monitoring device is powered down.

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13. A system as recited in Claim 11, wherein temporary configuration settings can be selectively deleted when said monitoring device is powered down.

14. A system as recited in Claim 1, including a remote station, said monitoring device and said remote station each including a wireless transceiver to enable bidirectional wireless communication therebetween.

15. A system as recited in Claim 14, wherein said remote station is capable of transmitting temporary configuration settings to said monitoring device by wireless communication.

16. A system as recited in Claim 1, wherein said vital signs monitoring device is patient wearable.

17. A system as recited in Claim 8, wherein said configuration file includes instructions for adjusting alarm limits of at least one monitored parameter, said adjustment enabling a user to adjust the alarm limits by predetermined percentage amounts.

18. A system as recited in Claim 17, wherein said monitoring device includes a user interface wherein a violated alarm limit can be adjusted when the alarm has sounded using a single button on said user interface.

19. A system as recited in Claim 1, wherein said vital signs monitoring device continuously monitors at least one physiologic parameter, said device including a pulse oximeter sensor assembly in which said device permits continuous operation of said at least one other parameter while enabling said pulse oximeter sensor assembly to be run either continuously or for spot checking a patient.

20. A device as recited in Claim 4, in which the peripheral device is a large display wherein data can be transmitted in real time to said display in said third mode.

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21. A device as recited in Claim 11, wherein said user-actuable controls include a plurality of user-actuable buttons for operating said monitoring device, and in which said buttons can selectively be locked out.

22. A device as recited in Claim 1, including a display having an integral backlight, and in which said display and the integral backlight can be selectively locked out to prevent unauthorized access.

23. A device as recited in Claim 22, wherein at least one of the display and the backlight can be powered down based on a predetermined amount of inactivity of said monitoring device.

24. A device as recited in Claim 1, including an ECG assembly, said ECG assembly including a pacer detection circuit for determining pacer spikes.

25. A device as recited in Claim 24, wherein said ECG sensor assembly is configured to selectively determine an appropriate ECG vector for noise detection.

26. A device as recited in Claim 11, wherein said user-actuable controls include a plurality of buttons that are used with a display screen to navigate using drop-down menus that are selectively accessible through the user interface.

27. A device as recited in Claim 26, wherein said user-actuable controls include a display button enabling a user to toggle through multiple data display modes of said monitoring device.

28. A method of monitoring a patient using a monitoring device, said method comprising the steps of:

providing a battery powered patient monitoring device in a first stand-alone mode, said device including a display to display patient-related data;

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configuring said patient monitoring device to operate in a second mode in which patient-related data is transmitted to a remote station by wireless communication;

placing said battery powered device in a charging cradle to permit said device to operate in a third mode in which the device is powered through connection to said charging cradle and in which said charging cradle is configured to transmit patient data from said device to a peripheral device through a wired connection when said monitoring device is attached to said charging cradle.

29. A method as recited in Claim 28, wherein said peripheral device includes a printer and in which said patient monitoring device includes a processor having a memory for storing patient data and a user interface, said method including the additional step of pressing a button on said user interface to selectively capture and store a snapshot of patient data wherein the placing of said patient monitoring device in said charging cradle causes any stored snapshot data to automatically be printed via said connected printer.

30. A method as recited in Claim 29, including the step of connecting a computing device and said printer to said charging cradle through a data port provided on said charging cradle.

31. A method as recited in Claim 29, wherein said patient monitoring device is configured to trend patient data and in which the placing of said patient monitoring device in said charging cradle causes all stored trended data to be printed via a printer connected to said charging cradle.

32. A method as recited in Claim 28, wherein said peripheral device includes a large display attached to said charging cradle via a data port wherein the placing of said patient monitoring device in said charging cradle causes data displayed by said patient monitoring device to be contemporaneously displayed by said large display.

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33. A charging cradle for use in a patient monitoring system, said charging cradle comprising:

a receptacle adapted for receiving a patient monitoring device;

means for charging the battery of a received patient monitoring device and for powering of said device in lieu of said battery; and

a data port adaptively configured for permitting bidirectional communication between a received patient monitoring device and a peripheral device.

34. A charging cradle as recited in Claim 33, including at least one locking mechanism adapted for mechanically engaging a patient monitoring device.

35. A charging cradle as recited in Claim 34, including a release button for releasing a patient monitoring device from said locking mechanism.

36. A charging cradle as recited in Claim 33, including at least one indicator indicating that the battery of said patient monitoring device is being charged.

37. A charging cradle as recited in Claim 33, including at least one indicator indicating whether said cradle is powered.

38. A charging cradle as recited in Claim 33, wherein said patient monitoring device is able to send all stored data to said peripheral device when said monitoring device is attached to said charging cradle.

39. A charging cradle as recited in Claim 33, wherein said peripheral device is a computing device, said computing device being programmed to transmit a configuration file to said patient monitoring device when said monitoring device is attached to said charging cradle.

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40. A charging cradle as recited in Claim 39, wherein said computing device is connected to a printer and in which said patient monitoring device and said computing device are configured to automatically print data stored by said patient monitoring device when said patient monitoring device is attached to said charging cradle.

41. A charging cradle as recited in Claim 33, wherein said peripheral device is a large display, said charging cradle enabling data to be transmitted from said patient monitoring device to said display via said data port.

42. A charging cradle as recited in Claim 33, wherein said data port is a USB data port.

43. A charging cradle as recited in Claim 39, wherein said configuration file includes instructions for setting alarm limits of said patient monitoring device such that a user interface of said device can incrementally change the alarm limits of a single monitored parameter by predetermined percentages when an alarm condition occurs.

44. A charging cradle as recited in Claim 33, wherein said charging cradle is attachable to a bedrail.

45. A charging cradle as recited in Claim 33, wherein said charging cradle is attachable to an IV pole.

46. A charging cradle as recited in Claim 41, wherein said charging cradle can be directly attached using bracketry to said large display.

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47. A method for configuring a patient monitoring device, said method including the steps of:

placing said monitoring device in a charging cradle;

attaching said charging cradle to a portable computer;

creating a configuration file at said portable computer;

uploading said configuration file to said patient monitoring device, said configuration file including new default settings to replace factory settings installed in said monitoring device.

48. A method as recited in Claim 47, wherein said patient monitoring device includes a user interface for enabling a set of control menus that are selectively displayed by said device, said method including the additional steps of:

powering up said patient monitoring device;

accessing at least one control menu to custom configure at least one operational setting of said monitoring device.

49. A method as recited in Claim 47, wherein the step of creating said configuration file includes the step of preparing a worksheet on the PC having listed settings, wherein responses to a prepared worksheet are converted into instructions for said configuration file.

50. A method as recited in Claim 49, wherein said configuration worksheet includes a setting for setting alarms limits for individual physiologic parameters measured by said monitoring device, the setting of said alarm limits providing an option for the user to affect a single alarm limit by a predetermined percentage amount when an alarm condition is warranted by said device.

51. A method as recited in Claim 50, wherein said patient monitoring device includes a user interface for enabling a set of control menus that are selectively displayed by said device, said method including the additional steps of:

powering up said patient monitoring device;

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accessing at least one control menu to custom configure at least one operational setting of said device wherein the triggering of an alarm condition by said device permits a user to alter the alarm limit using said user interface based on the predetermined percentage amounts entered using said configuration file.

52. A patient monitoring device comprising:

at least one physiologic parameter sensor assembly capable of continuously monitoring a physiologic parameter of a patient; and

a pulse oximetry sensor assembly that is configurable in a first continuous measurement mode and a second noncontinuous measurement mode, said second mode enabling random checking of pulse oximetry values while maintaining continuous operation of said at least one physiologic parameter sensor assembly.

53. A device as recited in Claim 52, including a user interface that permits selective operation of said first and second mode of said pulse oximeter sensor assembly.

54. A device as recited in Claim 53, including a display capable of displaying processed data from said at least one physiologic parameter assembly and said pulse oximeter sensor assembly.

55. A device as recited in Claim 54, wherein said display includes a dynamic pulse amplitude indicator.

56. A device as recited in Claim 54, wherein said at least one physiologic sensor assembly capable of performing continuous monitoring is an ECG sensor assembly.

57. A device as recited in Claim 54, wherein device is patient-wearable.

58. A device as recited in Claim 54, wherein said device weighs approximately two pounds.

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59. A device as recited in Claim 54, wherein physiologic data from said sensor assemblies can be selectively viewed in varying formats on said display using said user interface.

60. A device as recited in Claim 59, including a display button provided on said user interface that enables the device to be selectively toggled between a plurality of display modes.

61. A device as recited in Claim 54, including a wireless transceiver enabling said device to be selectively placed in one of a wireless networked mode and a wireless disconnected mode.

62. A device as recited in Claim 56, including a noninvasive blood pressure measuring sensor assembly.

63. A patient monitoring device comprising:

a housing;

a display disposed on said housing; and

a pulse oximeter sensor assembly, said sensor assembly being selectively engageable in a first mode that enables said pulse oximeter to be run continuously and a second mode enabling said sensor assembly to be run in a noncontinuous mode, said display being interconnected to said sensor assembly to enable display of pulse oximeter data in each of said first and said second modes.

64. A device as recited in Claim 63, including at least one physiologic parameter sensor assembly capable of monitoring a physiological parameter of a patient, said at least one physiologic sensor assembly being separate from said pulse oximetry sensor assembly.

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65. A device as recited in Claim 64, wherein said at least one physiologic sensor assembly continuously monitors a physiological parameter of a patient, said device being configured to permit operation of said at least one physiologic sensor assembly and said pulse oximeter assembly in each of said continuous and said noncontinuous modes.

66. A device as recited in Claim 65, wherein said pulse oximeter assembly includes a sensor that is attached to a peripheral measurement site of a patient, said continuous mode being performed while said sensor is attached to a said patient and said noncontinuous mode being performed by selectively removing and attaching said sensor, wherein attachment and detachment of said pulse oximeter sensor does not affect the operation of said at least one other physiologic sensor assembly of said device.

67. A device as recited in Claim 66, wherein said at least one physiologic sensor assembly is an ECG monitoring assembly.

68. A device as recited in Claim 64, wherein said at least one physiologic sensor assembly is a blood pressure monitoring assembly.

69. A patient monitoring device including:

a housing;

a display disposed in said housing; and

a noninvasive blood pressure measurement sensor assembly, said sensor assembly being connected to said display and including a display option for displaying a dynamic manometer reading as a blood pressure measurement is taken, including the display of specific pressure identification markers.

70. A device as recited in Claim 69, including a user interface disposed on said housing for controlling operation of said device.

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71. A device as recited in Claim 70, wherein the blood pressure sensor assembly includes an automatic mode and a manual mode, said modes being enabled by said user interface.

72. A device as recited in Claim 70, wherein the blood pressure sensor assembly includes a continuous automated mode in which continuous blood pressure readings are made within a predetermined time interval automatically.

73. A device as recited in Claim 70, including an ECG monitoring assembly.

74. A device as recited in Claim 73, in which the blood pressure sensor assembly includes an artifact filter that is employed using the ECG monitoring assembly with the blood pressure sensor assembly.

75. A patient monitoring device comprising:

a housing that includes a portable power supply and a display for permitting the monitoring device to operate in a first stand-alone mode;

a wireless transceiver enabling said monitoring device to operate in a second mode in which patient-related data is transmitted to a remote station and in which said monitoring device is configured to be separately powered in a third mode wherein said device can still operate simultaneously in the second networked mode while in said third mode.

76. A device according to Claim 75, in which the monitoring device is adapted to be placed in a charging cradle in the third mode, the charging cradle including a data port to permit communication between said patient monitoring device and at least one peripheral device.

77. A device as recited in Claim 75, wherein said monitoring device is patient wearable in said first and second modes.

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78. A device as recited in Claim 76, in which the peripheral device is a large display wherein patient-related data can be transmitted in real time to said display in said third mode using said data port.

79. A device as recited in Claim 76, in which the peripheral device is a computing device.

80. A device as recited in Claim 79, in which the computing device is configured to send a configuration file to the patient monitoring device providing default settings for said monitoring device.

81. A device as recited in Claim 79, in which said computing device is configured to automatically receive stored data from said patient monitoring device when said monitoring device is attached to said charging cradle.

82. A device as recited in Claim 76, including a processor having memory for storing and trending patient-related data, said device further including a user interface that permits snapshots of data to be selectively taken, wherein all trended data and snapshot data is automatically transmitted when said patient monitoring device is attached to said charging cradle.

83. A device as recited in Claim 75, including a user interface defined on said housing having a plurality of user-actuable buttons for operating said device, and in which said buttons can selectively be locked out.

84. A device as recited in Claim 75, including a display having a backlight, and in which said display and the backlight can be selectively powered off to prevent unauthorized access.

85. A device as recited in Claim 84, wherein at least one of the display and the backlight can be powered down based on inactivity of said device.

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86. A device as recited in Claim 75, including an ECG assembly, said ECG assembly including a pacer detection circuit for determining pacer spikes.

87. A device as recited in Claim 86, wherein said ECG assembly is configured for determining an appropriate ECG vector for electrical noise detection using pacer spikes from the pacer detection circuit.

88. A device as recited in Claim 75, wherein the wireless transceiver can be selectively powered down if the transceiver is out of range of an access point.

89. A device as recited in Claim 83, wherein said user interface includes a plurality of buttons that are used with a display screen to navigate using drop-down menus that are accessed through the user interface.

90. A device as recited in Claim 89, wherein said user interface can access a disconnected wireless mode menu in which the device can be selectively switched between a disconnected wireless mode and said wireless mode.

91. A patient monitoring device comprising:

a housing:

at least one battery disposed within said housing for powering said device;

at least one physiologic assembly including a sensor attachable to a patient and processing circuitry, at least a portion of said at least one physiologic assembly being disposed within said housing;

a wireless radio card enabling wireless communication between said device and a remote station in which patient monitored data is transmitted in real time to said station, said device including a communication status detector for detecting the state of the wireless connection and for powering down the radio card.

92. A device as recited in Claim 91, in which said device is operable in a first mode which is a wireless networked mode and a second mode which is a wireless disconnected mode.

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93. A device as recited in Claim 92, including a display and a user interface, said user interface including a plurality of user-actuable control buttons for accessing a plurality of control menus and in which one of said menus permits user selection between said a wireless disconnected mode and said wireless networked mode.

94. A device as recited in Claim 93, wherein said display includes a backlight and in which said device is configured to power off at least one of the display and the backlight after a predetermined amount of inactivity.

95. A device as recited in Claim 94, wherein said display and said backlight are automatically enabled if an alarm or alert condition is sensed by said monitoring device.

96. A device as recited in Claim 94, wherein at least one of said display and said backlight can selectively be locked out to prevent unauthorized use of said monitoring device.

97. A device as recited in Claim 93, wherein said user-actuable control buttons of said user interface can selectively be locked out to prevent operation and to prevent unauthorized use of said monitoring device.

98. A device as recited in Claim 96, wherein the lockout feature of said display and said backlight is automatically disabled if an alarm or an alert condition is sensed by said monitoring device.

99. A device as recited in Claim 97, wherein the lockout feature of said user actuable buttons is automatically disabled if an alarm or alert condition is sensed by said monitoring device.

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100. A device as recited in Claim 97, wherein said lockout feature is enabled through a predetermined simultaneous actuation of multiple user-actuable control buttons.

101. A device as recited in Claim 96, wherein said lockout feature is enabled through a predetermined simultaneous actuation of multiple user-actuable control buttons.

102. A patient monitoring device comprising:

a housing having an integrated display and a user interface;

a plurality of sensor assemblies for measuring physiological parameters of a monitored patient;

a processor having memory, said processor being disposed in said housing and operatively connected to said sensor assemblies, said display and user interface wherein data from said sensor assemblies is processed and displayed by said display in various display formats;

wherein said user interface includes a plurality of control buttons including a display button to enable a user to toggle between the various display formats.

103. A device as recited in Claim 102, wherein said display includes a back light and in which at least one of said display, said back light and said control buttons can be selectively locked out of operation to prevent unauthorized use of said monitoring device.

104. A device as recited in Claim 103, wherein said lockout feature is automatically disabled if an alarm or an alert condition is sensed by said monitoring device.

105. A device as recited in Claim 104, wherein said lockout feature is enabled and disabled by means of a predetermined combination of said control buttons.

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106. A device as recited in Claim 102, wherein configuration settings of said device can be temporarily adjusted from default settings stored by said processor using said user interface.

107. A device as recited in Claim 106, including a plurality of menus, that are selectively accessible by a user using said control buttons, as overlays on a display screen, said menus having a plurality of options for setting certain features of said monitoring device.

108. A device as recited in Claim 102, wherein one of said control buttons enables a user to selectively capture at least one snapshot of numeric and waveform data, each said at least one snapshot covering a predetermined time period.

109. A device as recited in Claim 102, wherein trended data can be selectively displayed in at least one of tabular and graphical form, and in which trended data can be displayed by use of said display button.

110. A device as recited in Claim 108, wherein said monitoring device is battery-powered, said device being adapted for fitting in a charging cradle.

111. A device as recited in Claim 110, wherein said monitoring device is configured to automatically send all stored data for printing to a peripheral device connected to a printer when said monitoring device is attached to said charging cradle.

112. A device as recited in Claim 111, wherein all stored snapshots are automatically printed when said monitoring device is attached to said charging cradle.

113. A device as recited in Claim 102, wherein said monitoring device is patient-wearable.

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114. A patient monitoring system comprising:

a patient monitoring device including a plurality of sensor assemblies for receiving vital-signs data, said device further including a housing having a processor for processing, storing and displaying processed data on an integrated display, said monitoring device being battery powered;

a cradle sized for receiving said monitoring device and including a charger for charging the batteries of said monitoring device and for providing a power supply for said device in lieu of batteries, said cradle further including a data port; and

at least one peripheral device that is connected to said cradle, wherein stored patient data is automatically sent to said peripheral device over said data port when said monitoring device is attached to said cradle.

115. A system as recited in Claim 114, wherein said peripheral device is a computing device is connected to a printer wherein said patient monitoring device includes a user interface including a control button for selectively capturing snapshots of patient data covering a predetermined time interval, wherein the placement of said monitoring device in said cradle automatically causes all snapshots to be printed.

116. A system as recited in Claim 115, wherein said patient monitoring device stores data as trended data.

117. A system as recited in Claim 115, wherein said computing device is configured to send a configuration file and said patient monitoring device is configured to receive said configuration file over the data port of said cradle, said configuration file being used to override factory settings for configuring said monitoring device.

118. A system as recited in Claim 117, wherein said configuration file is converted from a configuration worksheet having a listing of settings from which default settings are created.

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119. A system as recited in Claim 117, wherein said patient monitoring device includes a user interface enabling user-initiated configuration settings to be made.

120. A system as recited in Claim 119, wherein user-initiated configuration settings are temporary and can be selectively deleted in favor of default settings when a monitoring device is powered down.

121. A system as recited in Claim 120, wherein user-initiated settings can selectively be saved for use after powering down of said monitoring device.

122. A system as recited in Claim 114, wherein said peripheral device includes a large display, enabling data displayed by said monitoring device to be transmitted to said large display when said monitoring device is placed in said charging cradle using said data port.

123. A system as recited in Claim 114, wherein said patient monitoring device includes a wireless transceiver for communicating with a remote station.

124. A system as recited in Claim 120, wherein said patient monitoring device includes a wireless transceiver for communicating with a remote station and in which said temporary configuration settings can be made from the remote station.

125. A system as recited in Claim 124, wherein temporary configuration settings added using said remote station can be automatically deleted in favor of default settings if communications between said remote station and said monitoring device are lost.

126. A system as recited in Claim 123, wherein said monitoring device is selectively operable in a wireless mode and a stand-alone mode.

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127. A system as recited in Claim 126, wherein said monitoring device includes a communication status indicator that is displayed for indicating the status of the connection between the remote station and the monitoring device.

128. A system as recited in Claim 126, wherein communication with said remote station can be selectively disabled by said user if said device is out of range with the remote station.

129. A system as recited in Claim 114, wherein at least one sensor assembly is disabled on said monitoring device if battery power drops to a predetermined level.

130. A system as recited in Claim 129, wherein said sensor assembly is a non-invasive blood pressure sensor assembly.

131. A system as recited in Claim 129, wherein said monitoring device includes a battery status indicator that is displayed by said device.

132. A system as recited in Claim 114, wherein said patient monitoring device is patient wearable.

133. A system as recited in Claim 114, wherein said patient monitoring device includes a strap for hand-held operation thereof.

134. A system as recited in Claim 114, wherein said cradle includes a bracket for hanging on a bed rail.

135. A system as recited in Claim 122, wherein said large display includes an interface enabling said large display to be connected to said charging cradle.

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136. A system as recited in Claim 135, wherein said interface is a housing that includes a VGA card and a connector for receiving a cable from said data port.

137. A system as recited in Claim 136, wherein said cradle includes bracketry for connecting directly to said large display interface.

138. A system as recited in Claim 114, wherein said cradle includes at least one indicator for indicating that the batteries in said monitoring device are being charged.

139. A system as recited in Claim 114, wherein said cradle includes at least one indicator to indicate that power is being applied.

140. A system as recited in Claim 114, wherein said monitoring device includes at least one status indicator on the housing for apprising the user of the operational status of said device.

141. A system as recited in Claim 114, wherein said monitoring device includes at least one continuously operating sensor assembly and a pulse oximeter assembly that can operate selectively in a continuous mode and a noncontinuous mode.

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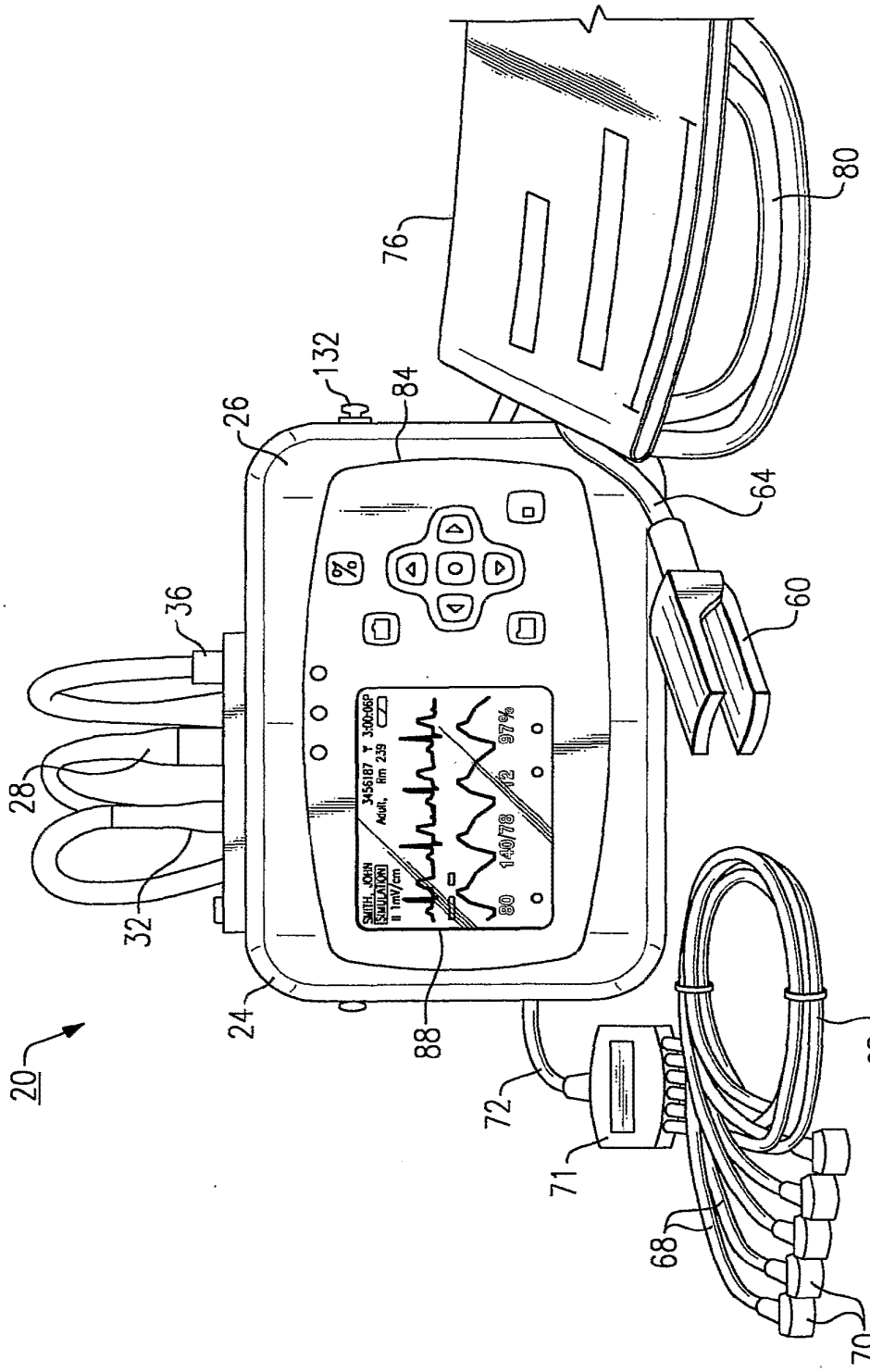

20
24
26
28
32
36
60
64
68
68
70
71
72
76
80
84
88
132
SMITH, JOHN
SIMULATION
II 1mV/cm
3456187 Y 3:00:06P
Adult, Rm 239
80
140/78
12
97%

FIG.1

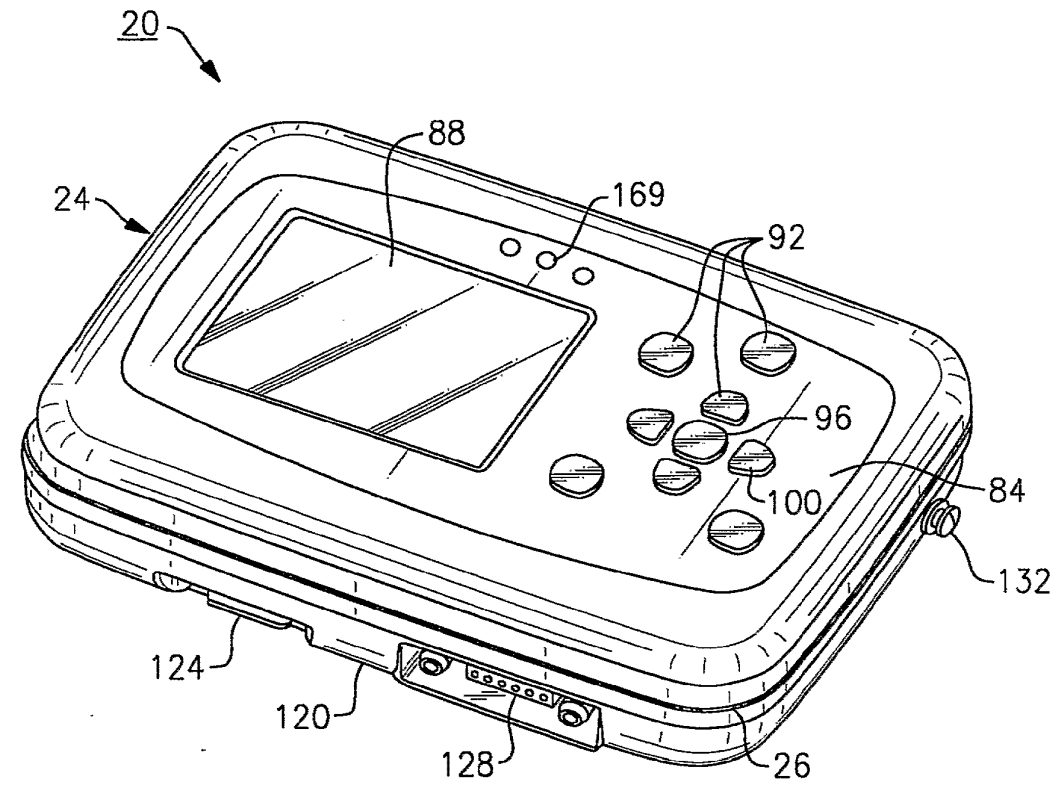

20
88
24
169
92
96
100
84
132
124
120
128
26

FIG.2

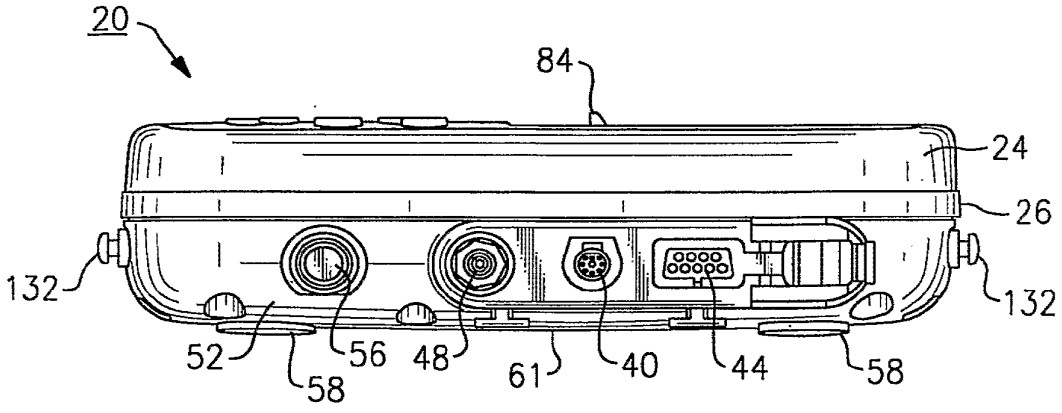

20
84
24
26
132
132
52
56
48
61
40
44
58
58

FIG.3

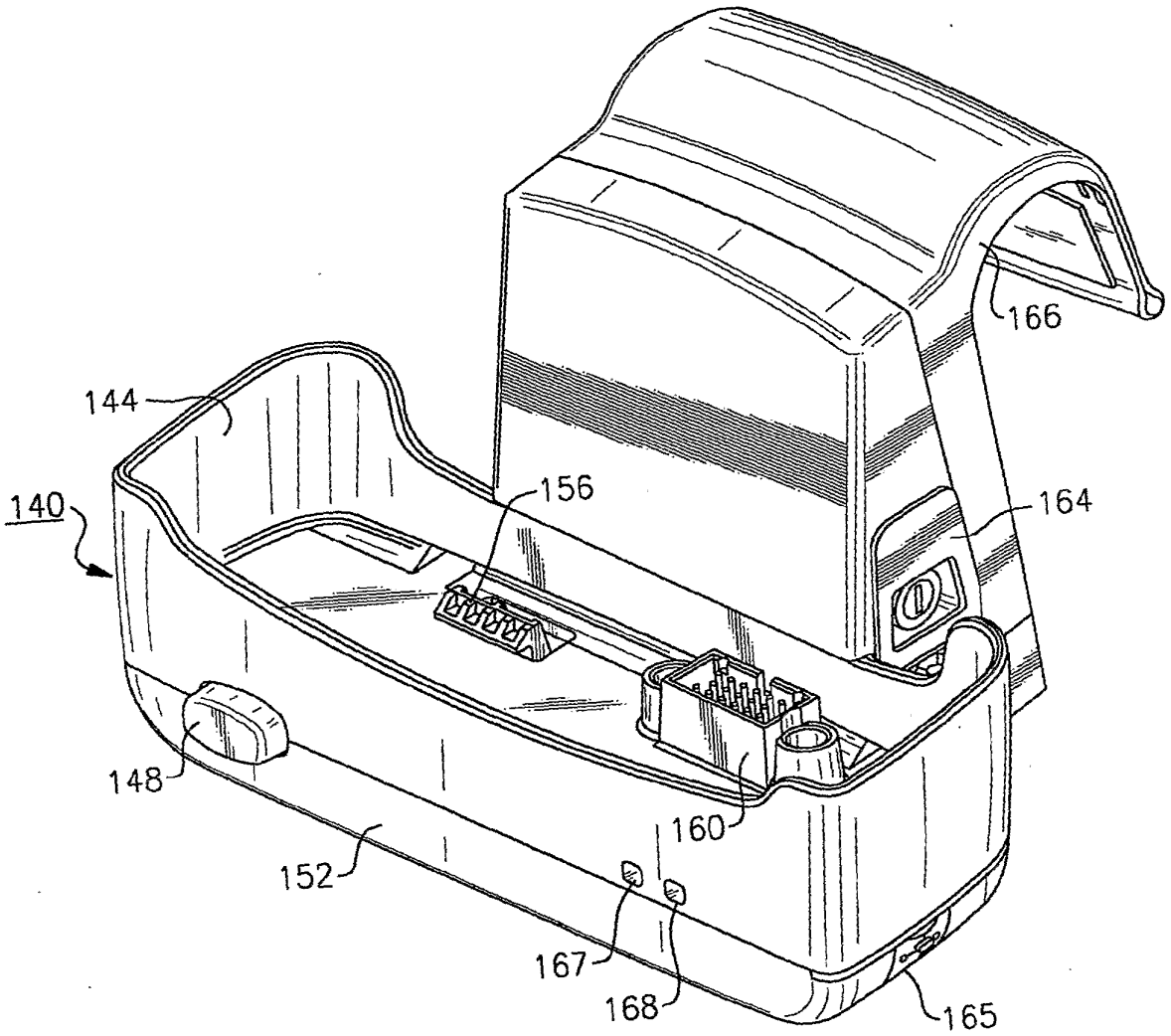


FIG.4

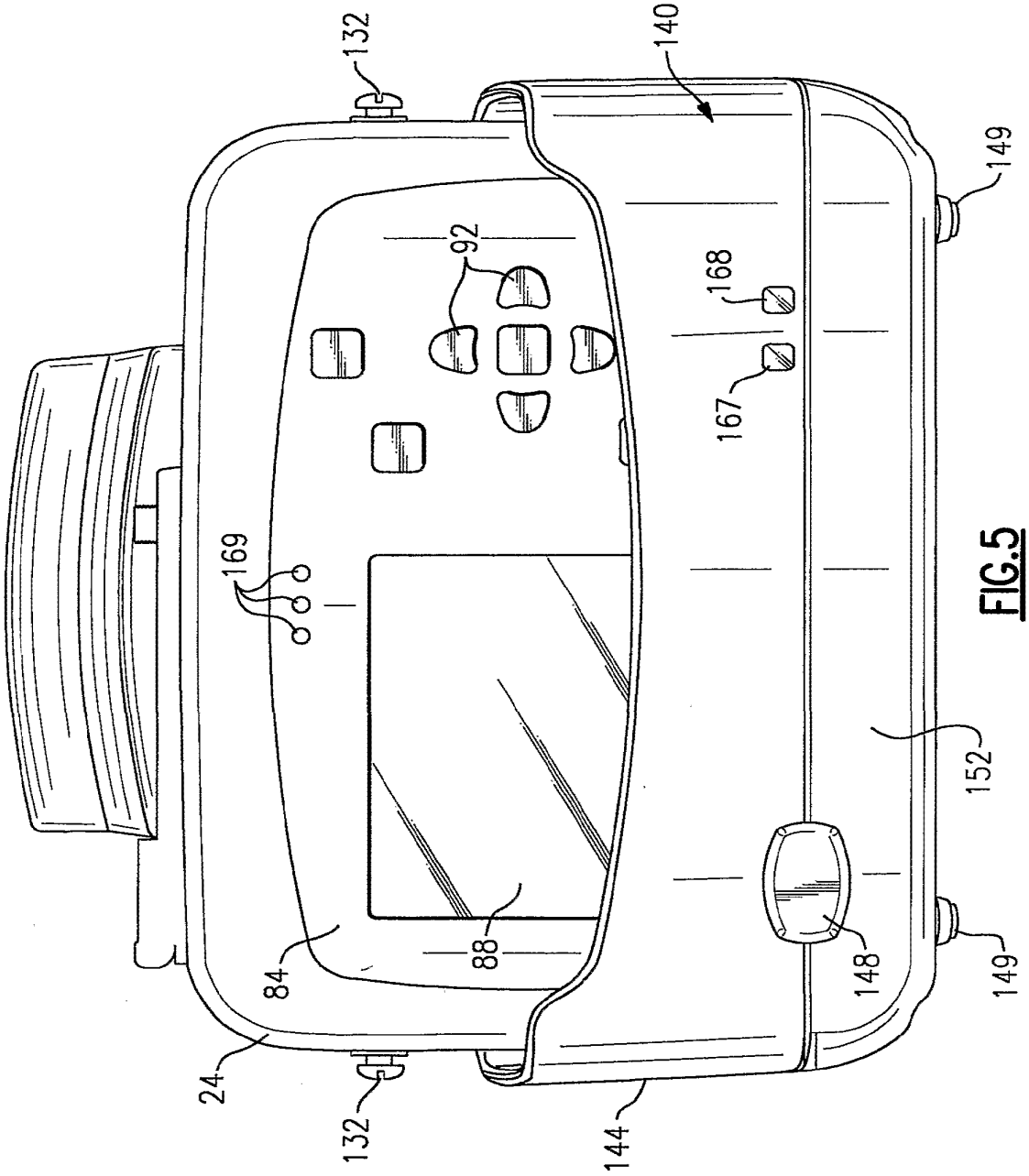


FIG.5

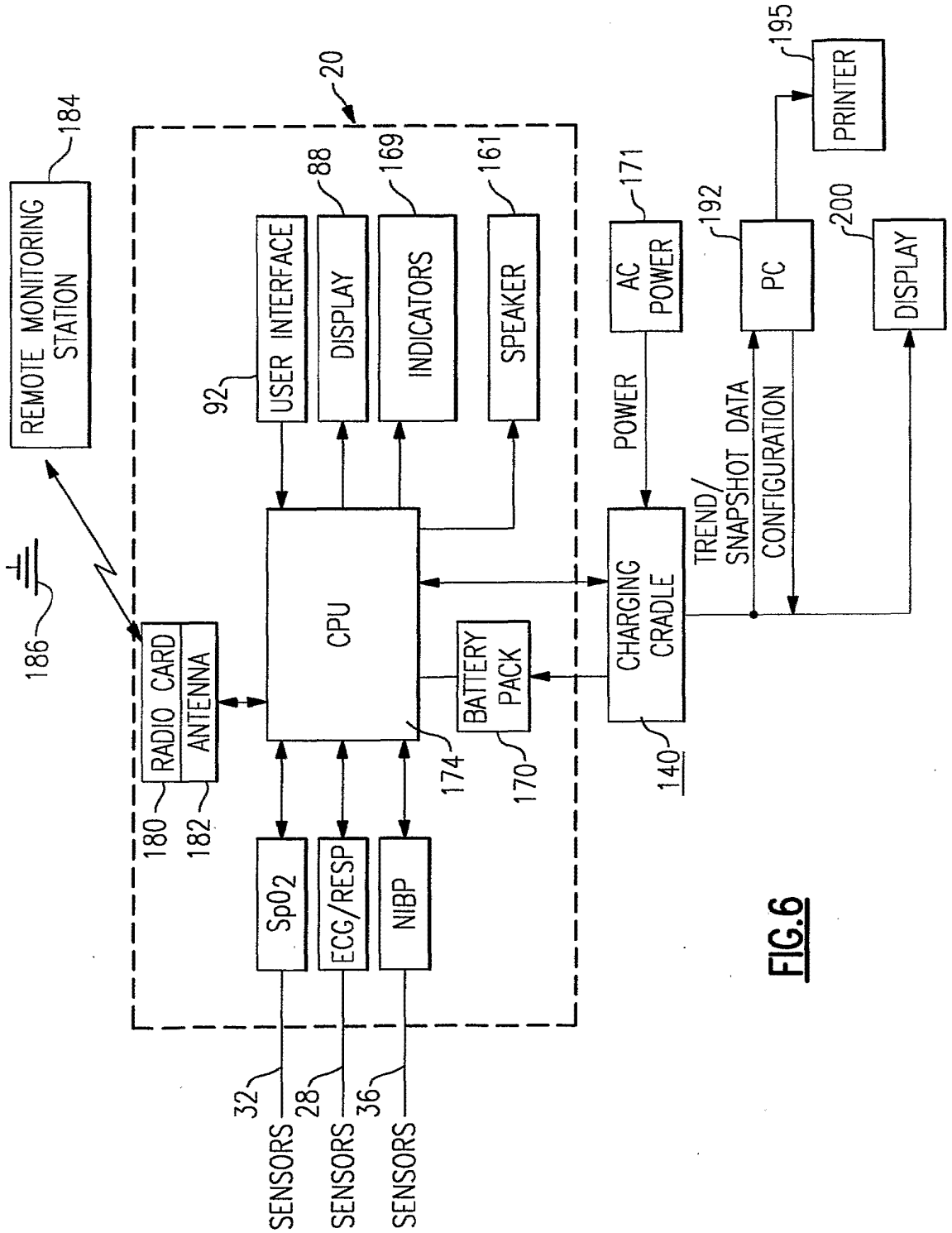

REMOTE MONITORING STATION
184
186
20
RADIO CARD
ANTENNA
180
182
CPU
USER INTERFACE
92
DISPLAY
88
INDICATORS
169
SPEAKER
161
BATTERY PACK
174
170
CHARGING CRADLE
140
AC POWER
171
POWER
TREND/ SNAPSHOT DATA
CONFIGURATION
PC
192
PRINTER
195
DISPLAY
200
SpO2
ECG/RESP
NIBP
32
28
36
SENSORS
SENSORS
SENSORS

FIG.6

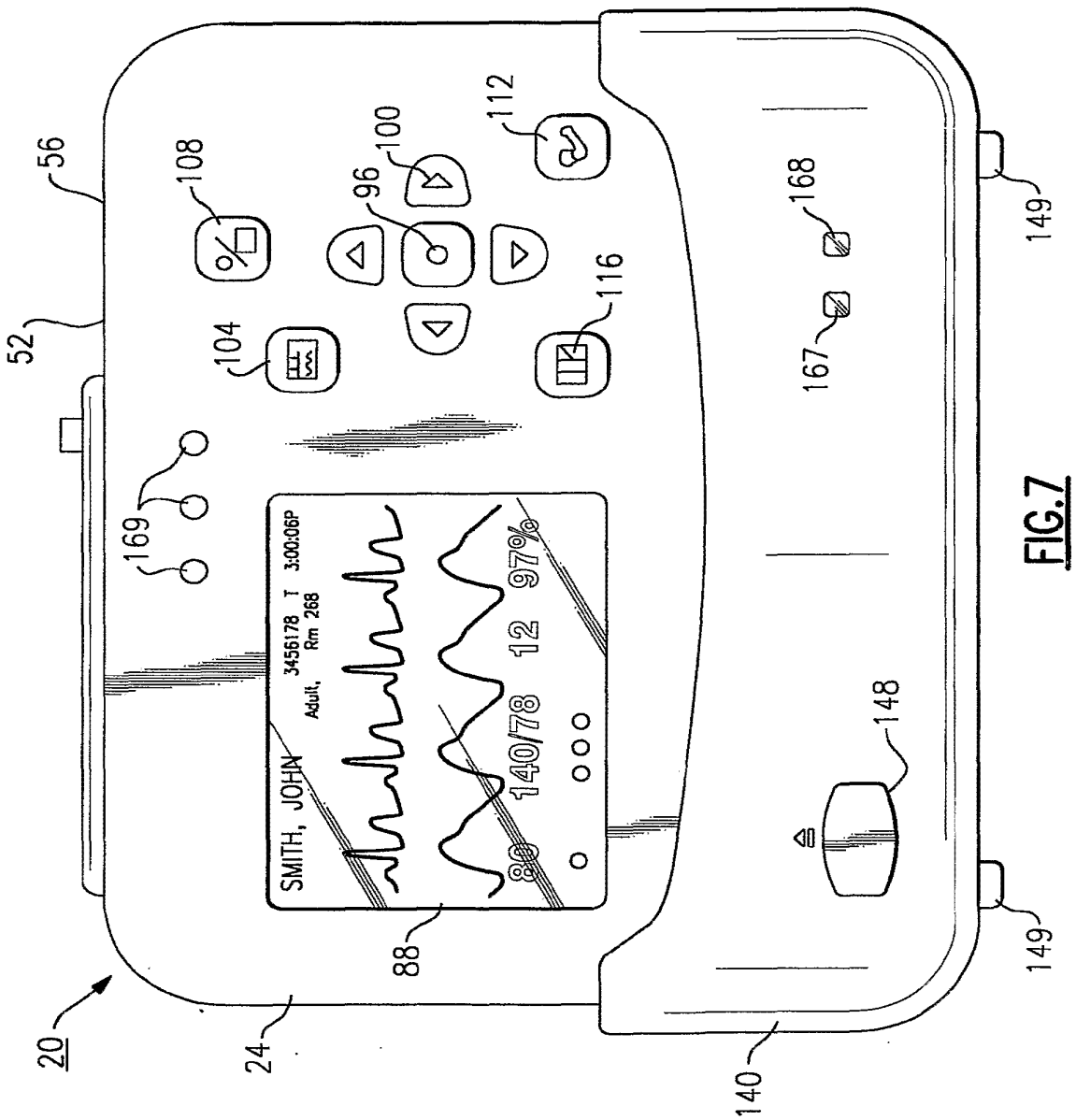

56
52
108
104
96
100
112
116
169
88
SMITH, JOHN
3456178 T 3:00:06P
Adult, Rm 268
140/78 12 97%
80
168
167
148
149
149
20
24
140

FIG.7

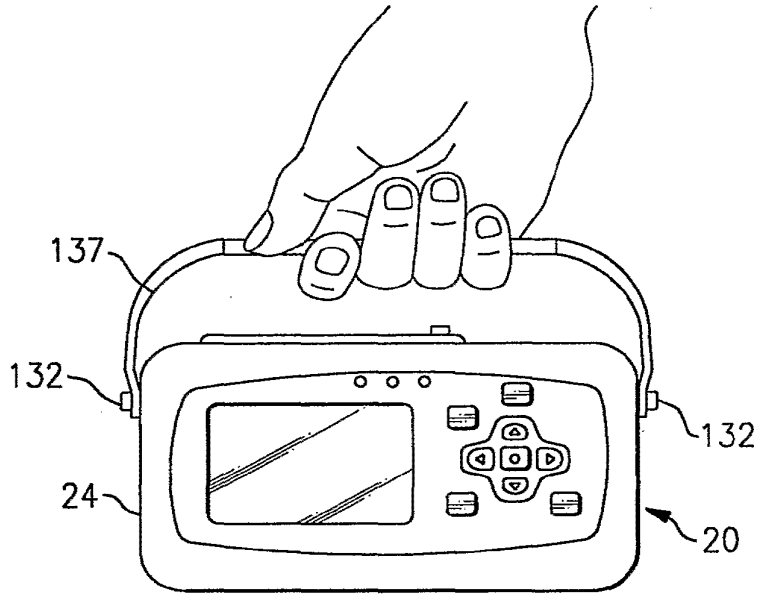


FIG.8

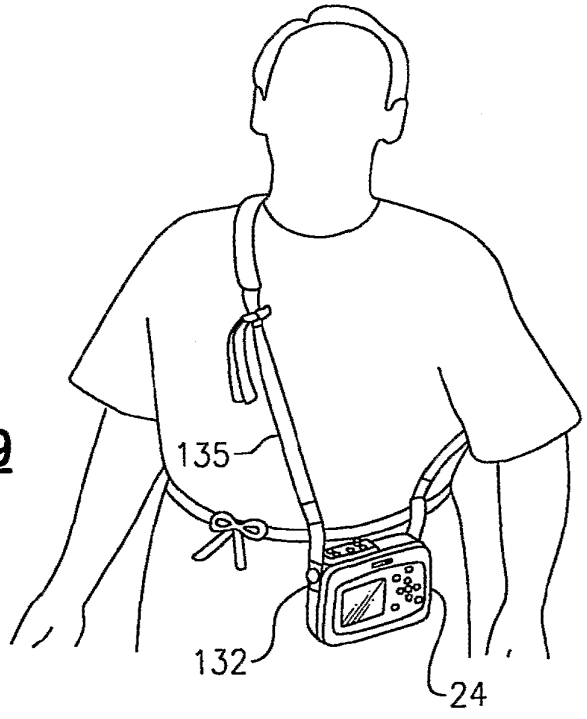


FIG.9

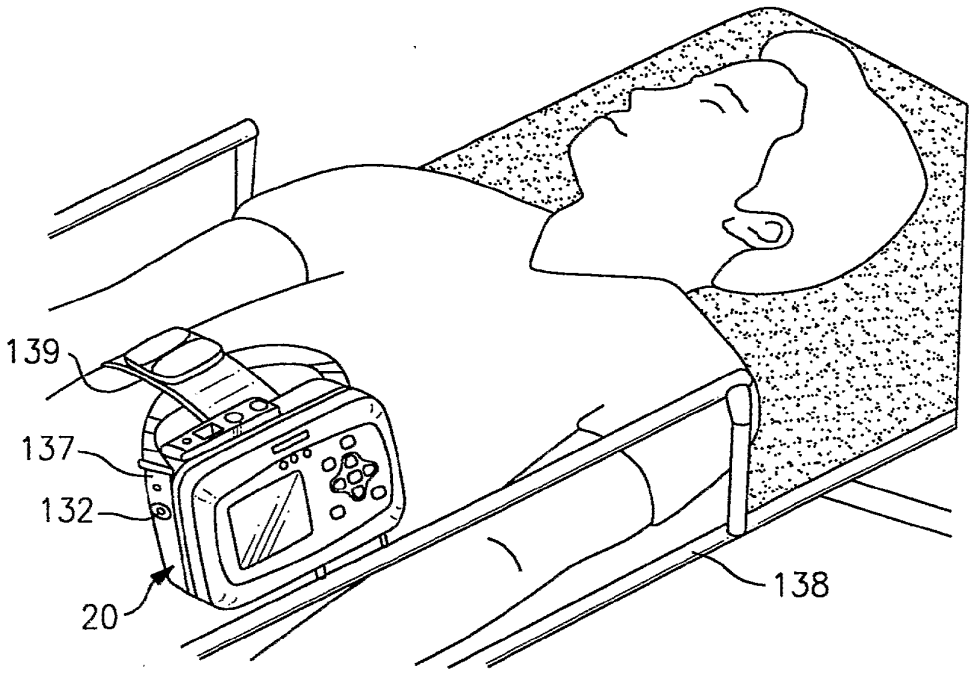


FIG.10

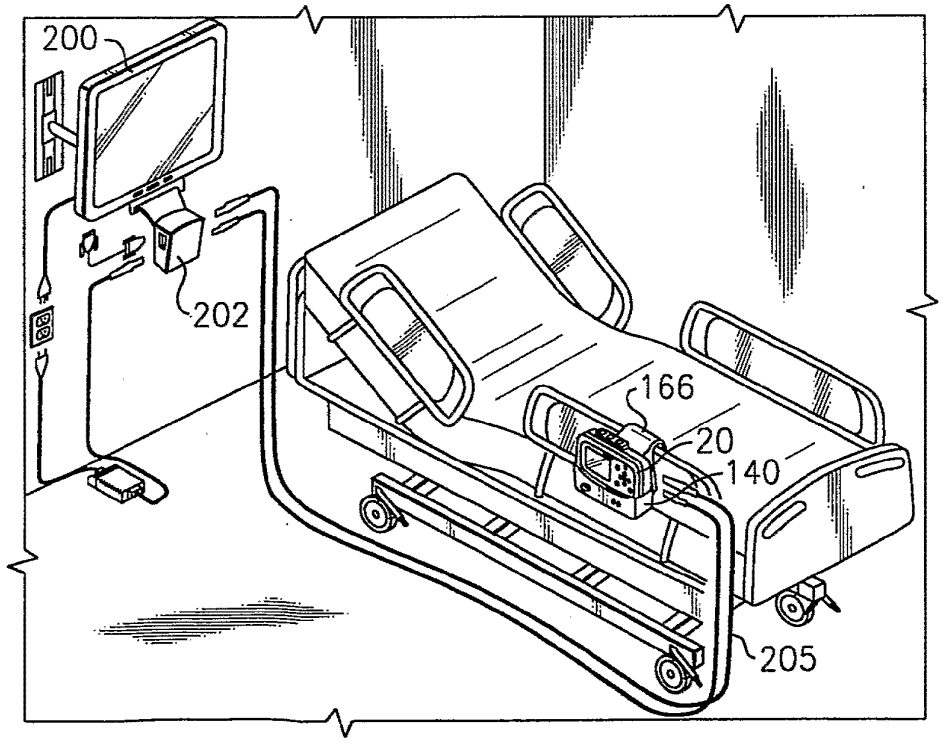


FIG.11

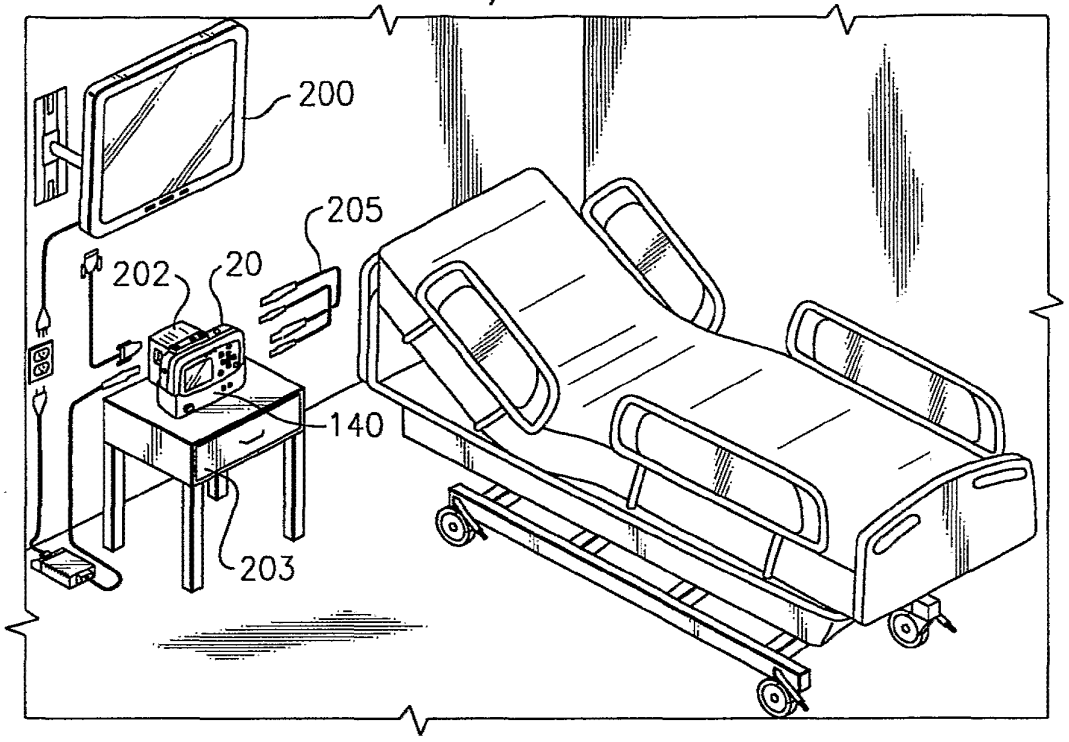


FIG.12

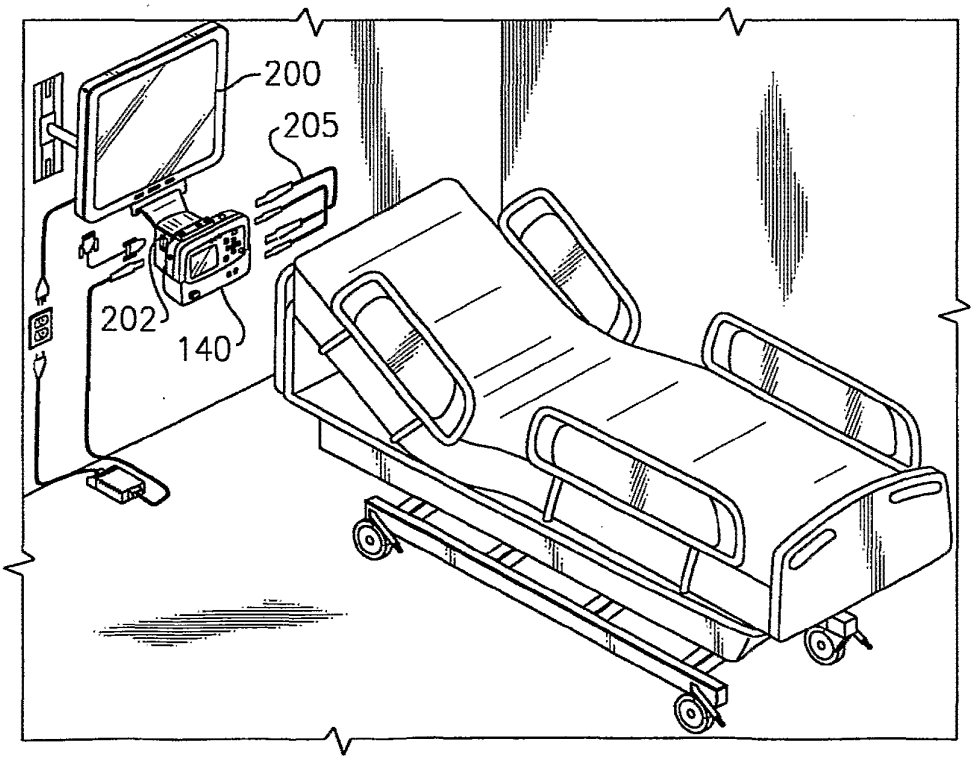


FIG.13

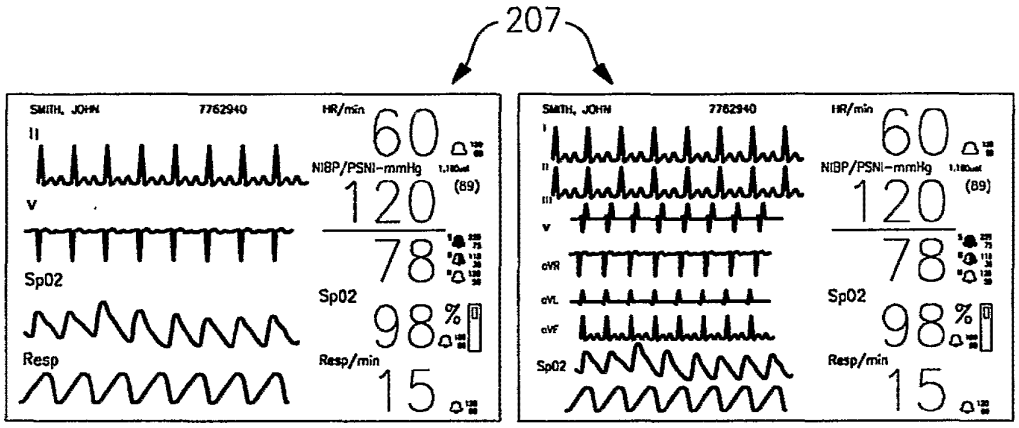

207
SMITH, JOHN
7762940
HR/min
60
II
NIBP/PSNI-mmHg
120
(89)
V
78
Sp02
Sp02
98 %
Resp
Resp/min
15
SMITH, JOHN
7762940
HR/min
60
NIBP/PSNI-mmHg
120
(89)
78
Sp02
98 %
Resp/min
15

FIG.14

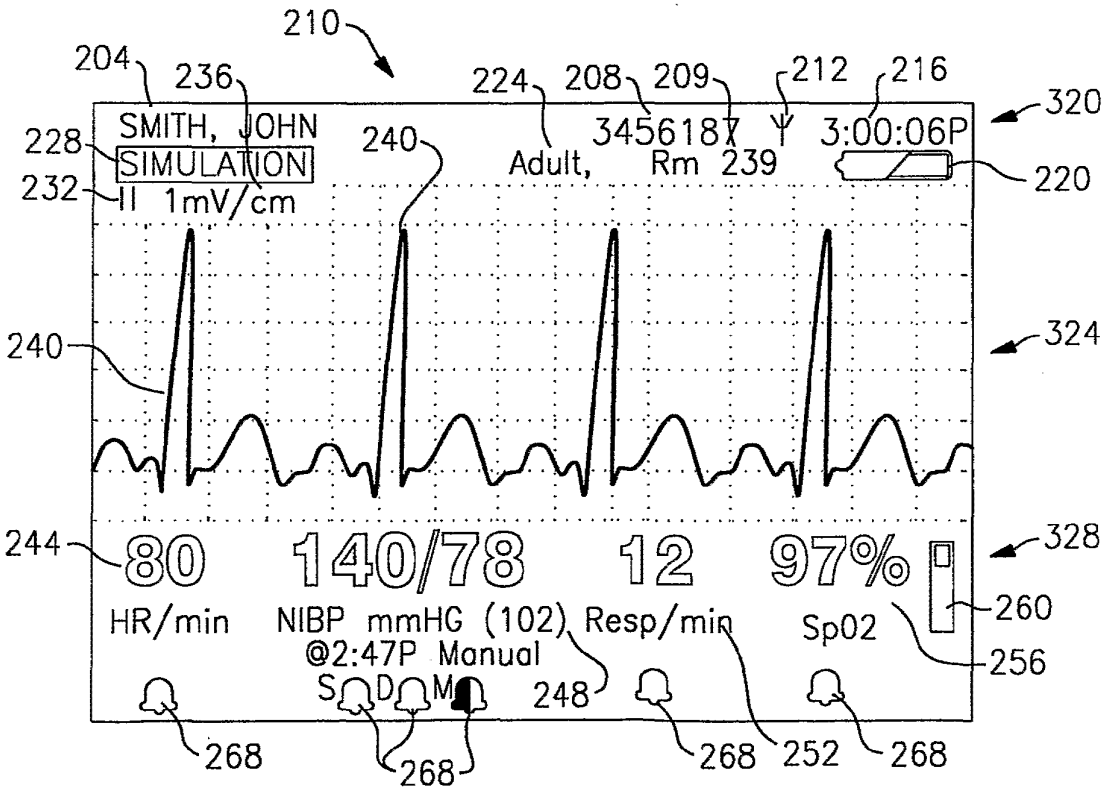

210
204
236
224
208
209
212
216
320
SMITH, JOHN
228
SIMULATION
240
Adult, Rm 239
3:00:06P
220
232
II 1mV/cm
240
324
244
80
140/78
12
97%
328
HR/min
NIBP mmHG (102)
Resp/min
Sp02
260
@2:47P Manual
256
S
D
M
248
268
268
268
252
268

FIG.15

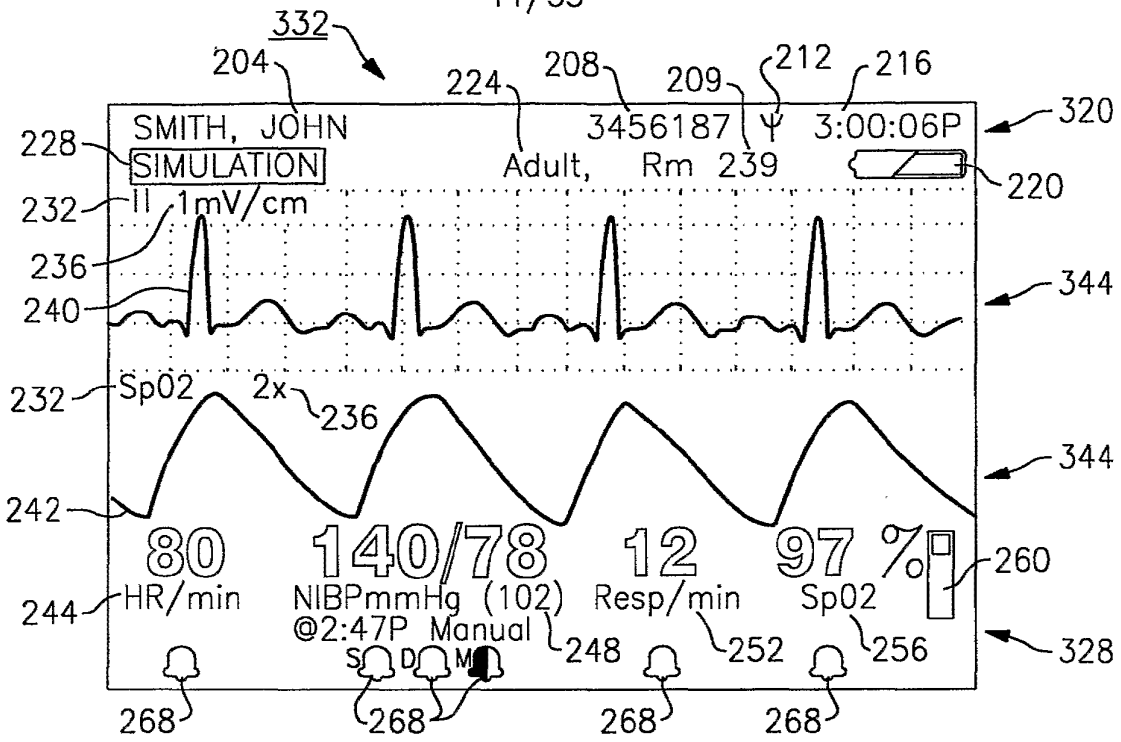

332
204
224
208
209
212
216
SMITH, JOHN
3456187
3:00:06P
320
228
SIMULATION
Adult, Rm 239
220
232
II 1mV/cm
236
240
344
232
Sp02
2x
236
344
242
80
140/78
12
97 %
260
244
HR/min
NIBPmmHg (102)
@2:47P Manual
Resp/min
Sp02
248
252
256
328
S
D
M
268
268
268
268

FIG.16

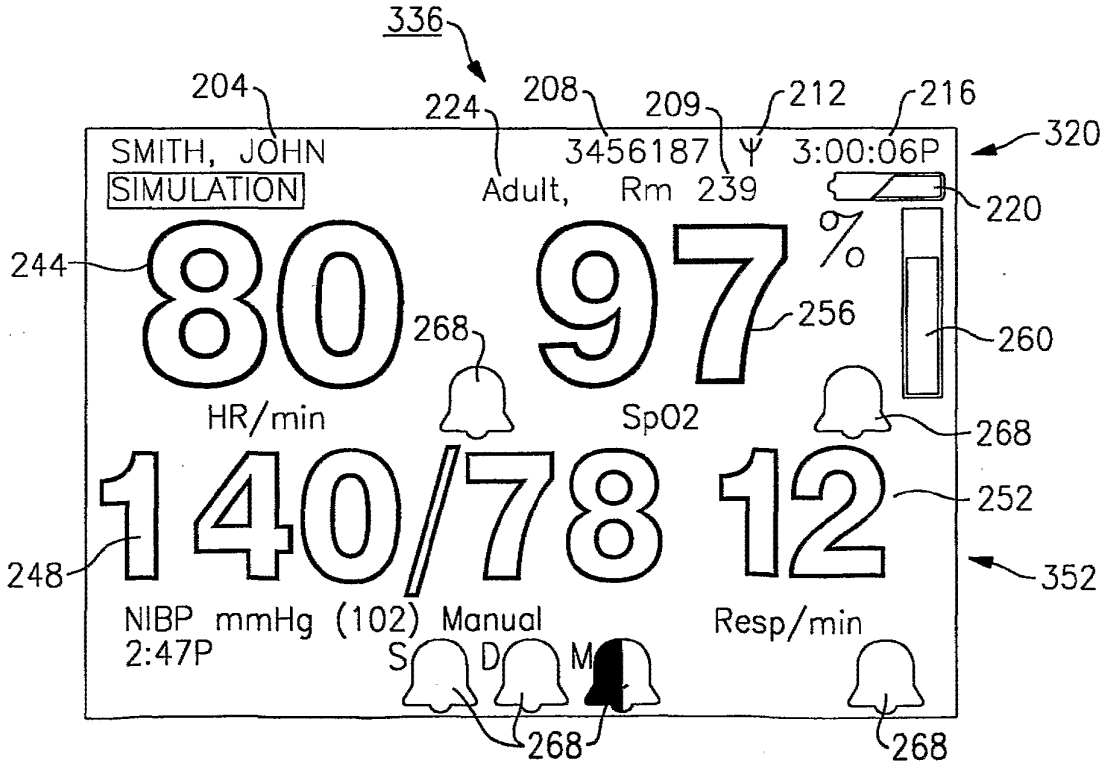

336
204
224
208
209
212
216
SMITH, JOHN
3456187
3:00:06P
320
SIMULATION
Adult, Rm 239
220
244
80
97
%
256
260
268
HR/min
Sp02
268
252
248
140/78
12
352
NIBP mmHg (102) Manual
2:47P
Resp/min
S
D
M
268
268

FIG.17

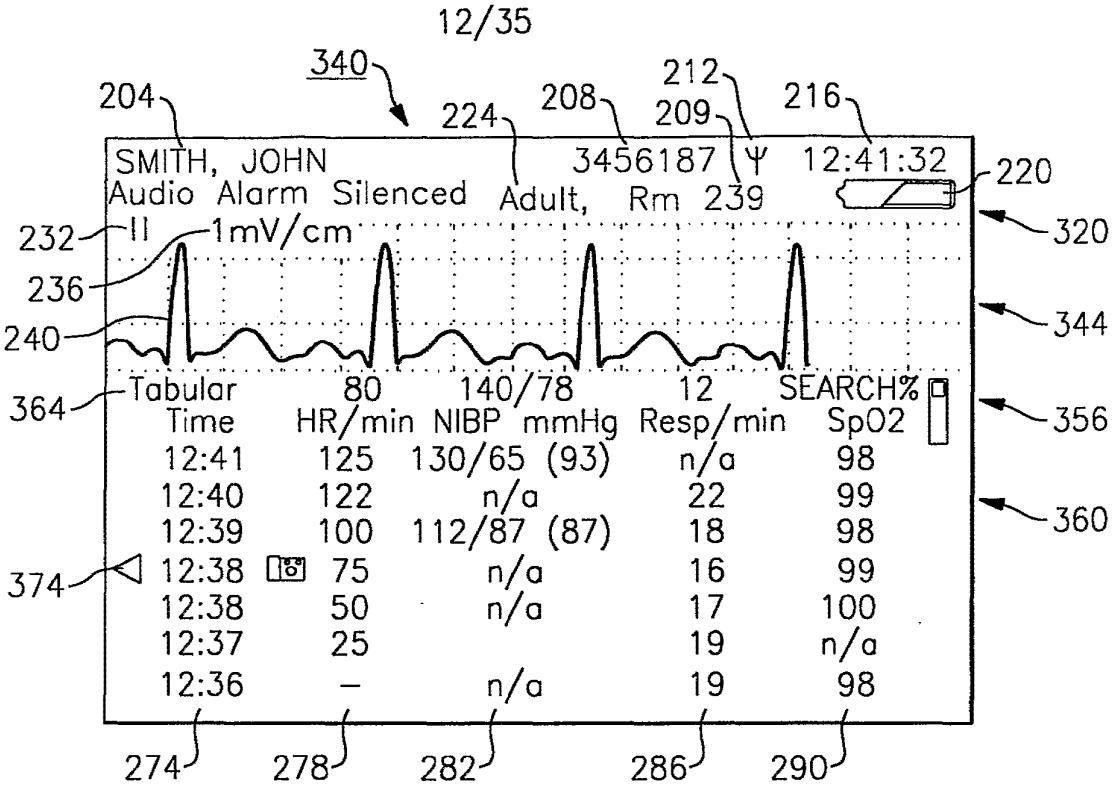

340
204
224
208
212
209
216
SMITH, JOHN
3456187
12:41:32
220
Audio Alarm Silenced
Adult, Rm 239
232
II
1mV/cm
320
236
344
240
364
Tabular Time
80 HR/min
140/78 NIBP mmHg
12 Resp/min
SEARCH% SpO2
356
12:41 125 130/65 (93) n/a 98
12:40 122 n/a 22 99
12:39 100 112/87 (87) 18 98
360
374
12:38 75 n/a 16 99
12:38 50 n/a 17 100
12:37 25 19 n/a
12:36 – n/a 19 98
274
278
282
286
290

FIG.18

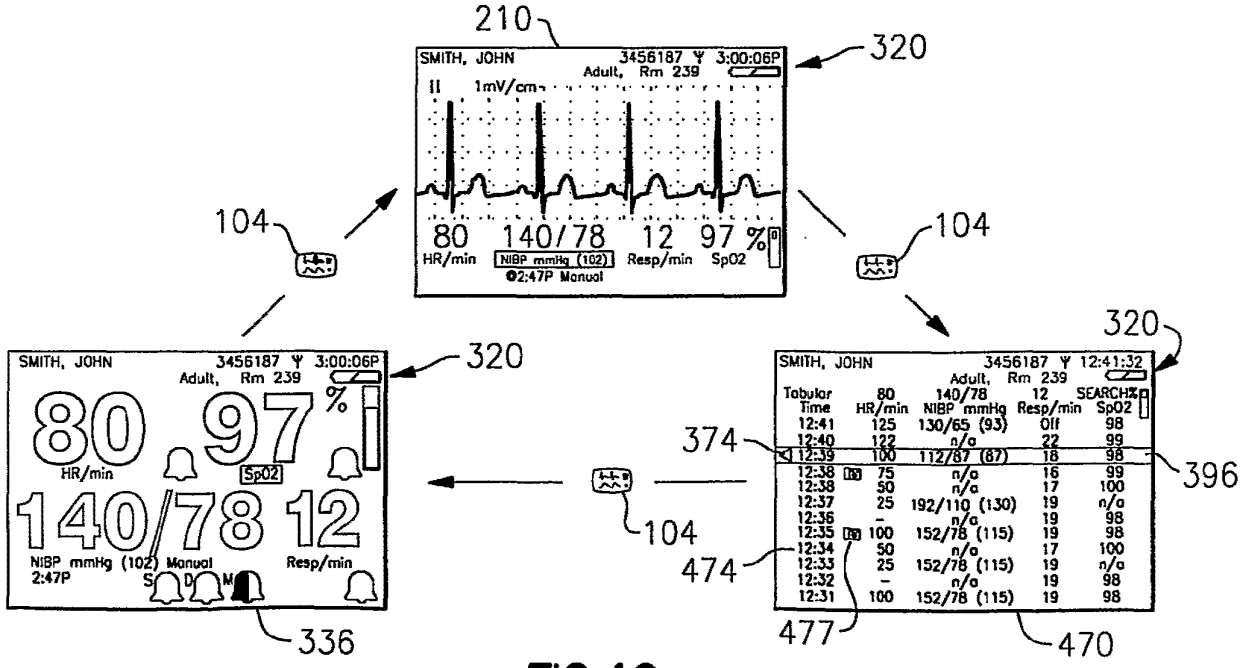

210
320
SMITH, JOHN
3456187 3:00:06P
Adult, Rm 239
II
1mV/cm
80 140/78 12 97 %
HR/min
NIBP mmHg (102)
Resp/min
SpO2
2:47P Manual
104
104
320
320
SMITH, JOHN
3456187 3:00:06P
Adult, Rm 239
80
97
%
HR/min
SpO2
140/78
12
NIBP mmHg (102) Manual
2:47P
Resp/min
336
104
374
474
SMITH, JOHN
3456187 12:41:32
Adult, Rm 239
Tabular Time
80 HR/min
140/78 NIBP mmHg
12 Resp/min
SEARCH% SpO2
12:41 125 130/65 (93) Off 98
12:40 122 n/a 22 99
12:39 100 112/87 (87) 18 98
396
12:38 75 n/a 16 99
12:38 50 n/a 17 100
12:37 25 192/110 (130) 19 n/a
12:36 – n/a 19 98
12:35 100 152/78 (115) 19 98
12:34 50 n/a 17 100
12:33 25 152/78 (115) 19 n/a
12:32 – n/a 19 98
12:31 100 152/78 (115) 19 98
477
470

FIG.19

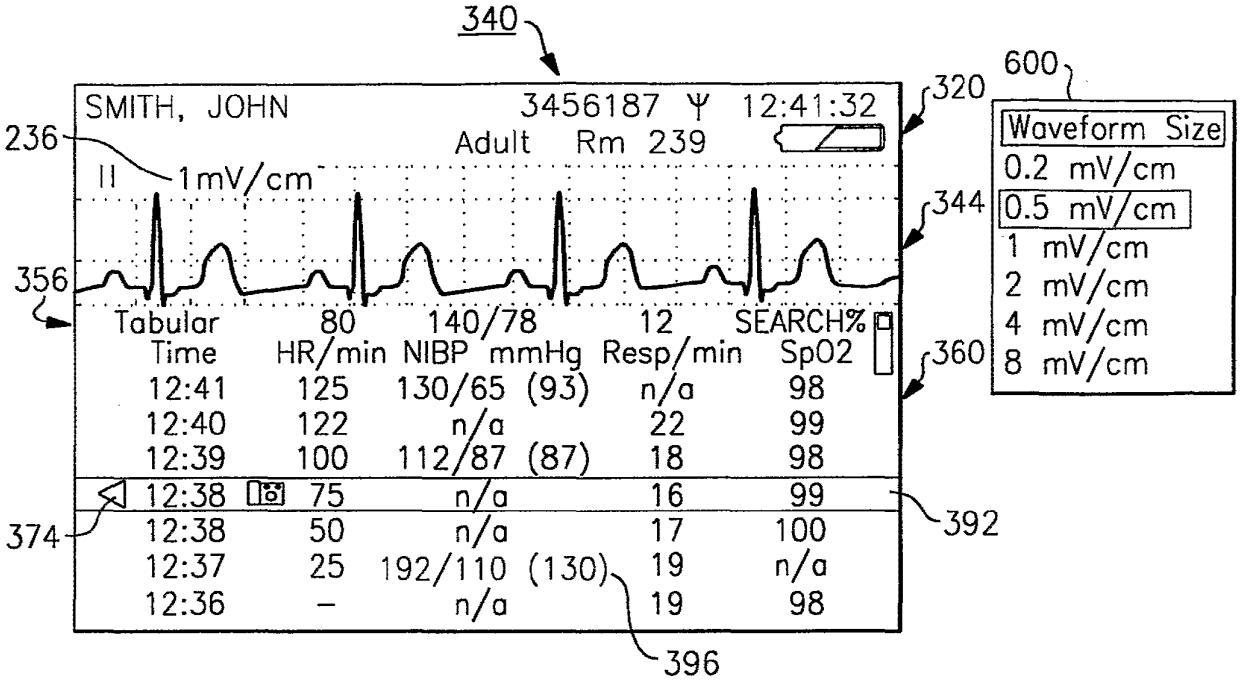

340
SMITH, JOHN
3456187 Ψ 12:41:32
Adult Rm 239
236
II 1mV/cm
356
320
600
Waveform Size
0.2 mV/cm
0.5 mV/cm
1 mV/cm
2 mV/cm
4 mV/cm
8 mV/cm
344
360
Tabular 80 140/78 12 SEARCH%
Time HR/min NIBP mmHg Resp/min SpO2
12:41 125 130/65 (93) n/a 98
12:40 122 n/a 22 99
12:39 100 112/87 (87) 18 98
12:38 75 n/a 16 99
374
392
12:38 50 n/a 17 100
12:37 25 192/110 (130) 19 n/a
12:36 – n/a 19 98
396

FIG.20

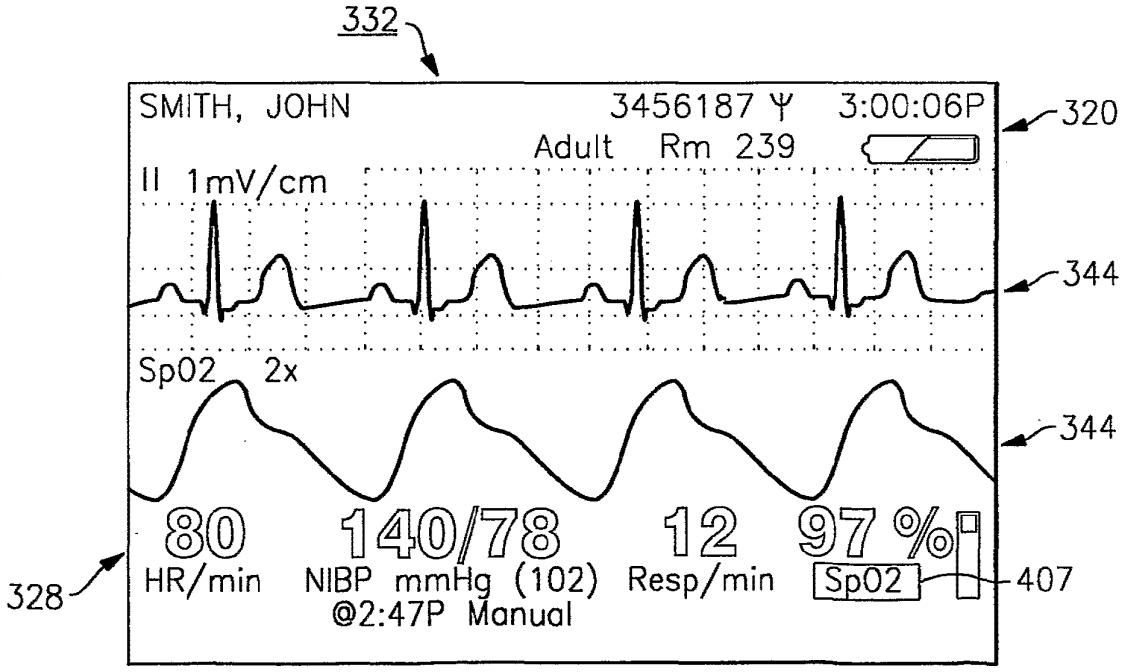

332
SMITH, JOHN
3456187 Ψ 3:00:06P
Adult Rm 239
320
II 1mV/cm
344
SpO2 2x
344
80 140/78 12 97 %
328
HR/min NIBP mmHg (102) Resp/min SpO2
407
@2:47P Manual

FIG.21

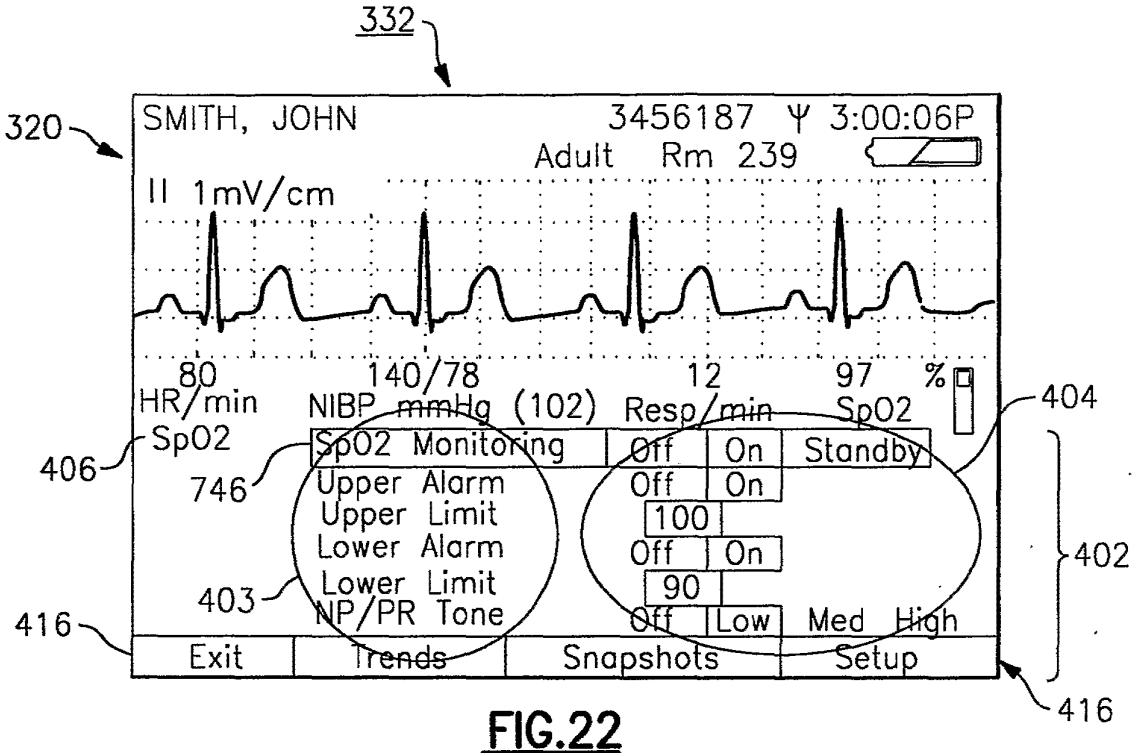

332
320
SMITH, JOHN
3456187 Ψ 3:00:06P
Adult Rm 239
II 1mV/cm
80 HR/min
140/78 NIBP mmHg (102)
12 Resp/min
97 % SpO2
406
SpO2
746
SpO2 Monitoring
Off
On
Standby
404
Upper Alarm
Off
On
Upper Limit
100
Lower Alarm
Off
On
Lower Limit
90
403
NP/PR Tone
Off
Low
Med
High
402
416
Exit
Trends
Snapshots
Setup
416

FIG.22

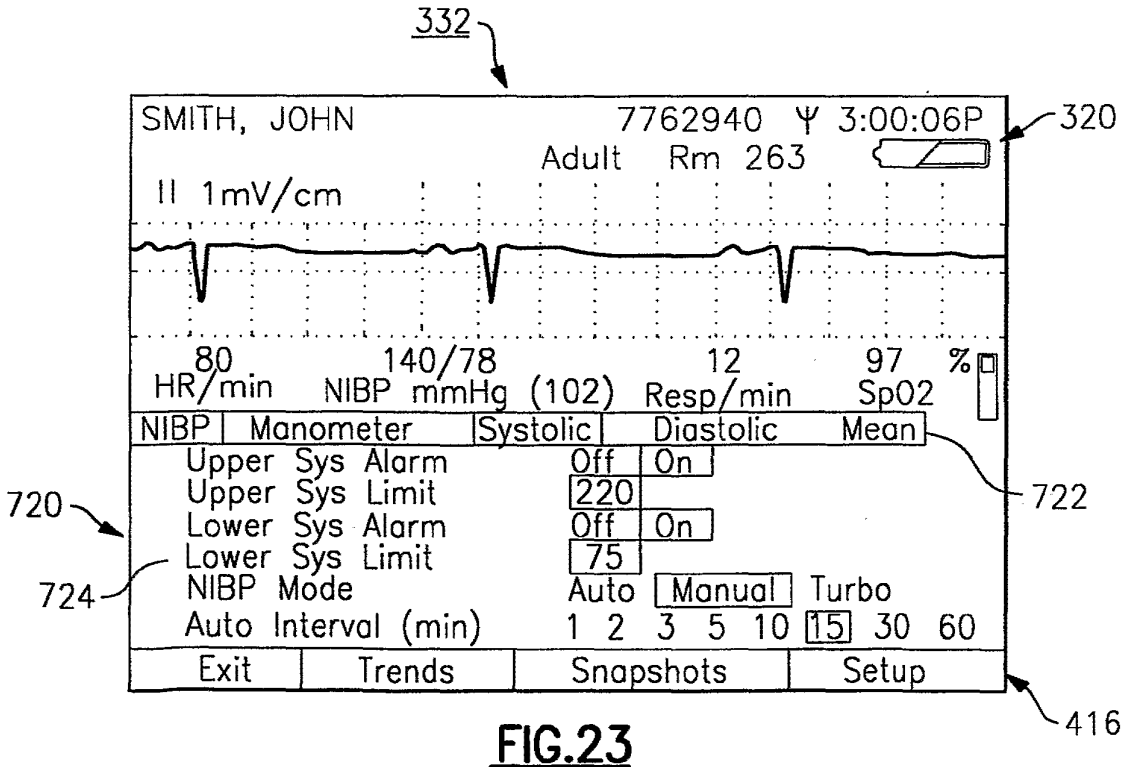

332
SMITH, JOHN
7762940 Ψ 3:00:06P
320
Adult Rm 263
II 1mV/cm
80 HR/min
140/78 NIBP mmHg (102)
12 Resp/min
97 % SpO2
NIBP
Manometer
Systolic
Diastolic
Mean
722
Upper Sys Alarm
Off
On
720
Upper Sys Limit
220
Lower Sys Alarm
Off
On
Lower Sys Limit
75
724
NIBP Mode
Auto
Manual
Turbo
Auto Interval (min)
1 2 3 5 10 15 30 60
Exit
Trends
Snapshots
Setup
416

FIG.23

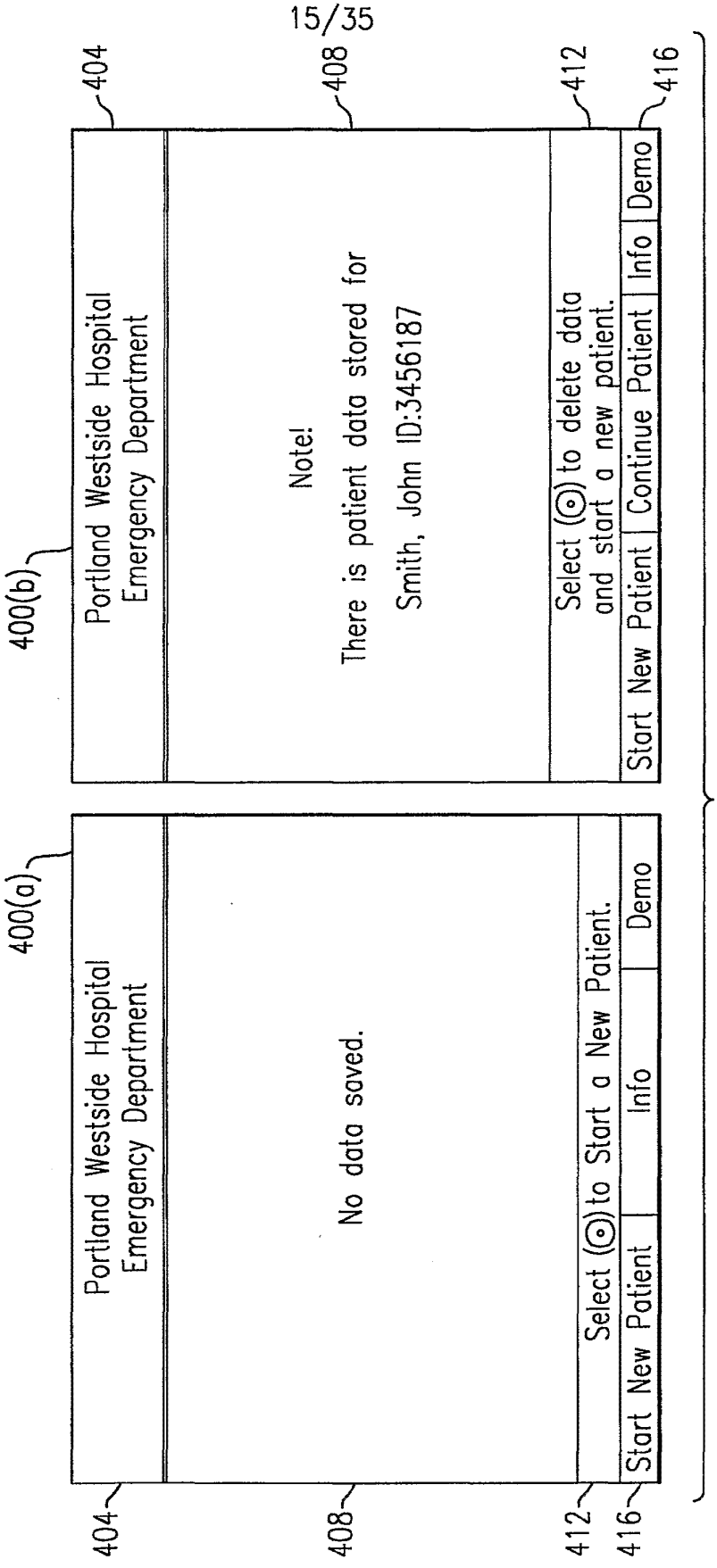

400(a)
Portland Westside Hospital
Emergency Department
No data saved.
Select (◎) to Start a New Patient.
Start New Patient
Info
Demo
404
408
412
416
400(b)
Portland Westside Hospital
Emergency Department
Note!
There is patient data stored for
Smith, John ID:3456187
Select (◎) to delete data
and start a new patient.
Start New Patient
Continue Patient
Info
Demo
404
408
412
416

FIG.24

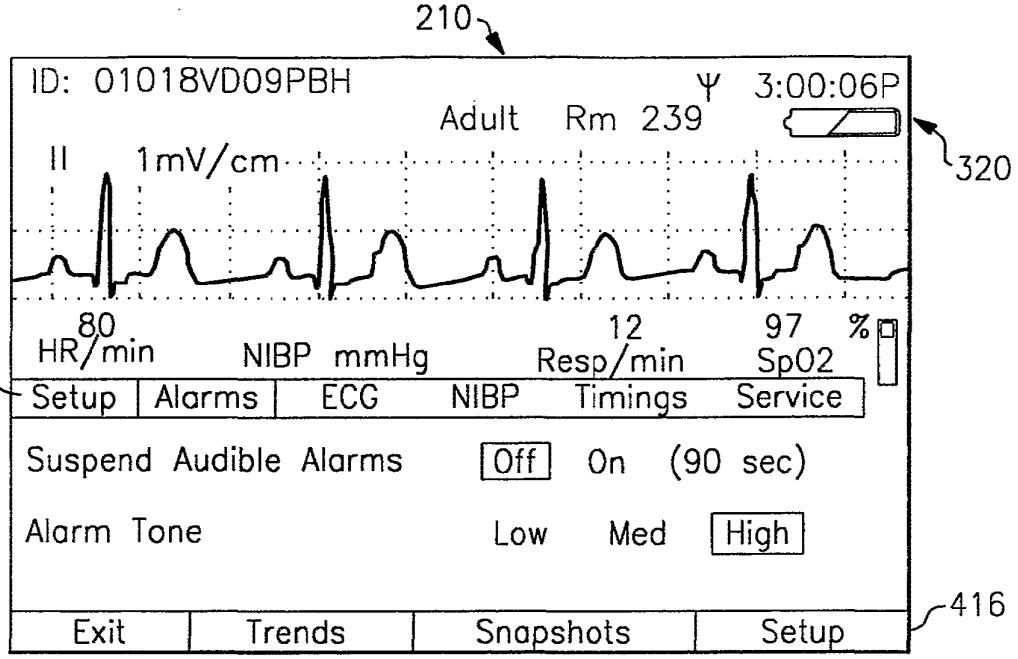


FIG.25

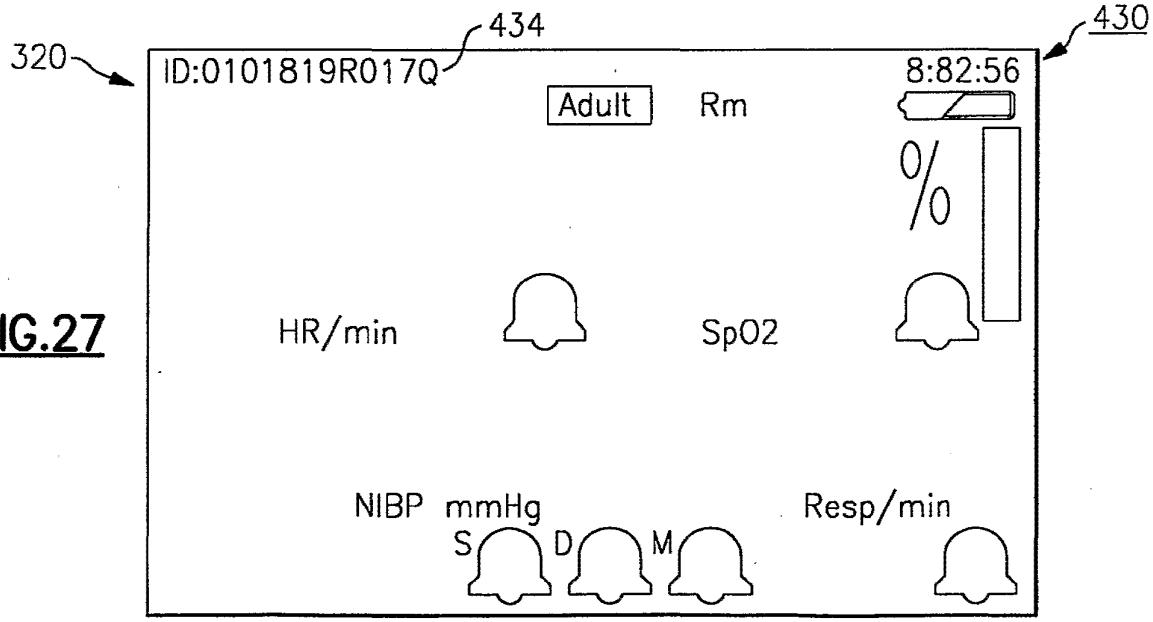


FIG.27

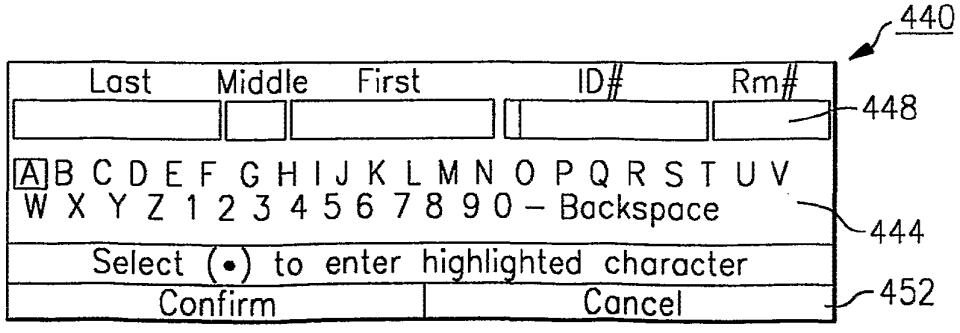


FIG.28

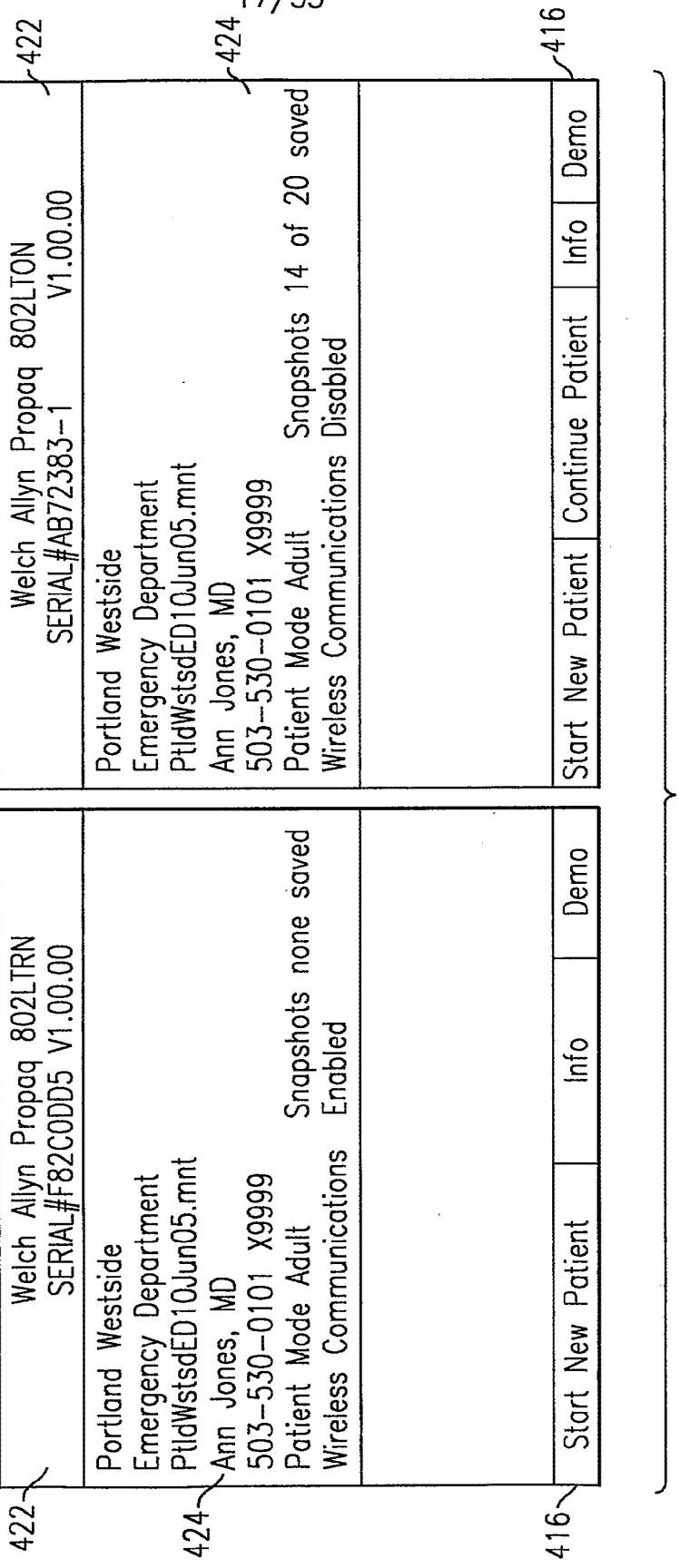

420(a)
420(b)
422
424
416
Welch Allyn Propaq 802LTRN
SERIAL#F82C0DD5 V1.00.00
Welch Allyn Propaq 802LTON
SERIAL#AB72383-1 V1.00.00
Portland Westside
Emergency Department
PtldWstsdED10Jun05.mnt
Ann Jones, MD
503-530-0101 X9999
Patient Mode Adult
Wireless Communications
Snapshots none saved
Enabled
Snapshots 14 of 20 saved
Disabled
Start New Patient
Info
Demo
Continue Patient

FIG.26

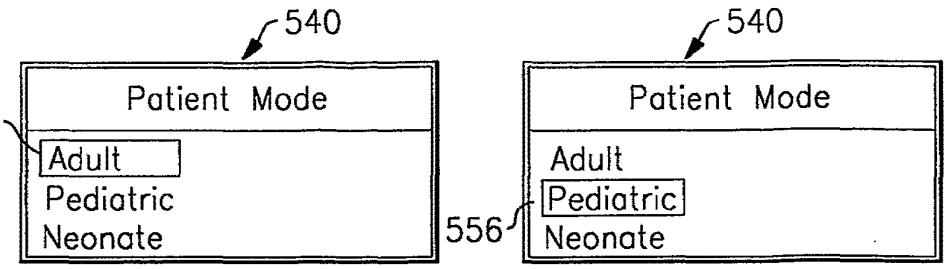


FIG.29

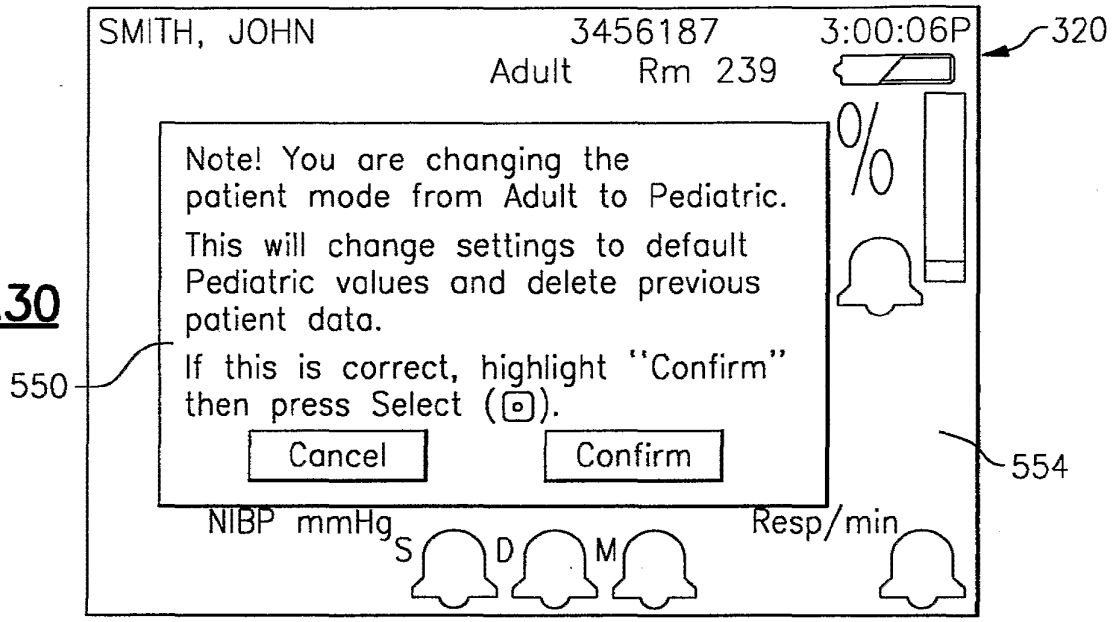


FIG.30

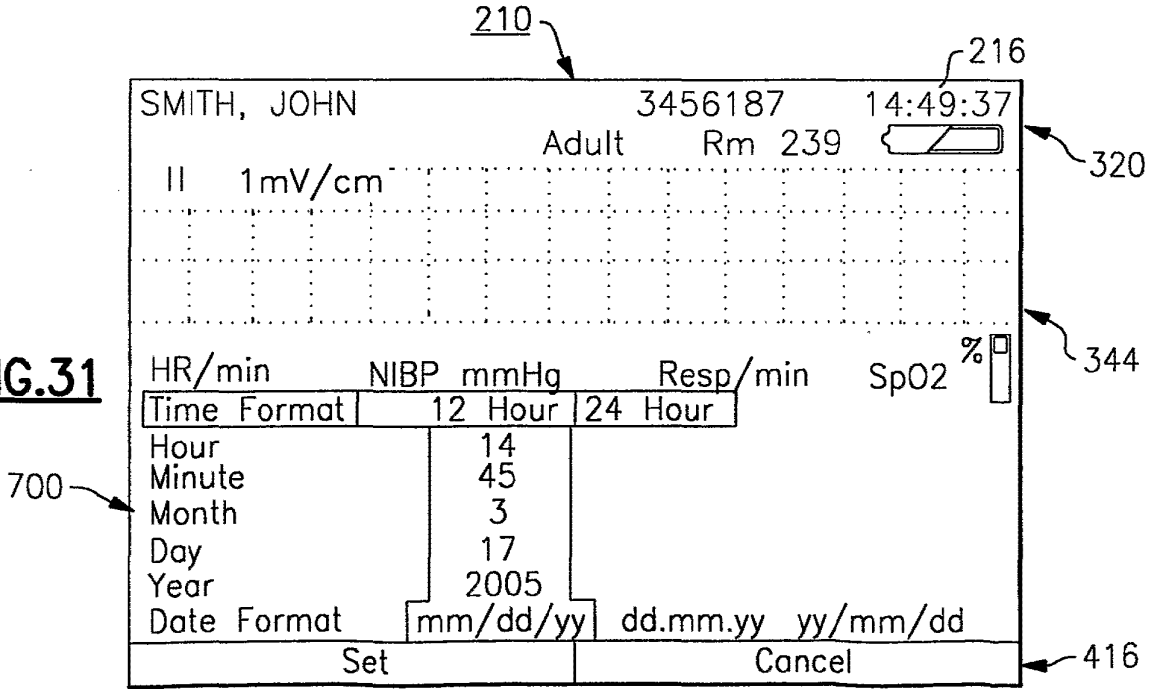


FIG.31

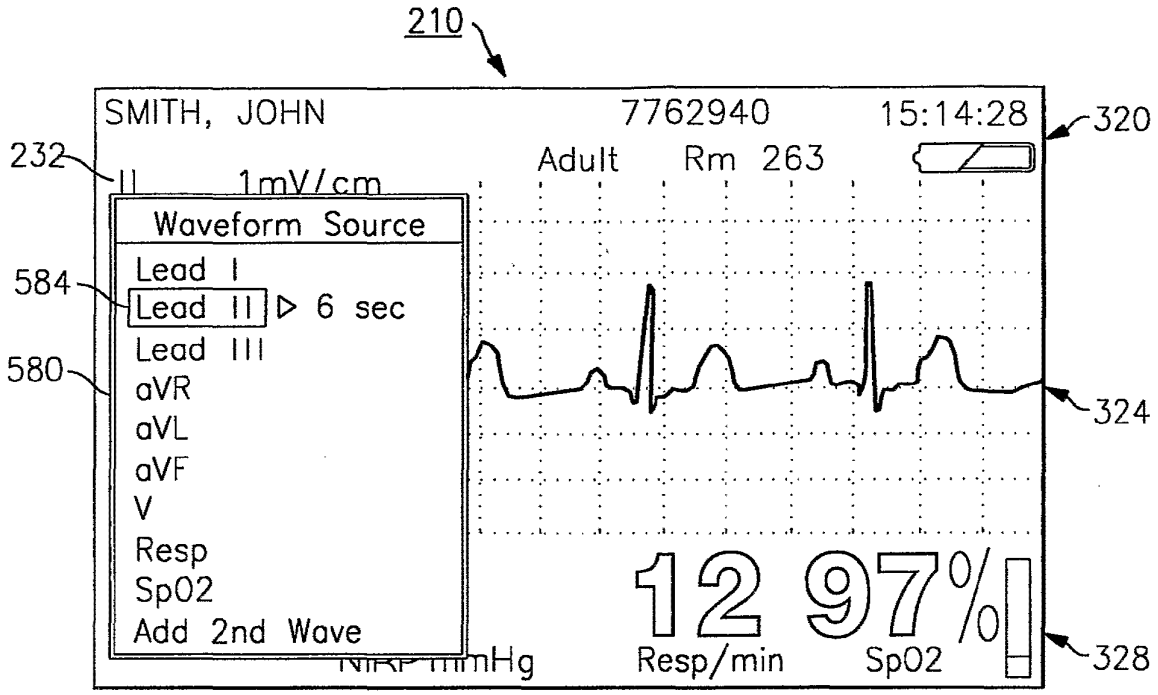

210
SMITH, JOHN
7762940
15:14:28
320
232
II 1mV/cm
Adult Rm 263
Waveform Source
584
Lead I
Lead II
6 sec
Lead III
580
aVR
aVL
aVF
V
Resp
SpO2
Add 2nd Wave
324
12
97%
NIBP mmHg
Resp/min
SpO2
328

FIG.32

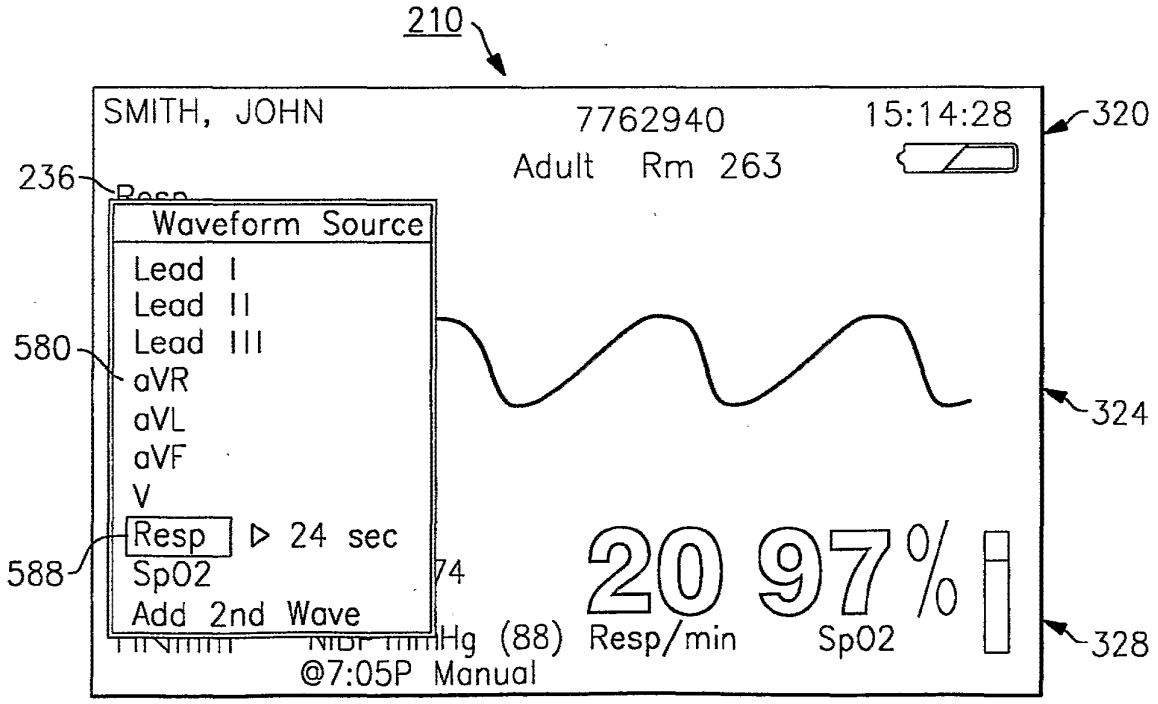

210
SMITH, JOHN
7762940
15:14:28
320
236
Adult Rm 263
Waveform Source
Lead I
Lead II
Lead III
580
aVR
aVL
aVF
V
Resp
24 sec
588
SpO2
Add 2nd Wave
324
20
97%
NIBP mmHg (88)
Resp/min
SpO2
328
@7:05P Manual

FIG.33

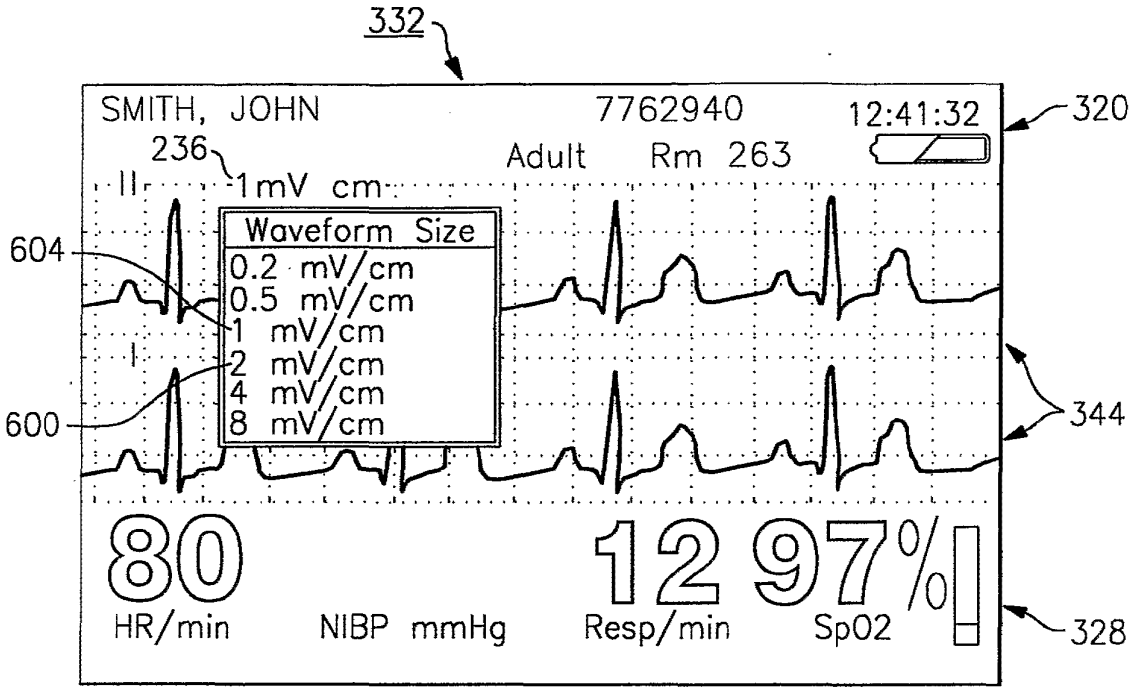

332
SMITH, JOHN
7762940
12:41:32
320
236
Adult Rm 263
II
1mV cm
Waveform Size
0.2 mV/cm
0.5 mV/cm
1 mV/cm
2 mV/cm
4 mV/cm
8 mV/cm
604
I
600
344
80
12
97%
HR/min
NIBP mmHg
Resp/min
SpO2
328

FIG.34

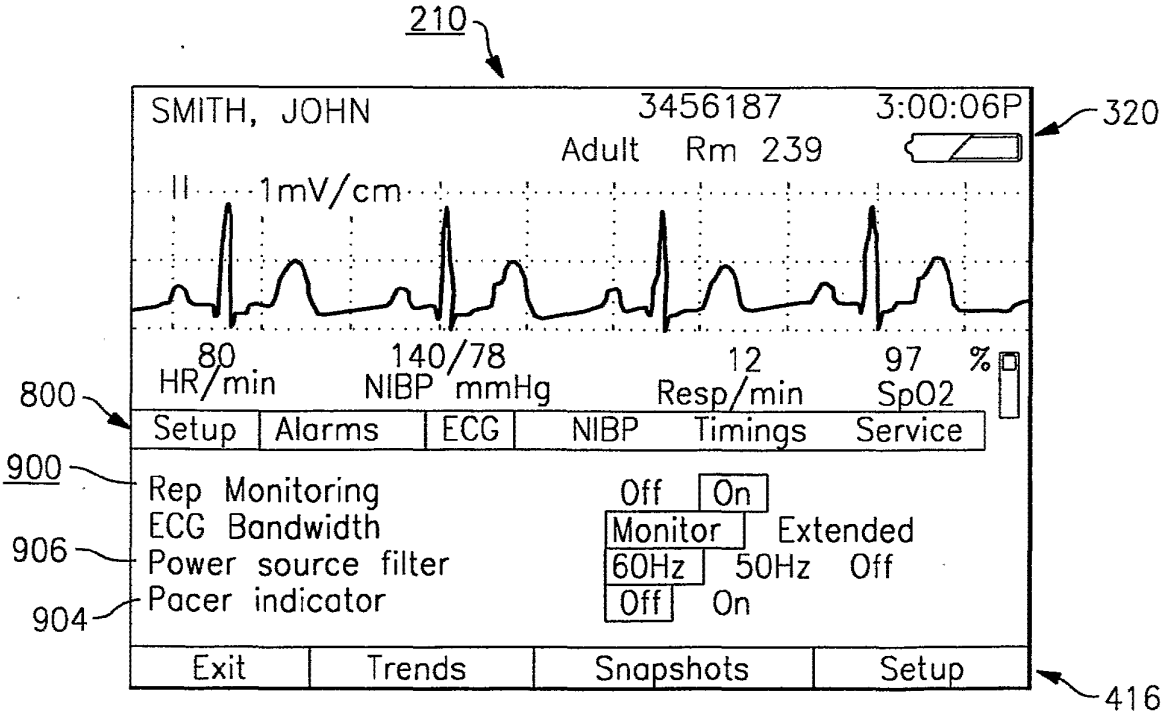

210
SMITH, JOHN
3456187
3:00:06P
320
Adult Rm 239
II
1mV/cm
80
HR/min
140/78
NIBP mmHg
12
Resp/min
97 %
SpO2
800
Setup
Alarms
ECG
NIBP
Timings
Service
900
Rep Monitoring
Off
On
ECG Bandwidth
Monitor
Extended
906
Power source filter
60Hz
50Hz
Off
904
Pacer indicator
Off
On
Exit
Trends
Snapshots
Setup
416

FIG.35

FIG.36

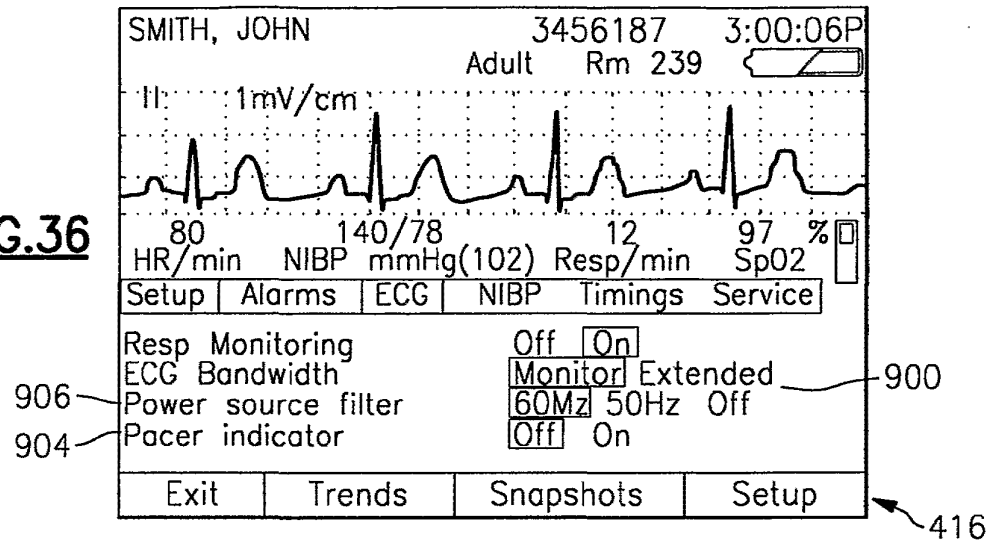


FIG.37

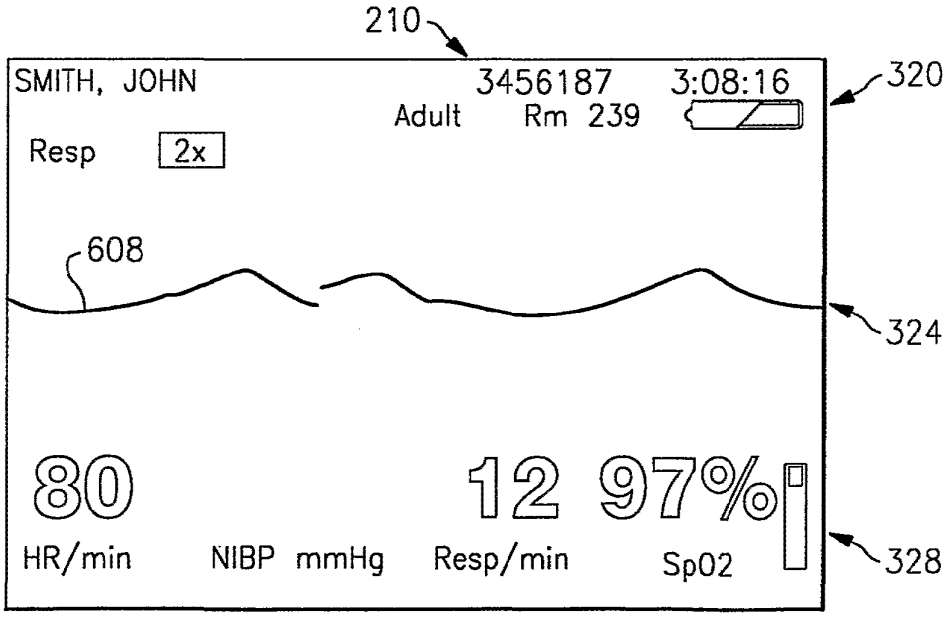
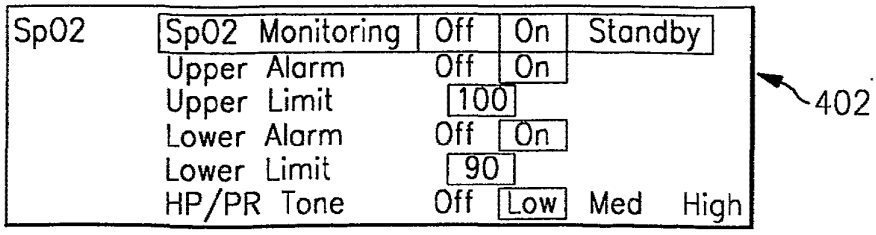


FIG.38



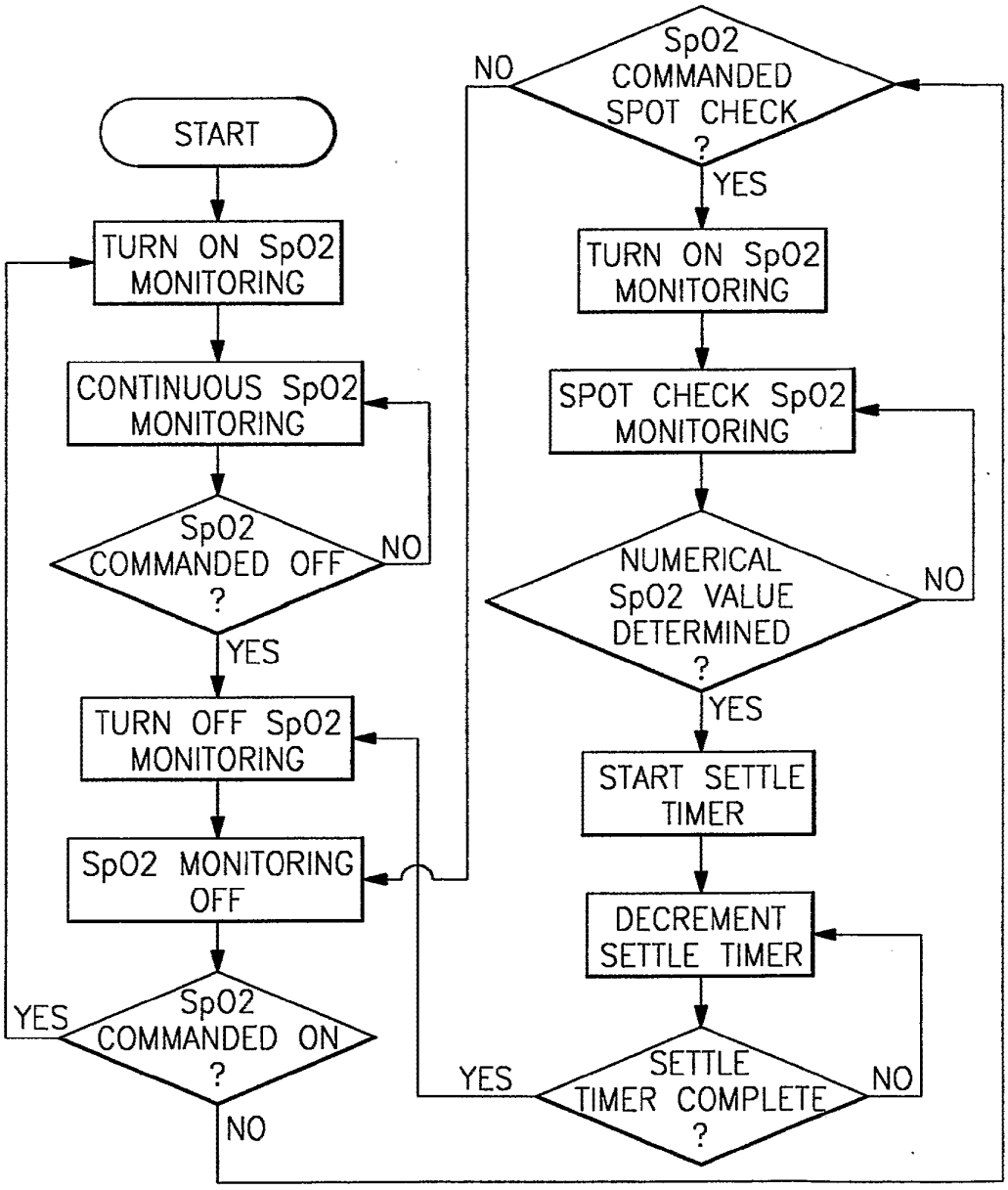

START
TURN ON SpO2 MONITORING
CONTINUOUS SpO2 MONITORING
SpO2 COMMANDED OFF ?
NO
YES
TURN OFF SpO2 MONITORING
SpO2 MONITORING OFF
SpO2 COMMANDED ON ?
YES
NO
SpO2 COMMANDED SPOT CHECK ?
NO
YES
TURN ON SpO2 MONITORING
SPOT CHECK SpO2 MONITORING
NUMERICAL SpO2 VALUE DETERMINED ?
NO
YES
START SETTLE TIMER
DECREMENT SETTLE TIMER
SETTLE TIMER COMPLETE ?
YES
NO

FIG.39

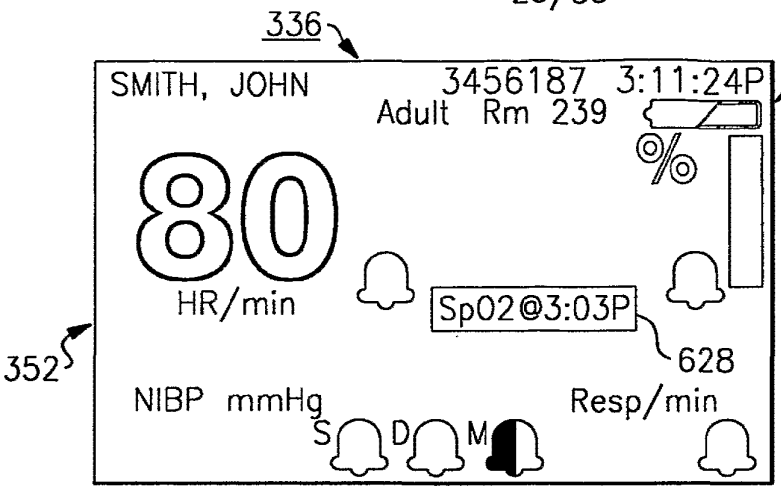


FIG.40

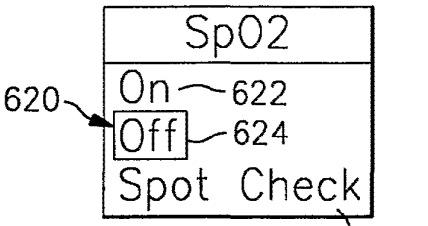


FIG.41

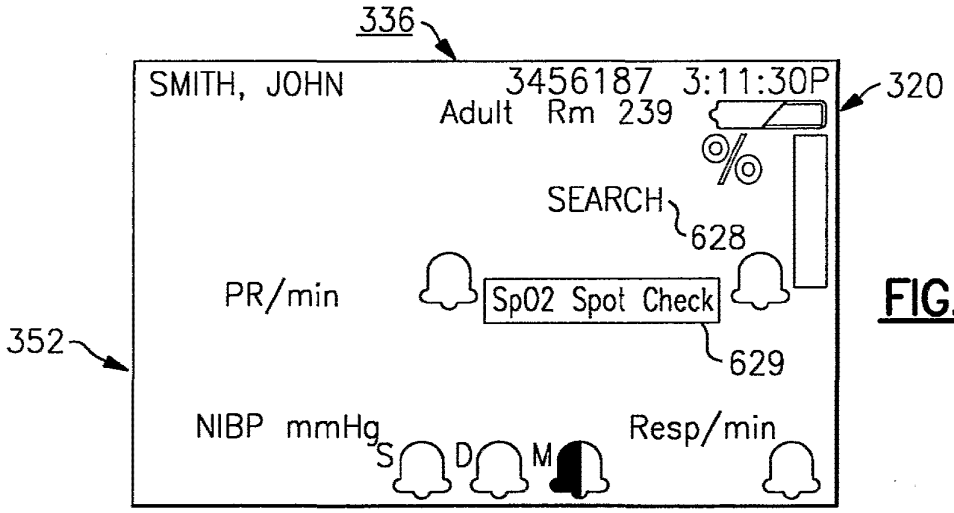


FIG.42

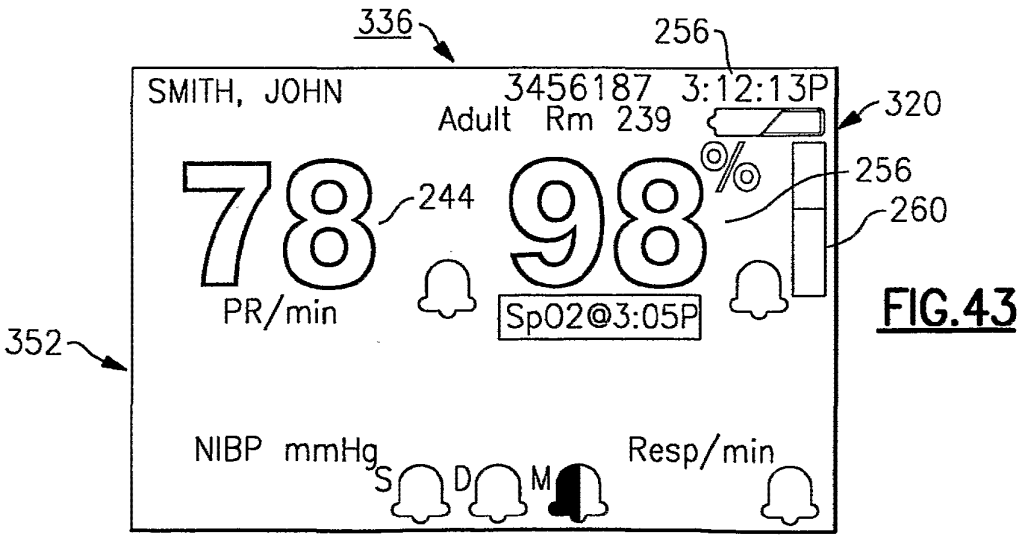


FIG.43

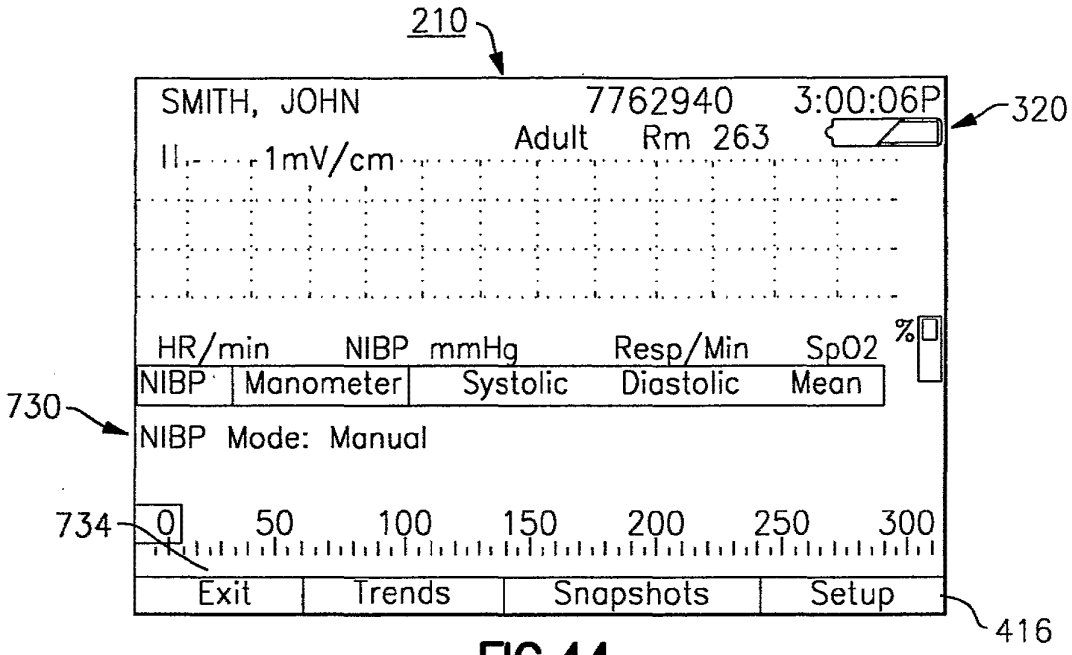

210
SMITH, JOHN
7762940
3:00:06P
320
Adult Rm 263
II 1mV/cm
HR/min NIBP mmHg Resp/Min SpO2 %
NIBP Manometer Systolic Diastolic Mean
730
NIBP Mode: Manual
734
0 50 100 150 200 250 300
Exit Trends Snapshots Setup
416

FIG.44

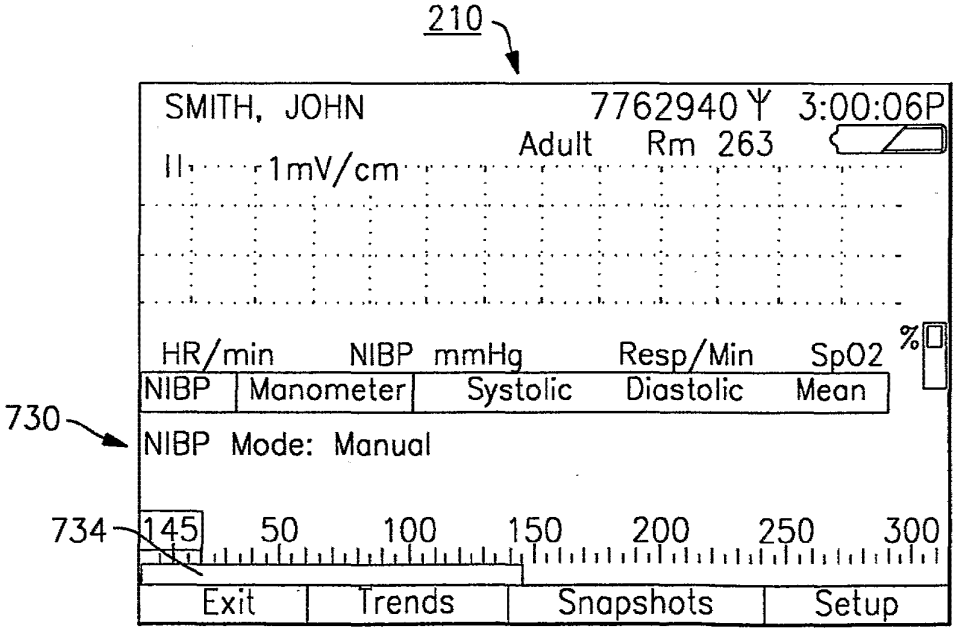

210
SMITH, JOHN
7762940
3:00:06P
Adult Rm 263
II 1mV/cm
HR/min NIBP mmHg Resp/Min SpO2 %
NIBP Manometer Systolic Diastolic Mean
730
NIBP Mode: Manual
734
145 50 100 150 200 250 300
Exit Trends Snapshots Setup

FIG.45

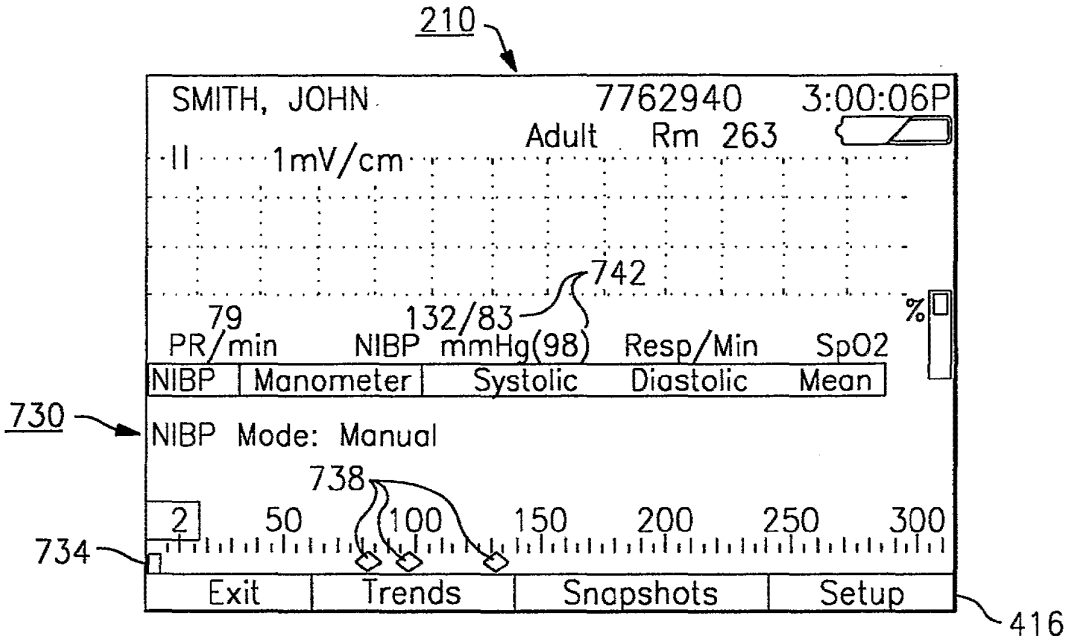

210
SMITH, JOHN
7762940
3:00:06P
Adult Rm 263
II
1mV/cm
742
79
PR/min
132/83
NIBP mmHg(98)
Resp/Min
SpO2
%
NIBP
Manometer
Systolic
Diastolic
Mean
730
NIBP Mode: Manual
738
2
50
100
150
200
250
300
734
Exit
Trends
Snapshots
Setup
416

FIG.46

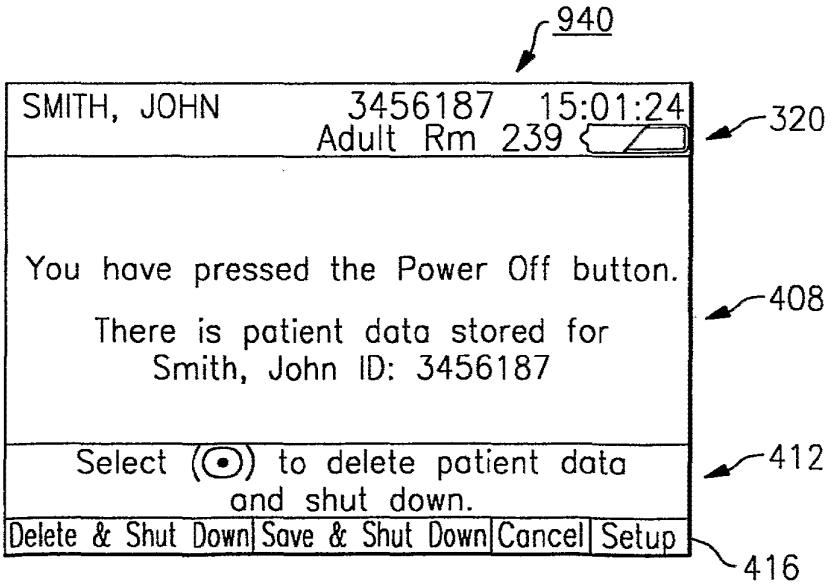

940
SMITH, JOHN
3456187
15:01:24
Adult Rm 239
320
You have pressed the Power Off button.
There is patient data stored for
Smith, John ID: 3456187
408
Select (⊙) to delete patient data
and shut down.
412
Delete & Shut Down
Save & Shut Down
Cancel
Setup
416

FIG.47

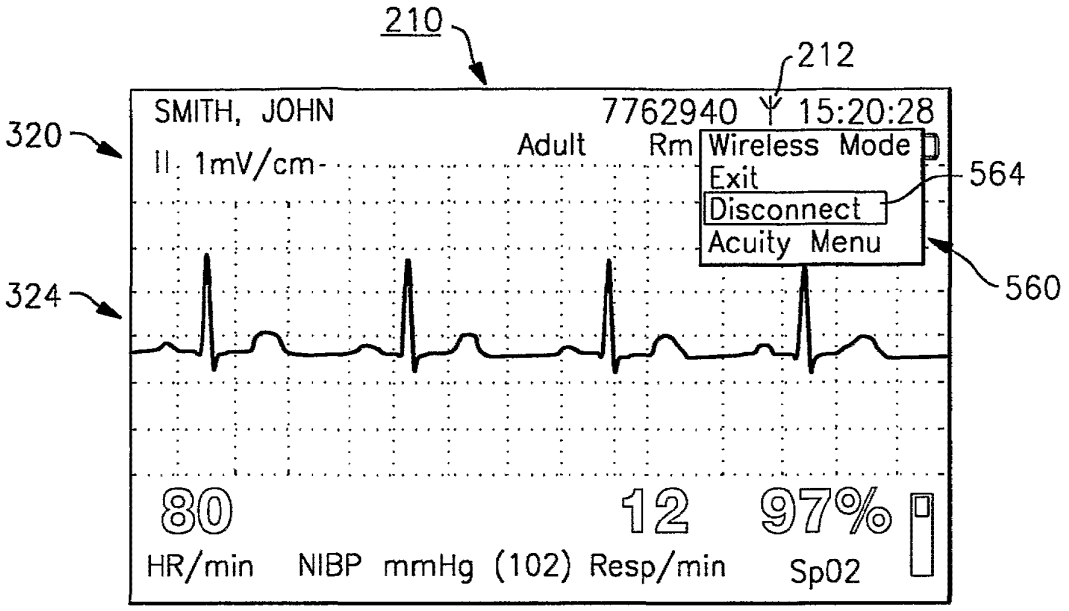

210
212
320
SMITH, JOHN
7762940
15:20:28
Adult
Rm
II 1mV/cm
Wireless Mode
Exit
Disconnect
Acuity Menu
564
560
324
80
12
97%
HR/min
NIBP mmHg (102)
Resp/min
Sp02

FIG.48

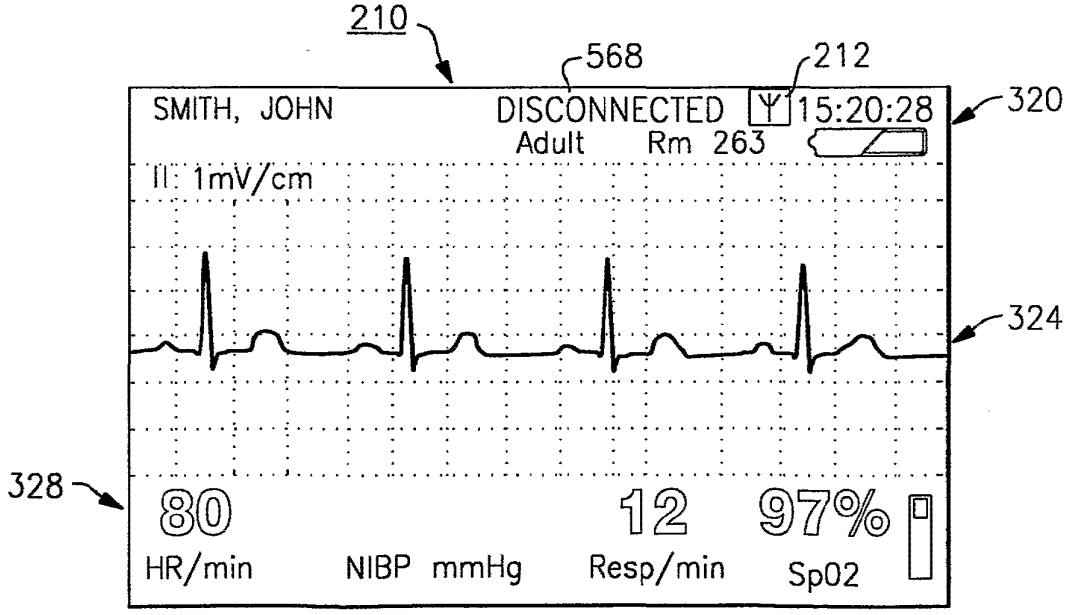

210
568
212
320
SMITH, JOHN
DISCONNECTED
15:20:28
Adult
Rm 263
II 1mV/cm
324
328
80
12
97%
HR/min
NIBP mmHg
Resp/min
Sp02

FIG.49

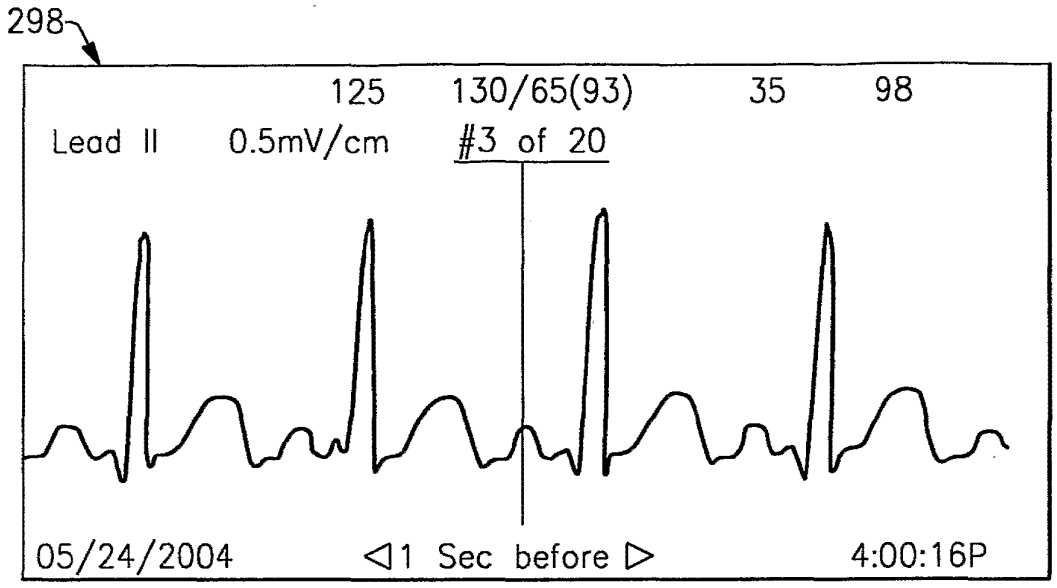

298
125
130/65(93)
35
98
Lead II
0.5mV/cm
#3 of 20
05/24/2004
1 Sec before
4:00:16P

FIG.50

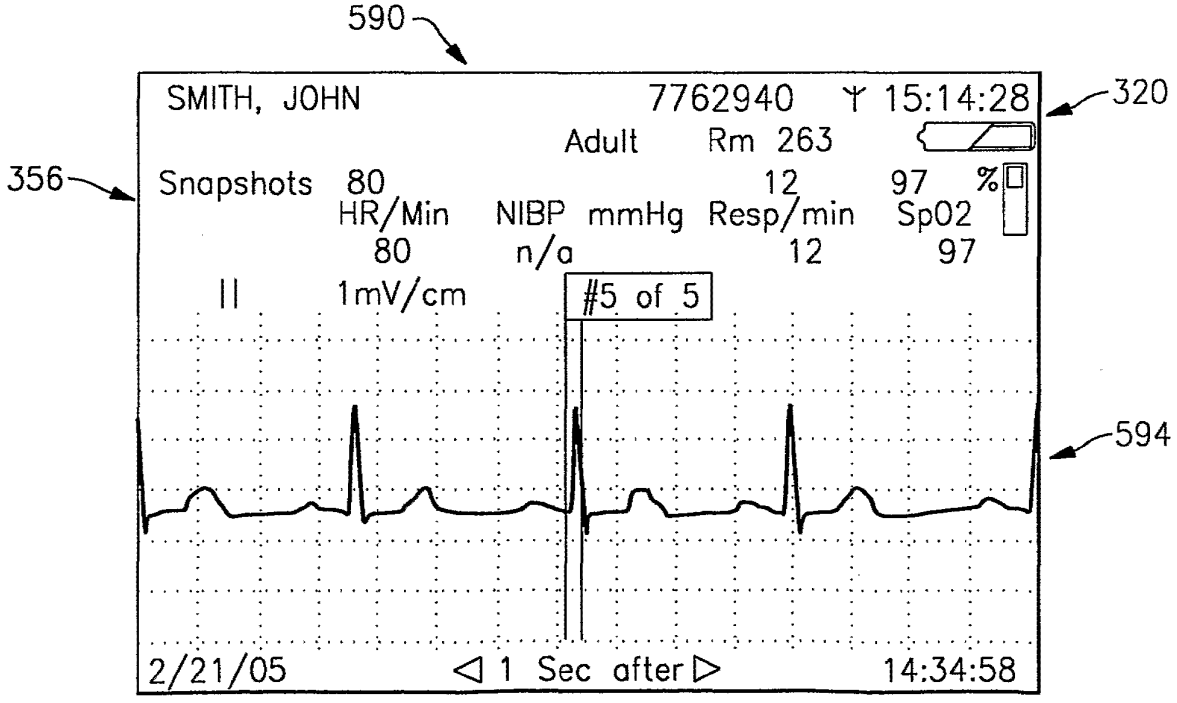

590
SMITH, JOHN
7762940
15:14:28
320
Adult
Rm 263
356
Snapshots
80
12
97
%
HR/Min
NIBP mmHg
Resp/min
SpO2
80
n/a
12
97
II
1mV/cm
#5 of 5
594
2/21/05
1 Sec after
14:34:58

FIG.51

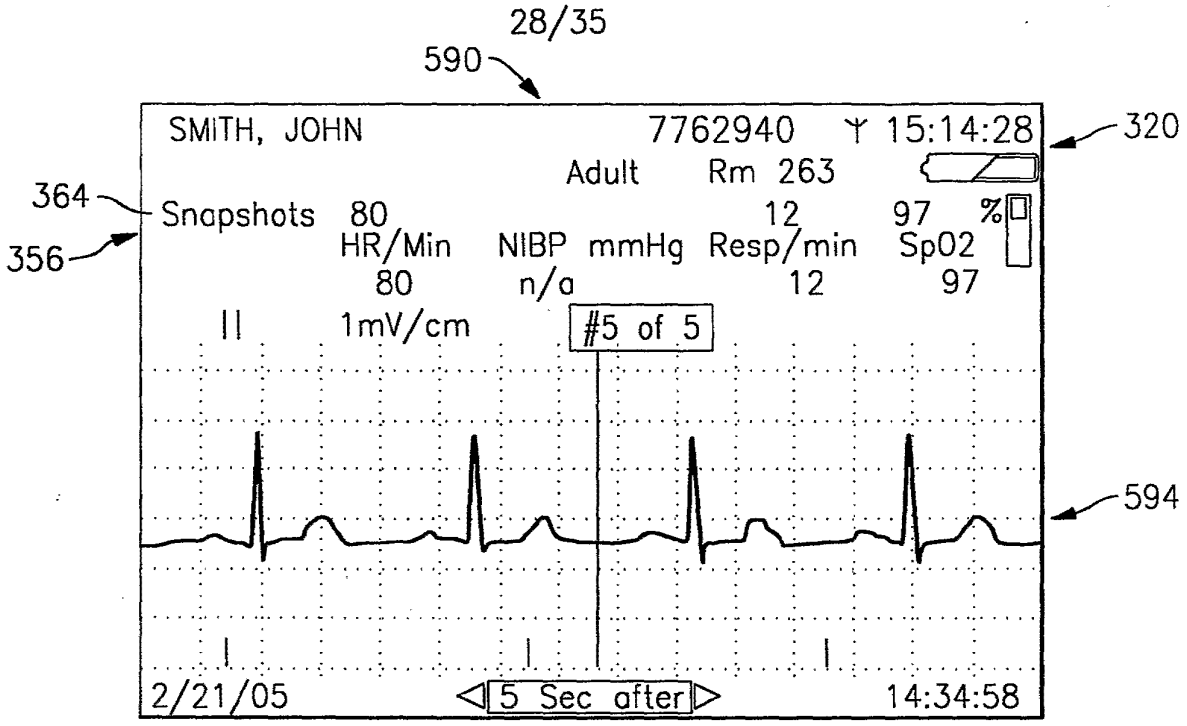

590
SMITH, JOHN
7762940
15:14:28
320
Adult
Rm 263
364
Snapshots
80
12
97
%
356
HR/Min
NIBP mmHg
Resp/min
SpO2
80
n/a
12
97
II
1mV/cm
#5 of 5
594
2/21/05
5 Sec after
14:34:58

FIG.52

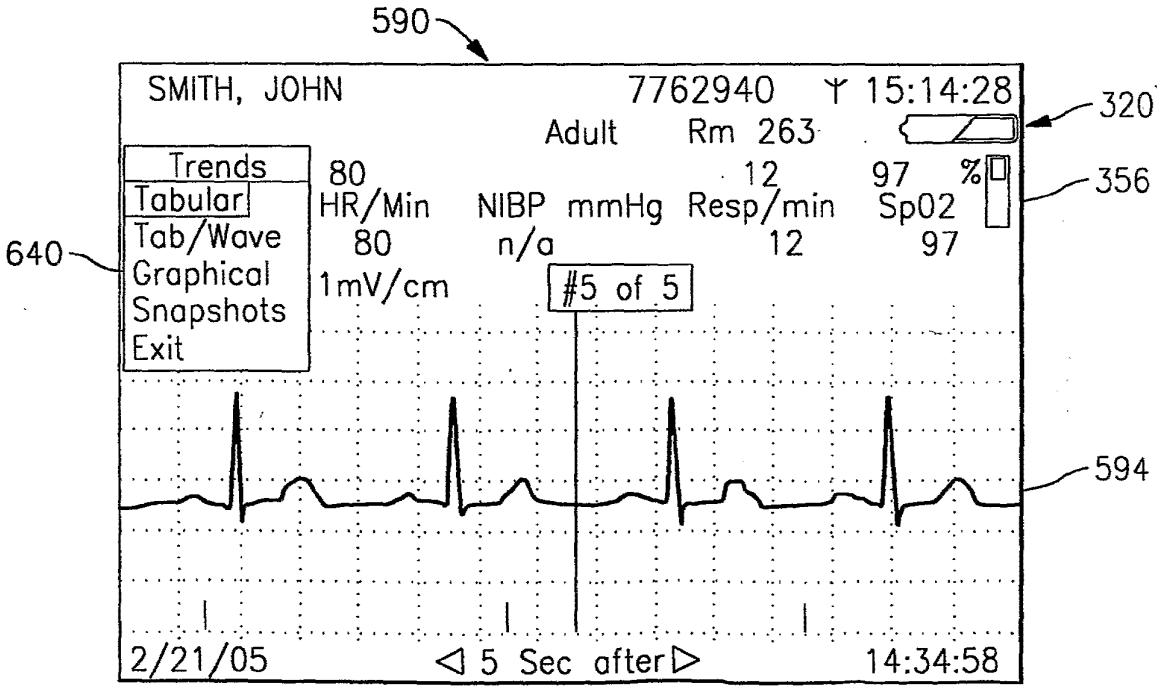

590
SMITH, JOHN
7762940
15:14:28
320
Adult
Rm 263
Trends
Tabular
Tab/Wave
Graphical
Snapshots
Exit
640
80
12
97
%
356
HR/Min
NIBP mmHg
Resp/min
SpO2
80
n/a
12
97
1mV/cm
#5 of 5
594
2/21/05
5 Sec after
14:34:58

FIG.53

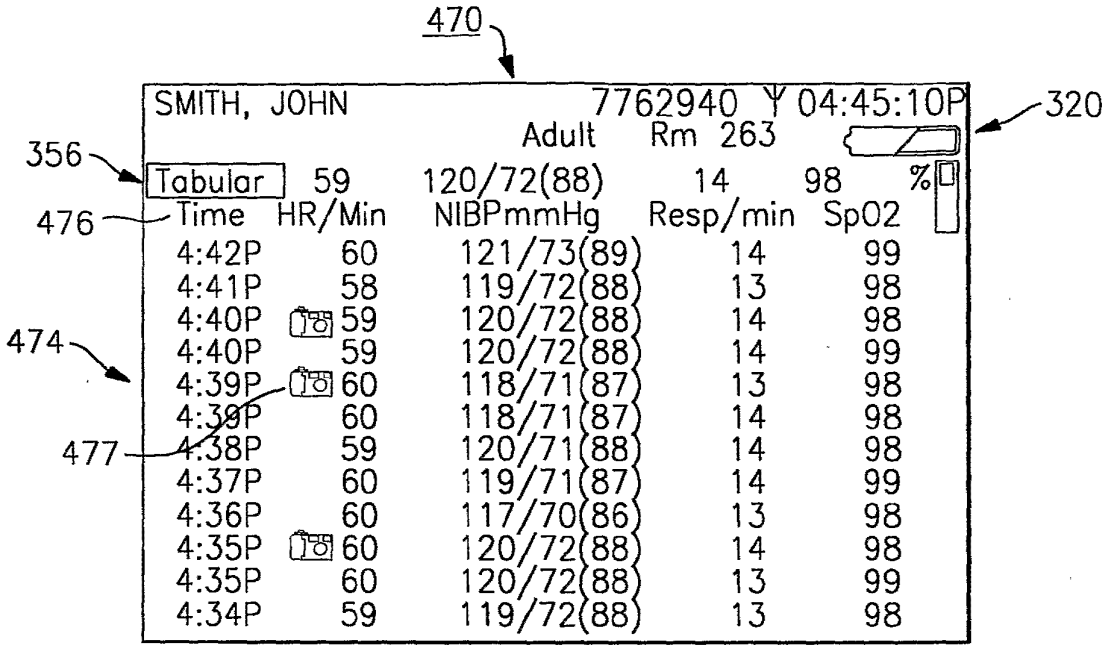

470
SMITH, JOHN
7762940
04:45:10P
320
Adult
Rm 263
356
Tabular
59
120/72(88)
14
98
%
476
Time
HR/Min
NIBPmmHg
Resp/min
SpO2
4:42P 60 121/73(89) 14 99
4:41P 58 119/72(88) 13 98
4:40P 59 120/72(88) 14 98
4:40P 59 120/72(88) 14 99
4:39P 60 118/71(87) 13 98
4:39P 60 118/71(87) 14 98
474
477
4:38P 59 120/71(88) 14 98
4:37P 60 119/71(87) 14 99
4:36P 60 117/70(86) 13 98
4:35P 60 120/72(88) 14 98
4:35P 60 120/72(88) 13 99
4:34P 59 119/72(88) 13 98

FIG.54

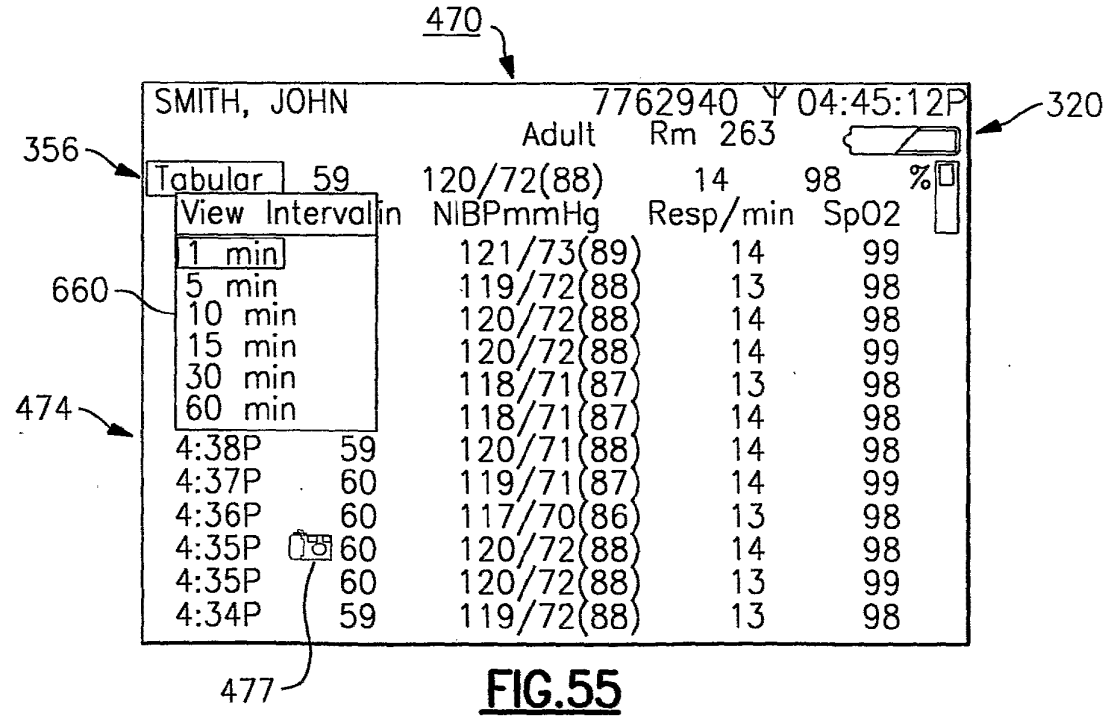

470
SMITH, JOHN
7762940
04:45:12P
320
Adult
Rm 263
356
Tabular
59
120/72(88)
14
98
%
View Interval
NIBPmmHg
Resp/min
SpO2
1 min
5 min
10 min
15 min
30 min
60 min
660
474
121/73(89) 14 99
119/72(88) 13 98
120/72(88) 14 98
120/72(88) 14 99
118/71(87) 13 98
118/71(87) 14 98
4:38P 59 120/71(88) 14 98
4:37P 60 119/71(87) 14 99
4:36P 60 117/70(86) 13 98
4:35P 60 120/72(88) 14 98
4:35P 60 120/72(88) 13 99
4:34P 59 119/72(88) 13 98
477

FIG.55

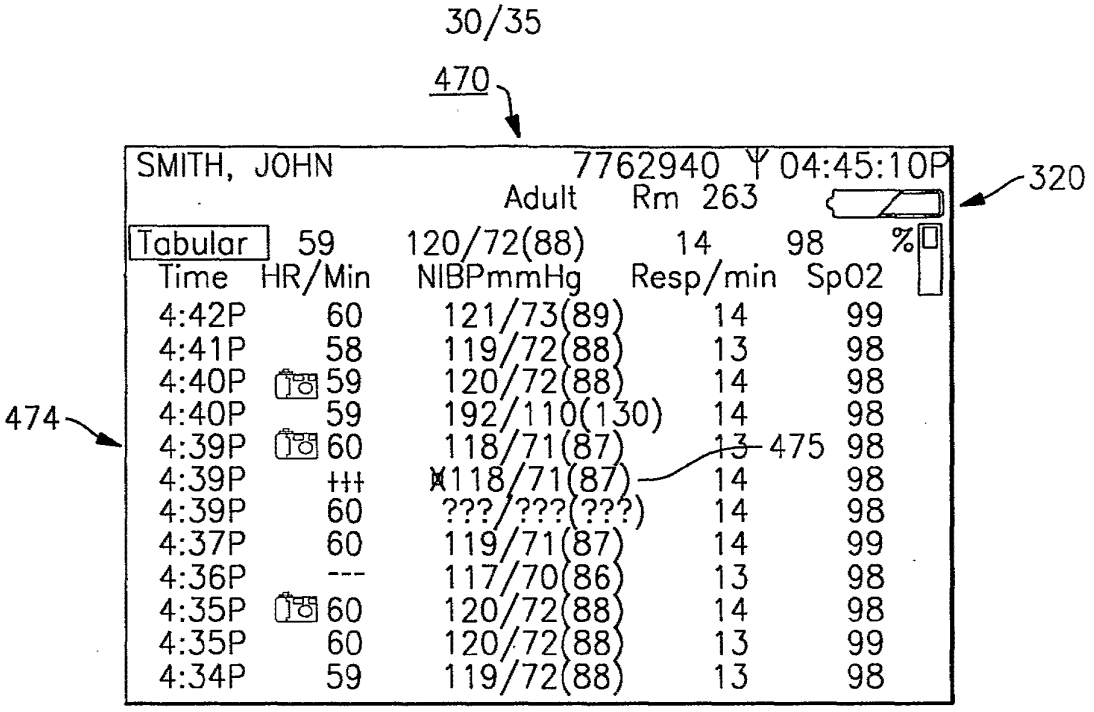

30/35
470
SMITH, JOHN
7762940
04:45:10P
Adult Rm 263
320
Tabular
59
120/72(88)
14
98 %
Time HR/Min NIBPmmHg Resp/min SpO2
4:42P 60 121/73(89) 14 99
4:41P 58 119/72(88) 13 98
4:40P 59 120/72(88) 14 98
4:40P 59 192/110(130) 14 98
4:39P 60 118/71(87) 13 475 98
4:39P +++ 118/71(87) 14 98
4:39P 60 ???/???(???) 14 98
4:37P 60 119/71(87) 14 99
4:36P --- 117/70(86) 13 98
4:35P 60 120/72(88) 14 98
4:35P 60 120/72(88) 13 99
4:34P 59 119/72(88) 13 98
474

FIG.56

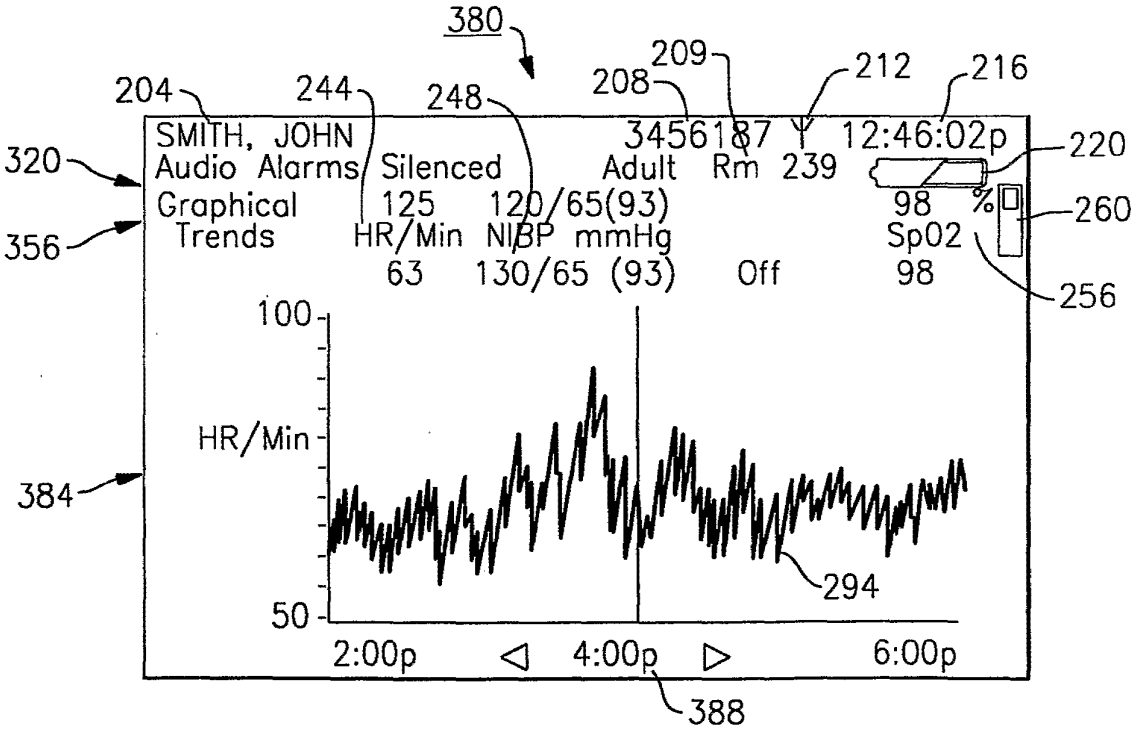

380
204
244
248
208
209
212
216
SMITH, JOHN
3456187
12:46:02p
320
Audio Alarms Silenced
Adult Rm 239
220
Graphical Trends
125 120/65(93)
98 %
260
356
HR/Min NIBP mmHg
Sp02
63 130/65 (93) Off 98
256
100
HR/Min
384
294
50
2:00p
4:00p
6:00p
388

FIG.57

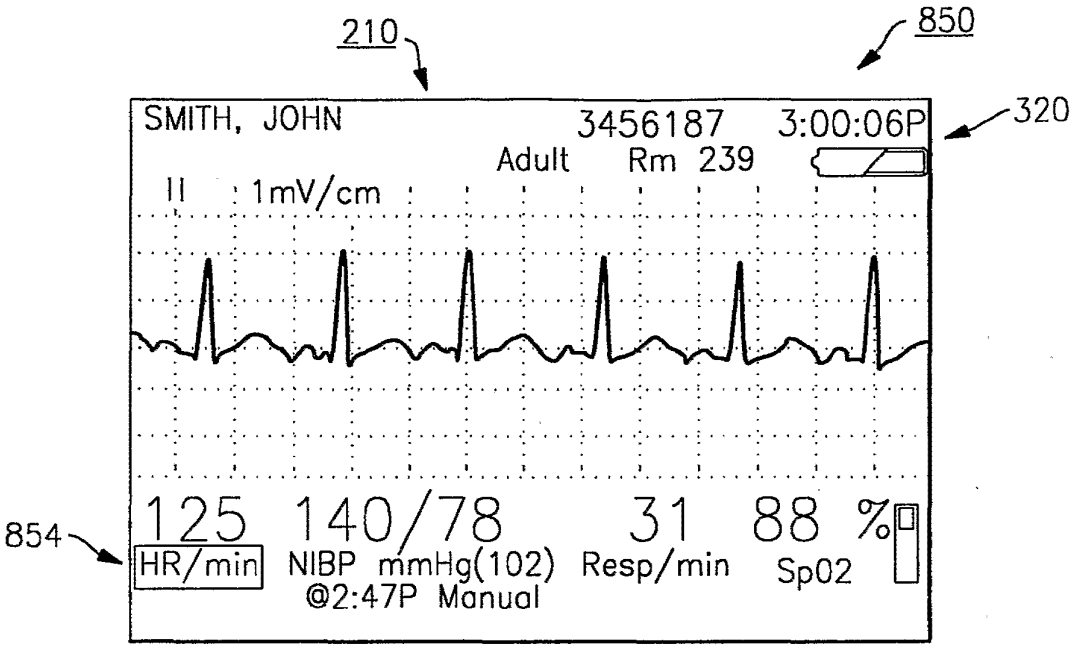

210
850
SMITH, JOHN
3456187
3:00:06P
320
Adult
Rm 239
II
1mV/cm
854
125
140/78
31
88 %
HR/min
NIBP mmHg(102)
Resp/min
Sp02
@2:47P Manual

FIG.58

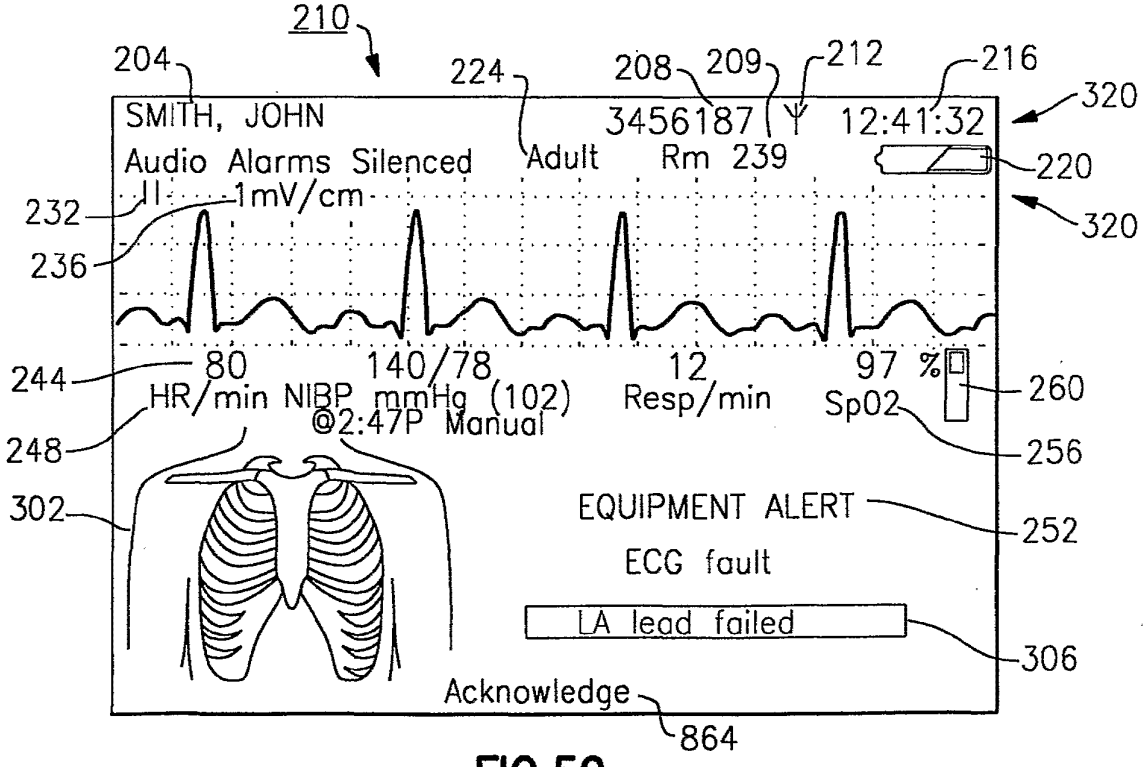

210
204
224
208
209
212
216
320
SMITH, JOHN
3456187
12:41:32
Audio Alarms Silenced
Adult
Rm 239
220
232
II
1mV/cm
320
236
244
80
140/78
12
97 %
260
HR/min
NIBP mmHg (102)
Resp/min
Sp02
248
@2:47P Manual
256
302
EQUIPMENT ALERT
252
ECG fault
LA lead failed
306
Acknowledge
864

FIG.59

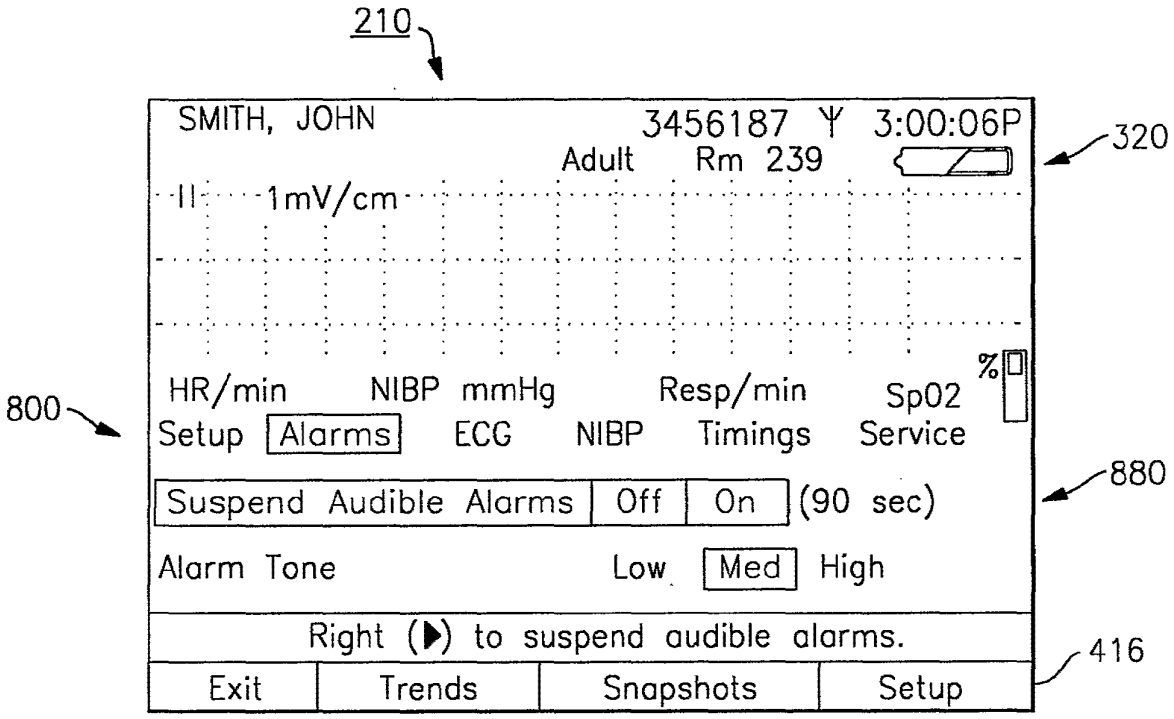

210
SMITH, JOHN
3456187
3:00:06P
Adult
Rm 239
320
II
1mV/cm
HR/min
NIBP mmHg
Resp/min
Sp02
%
800
Setup
Alarms
ECG
NIBP
Timings
Service
880
Suspend Audible Alarms
Off
On
(90 sec)
Alarm Tone
Low
Med
High
Right (▶) to suspend audible alarms.
416
Exit
Trends
Snapshots
Setup

FIG.60

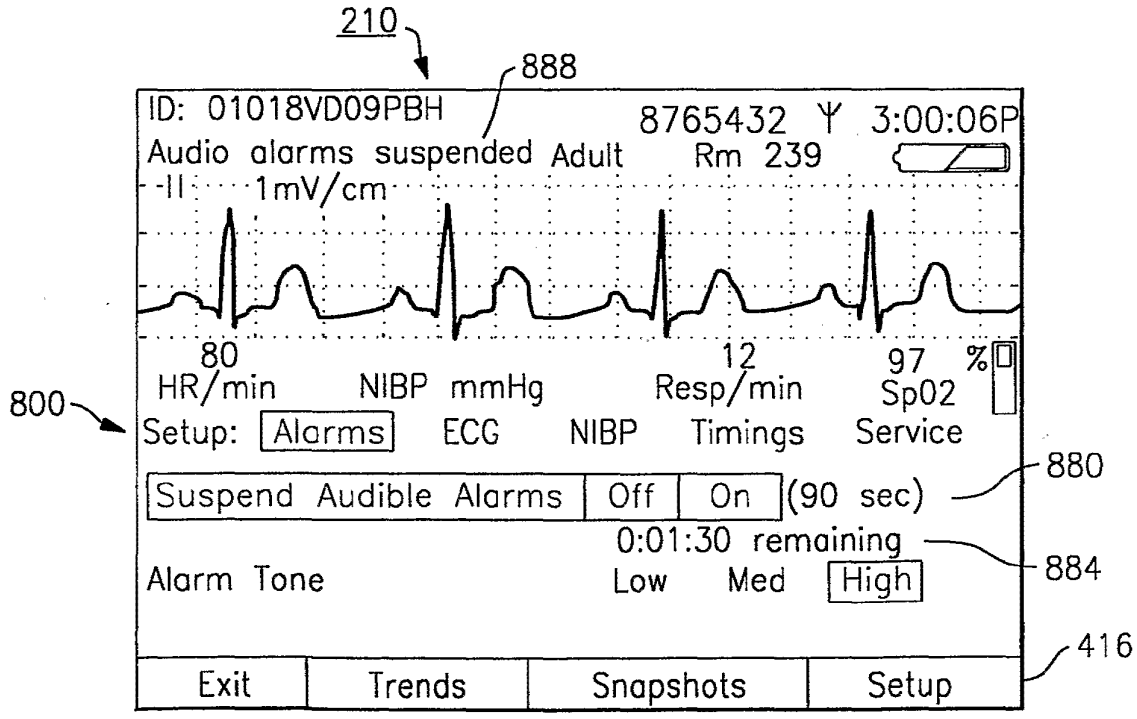

210
888
ID: 01018VD09PBH
8765432
3:00:06P
Audio alarms suspended
Adult
Rm 239
II
1mV/cm
80
12
97
%
HR/min
NIBP mmHg
Resp/min
Sp02
800
Setup:
Alarms
ECG
NIBP
Timings
Service
880
Suspend Audible Alarms
Off
On
(90 sec)
0:01:30 remaining
884
Alarm Tone
Low
Med
High
416
Exit
Trends
Snapshots
Setup

FIG.61

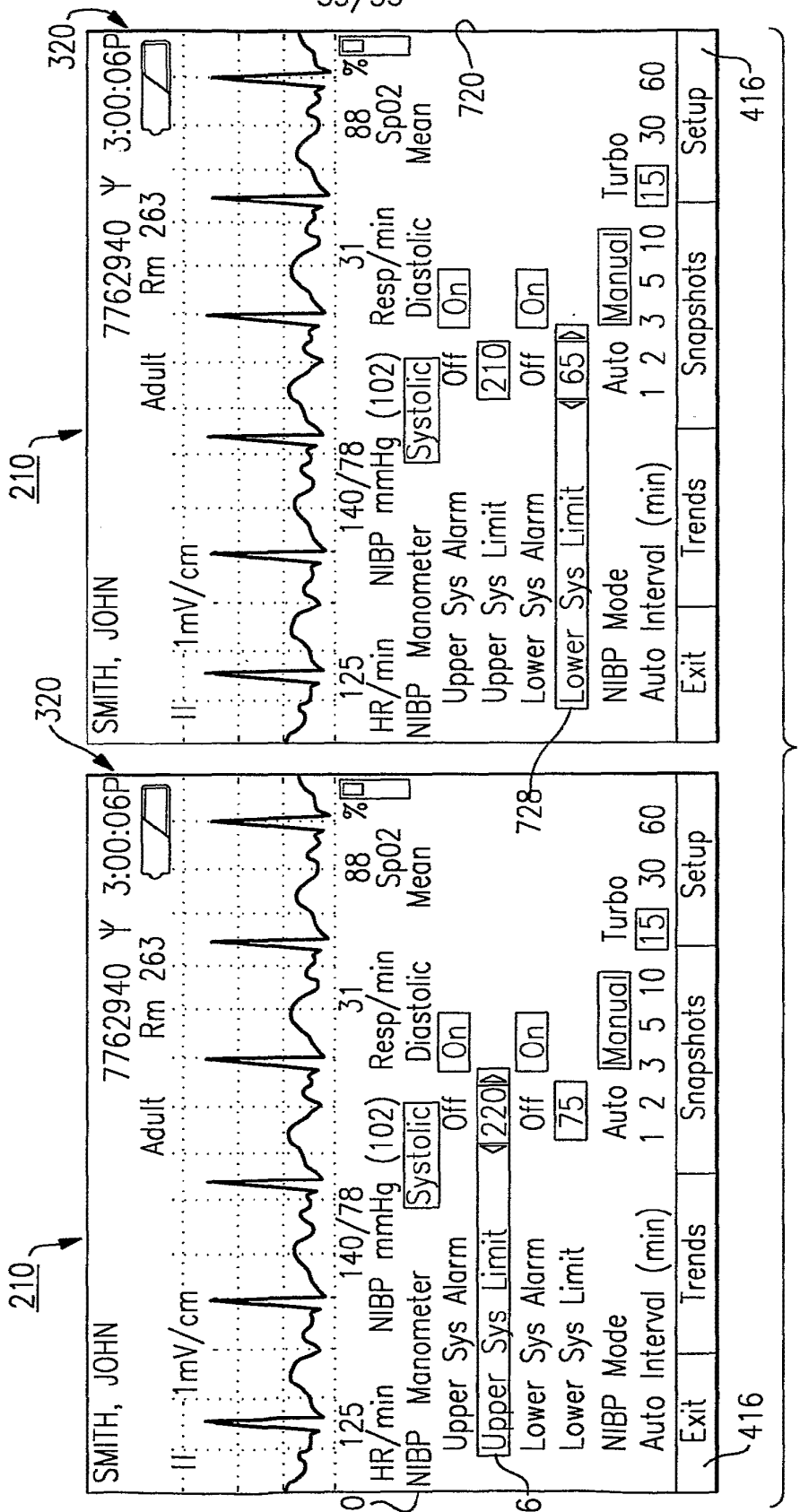

210
320
SMITH, JOHN
7762940
Adult
Rm 263
3:00:06P
1mV/cm
125
HR/min
140/78
NIBP mmHg (102)
31
Resp/min
88
SpO2
%
NIBP Manometer
Systolic
Diastolic
Mean
Upper Sys Alarm
Off
On
Upper Sys Limit
220
210
Lower Sys Alarm
Off
On
Lower Sys Limit
75
65
NIBP Mode
Auto
Manual
Turbo
Auto Interval (min)
1 2 3 5 10 15 30 60
Exit
Trends
Snapshots
Setup
720
726
728
416

FIG.62

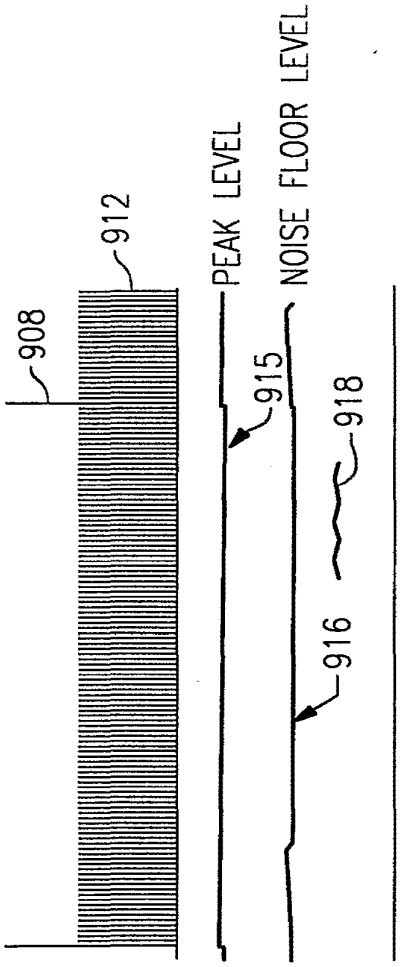


FIG.63

950

PARAMETER		ALARMING LEVEL	ALARM LIMIT (PARAMSET =5%)	ALARM LIMIT (PARAMSET =10%)	ALARM LIMIT (PARAMSET =15%)	ALARM LIMIT (PARAMSET =20%)	ALARM LIMIT (PARAMSET =25%)
HR/PR	UPPER	90	94	99	104	108	113
	LOWER	60	57	54	51	48	45
NIBP SYSTOLIC	UPPER	140	147	154	161	168	175
	LOWER	100	95	90	85	80	75
NIBP DIASTOLIC	UPPER	90	94	99	104	108	113
	LOWER	60	57	54	51	48	45
NIBP MAP	UPPER	107	112	118	123	128	134
	LOWER	73	69	66	62	58	55
SpO_2	UPPER	100	100	100	100	100	100
	LOWER	90	86	81	77	72	68
RESP	UPPER	20	21	22	23	24	25
	LOWER	12	11	11	10	10	9

FIG.65

198

8.1 ParamSet Enable

Do you want to enable ParamSet?

197 ☑(Yes)
☐(No)

Note If you select ☐(No), disregards the rest of the ParamSet settings.

8.2 ParamSet % for Upper HR/PR

ParamSet increases the Upper HP/PR limit ___%. (5, 10, 15, **20**, 25)

8.3 ParamSet % for Lower HR/PR 199

ParamSet decreases the Lower HP/PR limit ___%. (5, 10, 15, **20**, 25)

8.4 ParamSet % for Upper NIBP Systolic

ParamSet increases the Upper NIBP Systolic limit by ___%. (5, 10, **15**, 20, 25)

8.5 ParamSet % for Lower NIBP Systolic

ParamSet decreases the Lower NIBP Systolic limit by ___%. (5, 10, **15**, 20, 25)

8.6 ParamSet % for Lower NIBP Diastolic

ParamSet increases the Upper NIBP Diastolic limit by ___%. (5, 10, **15**, 20, 25)

8.7 ParamSet % for Lower NIBP Diastolic

ParamSet decreases the Lower NIBP Diastolic limit by ___%. (5, 10, **15**, 20, 25)

8.8 ParamSet % for Upper NIBP Mean

ParamSet increases the Upper NIBP Mean limit by ___%. (5,**10**,15)

8.9 ParamSet % for Lower NIBP Mean

ParamSet decreases the Lower NIBP Mean limit by ___%. (5,**10**,15)

8.10 ParamSet % for Upper SpO_2

ParamSet increases the Upper SpO_2 limit by ___%. (**5**, 10)

8.11 ParamSet % for Lower SpO_2

ParamSet decreases the Lower SpO_2 limit by ___%. (**5**, 10)

8.12 ParamSet % for Upper Resp

ParamSet increases the Upper Resp limit by ___%. (**5**, 10, 15, 20, 25)

8.13 ParamSet % for Lower Resp

ParamSet decreases the Lower Resp limit by ___%. (**5**, 10, 15, 20, 25)

FIG.64

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	３２２		３２２	
	３３２		３３２	

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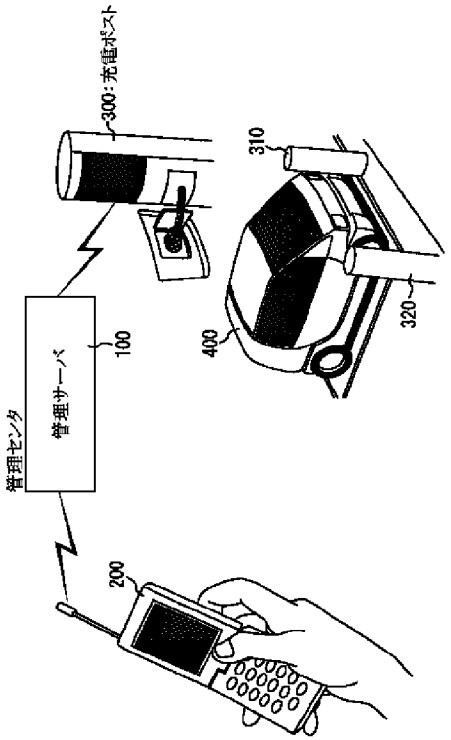
(54)【発明の名称】　電気自動車共同利用システム

(57)【要約】
【課題】電気自動車を普及させるために、電気自動車を手軽に利用できる共同利用システムを構築することである。
【解決手段】管理サーバ１００は、管理センタの設けられており、ユーザや電気自動車４００等を管理している。管理サーバ１００は、ユーザと、ｉモード等のインターネットにアクセス可能な携帯電話機２００を介して通信している。また、管理サーバ１００は、電気自動車４００を充電するための充電ポスト３００とも、公衆回線等を介して接続している。また、管理サーバ１００は、電気自動車４００とも、充電ポストとの接続を介すること等により、接続することが可能である。この電気自動車共同利用システムは、ユーザが有している携帯電話機２００を利用することにより、手軽に電気自動車を共同利用することができるシステムを構築しようとするものである。



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【特許請求の範囲】
【請求項１】複数の電気自動車を共同利用する電気自動車共同利用システムにおいて、
前記電気自動車に対して、駐車中に充電するための複数の充電ポストと、
該充電ポストおよび前記電気自動車を管理する管理サーバとを備え、該管理サーバは、
前記充電ポストに接続されている電気自動車の状態および位置のデータを収集しており、
ユーザの携帯電話機からのアクセスにより、会員であることの認証を行い、
会員であることが認証されると、ユーザからの前記電気自動車の予約を受け付け、
前記予約が成立するかを、前記収集してある電気自動車のデータから検索し、その結果を前記携帯電話機に対して送信することを特徴とする電気自動車共同利用システム。
【請求項２】　請求項１記載の電気自動車共同利用システムにおいて、前記管理サーバが、前記携帯電話機に対して予約が成立した場合に送信する結果には、ユーザが使用できる電気自動車が駐車している位置を示す地図が含まれることを特徴とする電気自動車共同利用システム。
【請求項３】　請求項１又は２に記載の電気自動車共同利用システムにおいて、前記管理サーバが、前記携帯電話機に対して予約が成立した場合に送信する結果には、ユーザの目的地最寄りの予約した充電ポストの位置を示す地図が含まれることを特徴とする電気自動車共同利用システム。
【請求項４】　請求項１～３のいずれかに記載の電気自動車共同利用システムにおいて、
前記充電ポストは、予約を表示するための表示灯を有しており、
予約されたときに、前記管理サーバからの指示により、点灯することを特徴とする電気自動車共同利用システム。
【請求項５】　請求項１～４のいずれかに記載の電気自動車共同利用システムにおいて、前記管理サーバは、前記会員であることを認証するときに、使用している携帯電話機の電話番号を利用していることを特徴とする電気自動車共同利用システム。
【請求項６】　請求項１～５のいずれかに記載の電気自動車共同利用システムにおいて、前記管理サーバは、
ユーザが使用した電気自動車の利用時間を監視して、利用料金を算出するとともに、
算出した利用料金を、ユーザの使用している携帯電話の料金口座に加算することを特徴とする電気自動車共同利用システム。
【請求項７】　請求項１～６のいずれかに記載の電気自動車共同利用システムにおいて、
ユーザが使用する電気自動車が決定された場合に、該ユーザの携帯電話機の電話番号を、該ユーザが使用する電気自動車に対して通知することを特徴とする電気自動車共同利用システム。
【請求項８】　電気自動車を共同利用するための管理サーバを有する電気自動車共同利用システムの電気自動車において、
前記管理サーバとの通信手段と、
携帯電話機を接続するための接続手段と、
前記接続手段に接続した携帯電話機の自局電話番号を読み出す電話番号読出し手段と、
前記電気自動車の状態を監視する監視システムとを有しており、
前記監視システムは、前記電気自動車を利用するユーザの携帯電話機の電話番号を前記通信手段により通知された後、前記電話番号読出し手段からの電話番号と通知された電話番号とが一致した場合に、使用可能状態とすることを特徴とする電気自動車共同利用システムの電気自動車。
【請求項９】複数の電気自動車を共同利用する電気自動車共同利用システムにおいて、
前記電気自動車に対して、駐車中に充電するための複数の充電ポストと、
該充電ポストおよび前記電気自動車を管理する管理サーバとを備え、
前記管理サーバは、
前記電気自動車と前記充電ポストとの間における、充電するための接続関係を検知しており、
前記電気自動車の使用開始時および使用終了時を、前記接続関係の終了時および開始時を検出することにより行うことを特徴とする電気自動車共同利用システム。
【請求項１０】　請求項９に記載の電気自動車共同利用システムにおいて、
前記充電ポストは、前記接続関係を保持するためのロック機構を有しており、
該ロック機構は、前記管理サーバからの指示により、ロック開始、ロック解除となることを特徴とする電気自動車共同利用システム。
【請求項１１】　請求項９又は１０に記載の電気自動車共同利用システムにおいて、
前記充電ポストは、使用可能状態を表示するための表示灯を有しており、
前記管理サーバからの指示により表示することを特徴とする電気自動車共同利用システム。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電気自動車の共同利用システムに関する。
【技術的背景】一般に、環境に優しいとされる、窒素酸化物や二酸化炭素を全く排出しない純電気自動車や、そ

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れらの排出量がこれまでのガソリン車に比べて少ないハイブリッド電気自動車が知られている。このような電気自動車の普及は、環境対策の一環として、重要な課題であると考えられる。

【発明が解決しようとする課題】本発明の目的は、電気自動車を普及させるために、電気自動車を手軽に利用できる共同利用システムを構築することである。

【０００２】

【課題を解決するための手段】上記目的を達成するために、本発明は、複数の電気自動車を共同利用する電気自動車共同利用システムであって、前記電気自動車に対して、駐車中に充電するための複数の充電ポストと、該充電ポストおよび前記電気自動車を管理する管理サーバとを備え、該管理サーバは、前記充電ポストに接続されている電気自動車の状態および位置のデータを収集しており、ユーザの携帯電話機からのアクセスにより、会員であることの認証を行い、会員であることが認証されると、ユーザからの前記電気自動車の予約を受け付け、前記予約が成立するかを、前記収集してある電気自動車のデータから検索し、その結果を前記携帯電話機に対して送信することを特徴とする。前記サーバが前記携帯電話機に対して予約が成立した場合に送信する結果には、ユーザが使用できる電気自動車が駐車している位置を示す地図やユーザの目的地最寄りの予約した充電ポストの地図が含まれるようにすることもできる。前記充電ポストは予約を表示する表示灯を有しており、予約されたときに、前記管理サーバからの指示により点灯することもできる。また、前記会員であることを認証するときに、使用している携帯電話機の電話番号を利用することも可能である。前記サーバは、ユーザが使用した電気自動車の利用時間を監視して、利用料金を算出するとともに、算出した利用料金を、ユーザの使用している携帯電話の料金口座に加算することもできる。さらに、前記サーバは、ユーザが使用する電気自動車が決定された場合に、該ユーザの携帯電話機の電話番号を、該ユーザが使用する電気自動車に対して通知することができる。前記電気自動車は、前記管理サーバとの通信手段と、携帯電話機を接続するための接続手段と、前記接続手段に接続した携帯電話機の自局電話番号を読み出す電話番号読出し手段と、前記電気自動車の状態を監視する監視システムとを有しており、前記監視システムは、前記電気自動車を利用するユーザの携帯電話機の電話番号が前記通信手段により通知された後、前記電話番号読出し手段からの電話番号と、通知された電話番号が一致した場合に使用可能状態とすることができる。その上、複数の電気自動車を共同利用する電気自動車共同利用システムであって、前記電気自動車に対して、駐車中に充電するための充電ポストと、該充電ポストおよび前記電気自動車を管理する管理サーバとを備えており、前記管理サーバは、前記電気自動車と前記充電ポストとの間における、充電するための接続関係を検知しており、前記電気自動車の使用開始時および使用終了時を、前記接続関係の終了時および開始時を検出することにより行うこともできる。このときに、前記充電ポストは、前記接続関係を保持するためのロック機構を有することもでき、該ロック機構は、前記管理サーバからの指示により、ロック開始、ロック解除の状態となる。また、前記充電ポストは、使用可能状態を表示する表示灯を有しており、前記管理サーバからの指示により表示することもできる。

【０００３】

【発明の実施の形態】本発明の実施形態を、図面を参照して詳細に説明する。図１は、本発明の電気自動車共同利用システムにおける構成の１例を示す図である。図１において、管理サーバ１００は、管理センタに設けられており、この電気自動車共同利用システムを利用するユーザや共同利用される電気自動車４００等を管理して、電気自動車共同利用システムを運営するための中心的システムである。管理サーバ１００は、電気自動車共同利用システムを利用するユーザと、例えばｉモード等のインターネットにアクセス可能な携帯電話機２００を介して、通信している。また、管理サーバ１００は、電気自動車４００を充電するための充電ポスト３００を管理している駐車場毎に設けられた駐車場システム（図示せず）とも、公衆回線や携帯電話網を介して接続している。また、管理サーバ１００は充電ポストとの接続を介することや、直接的に携帯電話網等による無線回線により、、電気自動車４００とも接続することが可能である。本発明の電気自動車共同利用システムは、ユーザが有している携帯電話機２００を利用することにより、手軽に電気自動車を共同利用することができるシステムを構築しようとするものである。

【０００４】電気自動車共同利用システムは、電気自動車を利用できる範囲に、複数の専用駐車場を設置する。この駐車場について図２に示す。図２（ａ）に示す専用駐車場には、屋根を設けるとともに、充電ポスト３３２～３３８を有している。図２（ｂ）は、パーキング・メーター・タイプの駐車場を示しており、充電ポストが道路脇に、パーキング・メーターのように立っている。各充電ポストを管理している駐車場システムは、前に述べたように、管理サーバと公衆回線等の有線か、携帯電話網等の無線によって通信できるとともに、充電中の電気自動車とも充電ケーブル等の有線か、ブルートゥースや携帯電話網のような無線により通信することができる。このように、電気自動車用の各駐車場には、必ず充電ポストは設置されており、共同利用される電気自動車は、駐車状態（利用されていない状態）のときは、駐車場の充電ポストに充電ケーブルを介して接続されて充電されている。また、充電ポストは、接続されている充電ケーブルを機械的にロックするロック機構を備えている。このロック機構のロックやロック解除は、電気的に制御可

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能であり、駐車場システム等からの指示により制御することができる。この充電ケーブルのロック機構は、例えば、充電ケーブルのプラグのブレードを契合できる形状とし、その形状を用いて機械的に契合することでロックしたり、充電ポストに設けたケースを開いて充電ケーブルをコンセントに接合するような構成として、そのケースを閉じて開かない様にしてロックする。充電ケーブルをロックする制御可能なロック機構を設けることにより、電気自動車が駐車中は確実に充電されるとともに、駐車中の電気自動車に対する防犯にもなる。

【０００５】この共同利用システムにおいては、各電気自動車には、ユニークな自動車ＩＤが付与されており、これにより管理サーバは、電気自動車の管理を行っている。また、充電ポストにもユニークな充電ポストＩＤが付与されており、これにより管理サーバは、各充電ポストの状態管理を行っている。例えば、管理サーバは、どの充電ポストにどの電気自動車が接続されており、その電気自動車の充電状態はどの程度であるかを、これらのＩＤを用いて把握している。

【０００６】ここで説明している実施形態では、使用している電気自動車は、小型で軽量なものを使用しており、例えば、道路に停車する場合も、道路に沿って停車する必要はなく、道路に対して直交する方向に駐車可能である。この様な小型の電気自動車を用いることにより、使用する蓄電池が小さく軽量なものを使用することができるとともに、駐車スペースも少なくてすむ。このため、各所に共同利用する電気自動車のための駐車場を設置することが可能となり、利便性も向上する。また、電気自動車が駐車場に止まっている場合には、充電ポストと接続されているように構成しているために、積載されている蓄電池はフル充電状態であることが多く、小さい容量の蓄電池を使用しても十分に適用領域内で利用することができる。

【０００７】＜携帯電話機の利用＞この電気自動車の共同利用システムは、携帯電話機を使用することも特徴の１つである。

（会員登録）共同利用システムのユーザは、このシステムの電気自動車を利用するためには、まず、自分自身の携帯電話機を用いて会員登録を行う必要がある。この会員登録するためには、ｉモード等のインターネットにアクセスすることができる携帯電話機を用いて、共同利用システムのサイト（即ち、管理サーバ）にアクセスして行う。会員登録すると、管理サーバにユーザの電話番号とともに、パスワード（暗証番号）が登録される。管理サーバは、会員の認証に電話番号とパスワードを用いている。電気自動車の利用に対する課金は、この電話番号に対する電話料金口座に対してなされ、支払は電話代とともに行われる。

【０００８】（会員カードとしての利用）会員登録したユーザの携帯電話機は、共同利用システムにおいては、会員カードと同様の働きを行う。このために、各充電ポスト３００には、図３（ａ）に示すように、携帯電話機を接続できるような接続ボックス３５０が設けられている。この接続ボックス３５０は、駐車場システムを接続されており、接続された携帯電話の自局電話番号を読み出すことができる。また、各電気自動車４００には、携帯電話機を接続できる接続ボックス４１０が設けられている。この接続ボックス４１０は、電気自動車内に設けられた電気自動車の状態等を監視している監視システムと接続されており、接続された携帯電話機の自局電話番号を読み取ることができる。なお、接続ボックス４１０に接続された状態で、ハンズフリーで携帯電話機を使用することができるようにしてもよい。これらの接続ボックスによる携帯電話機の利用については、後で詳しく説明する。

【０００９】＜電気自動車の利用の仕方＞図４および図５を用いて、このシステムに対して会員登録を行ったユーザが、電気自動車をどの様にして利用するのかを詳しく説明する。さて、管理サーバは、図４（ａ）に示すように、各駐車場の各充電ポストにどの電気自動車が接続されているかを、例えば、管理サーバー駐車場システムー充電ポストー充電ケーブルー電気自動車の監視システムの経路で通信することにより、把握している。また、管理サーバは、各電気自動車の状態、例えば、充電状態や故障の状態等も同様の通信経路で把握している。

【００１０】（予約）会員登録を完了した後に、電気自動車を利用を希望するユーザは、図４（ｂ）に示すように、携帯電話機を使用して、管理サーバにアクセスすることで予約を行う。この予約を行うときのシステム動作を、図６を用いて詳しく説明する。図６において、ユーザは、携帯電話機のｉモード等を用いて、管理センタ内に設けられた管理サーバ上の予約ページにアクセスする（Ｓ６０２，Ｓ６０４）。管理サーバでは、予約処理を開始し（Ｓ６０６）、まず電話番号を会員のＩＤとして、会員登録されているかを調べ、会員登録されていた場合、パスワード入力画面を送信する（Ｓ６０８）。ユーザは、送られてきたパスワード入力画面に対して、パスワードを入力して（Ｓ６１０）、送信する（Ｓ６１２）。管理サーバでは、電話番号およびパスワードを用いてユーザの認証を行い、会員であることが確認される（Ｓ６１４）と、予約画面を携帯電話機に送信する（Ｓ６１６）。ユーザは、送られてきた予約画面内に、希望する出発地、到着地（目的地）や、出発予定時刻、到着予定時刻等を入力して（Ｓ６１８）、管理サーバへ送信する（Ｓ６２０）。管理サーバでは、送られてきた情報を基に、出発地に最寄りの駐車場で、使用できる電気自動車を検索する（Ｓ６２２）。そして、検索した結果である最寄りの駐車場や使用できる電気自動車を、駐車場への地図や電気自動車の車両番号として、携帯電話機に送信する（Ｓ６２４）。このときに、到着地に最寄りの

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駐車場の地図を送ることもできる。ユーザは、送られてきた地図や車両番号を確認して（Ｓ６２６）、それで良かったら使用する旨を管理サーバに送る（Ｓ６２８）。ユーザは、送られてきた駐車場の地図や車両番号等を、携帯電話機内に記憶しておけば、何時でも読み出すことができる。管理センタは、使用予定の電気自動車を予約済みとして、予約処理を終了する（Ｓ６３０）。また、この予約処理として、到着地に最寄りの駐車場における充電ポストの１つも予約することもできる。この様にして、ユーザは携帯電話機を使用することにより、電気自動車を予約することができるとともに、駐車場の地図等も受け取ることができる。

【００１１】（実車引き取り）ユーザは、携帯電話機内に記憶した地図を用いて、出発地最寄りの電気自動車用駐車場へ行って、電気自動車を使用することができる。駐車場に着いたところは、図４（ｃ）に示している。予約された電気自動車を使用するための手順の例を、図４（ｄ）および図５（ｅ），（ｆ）を用いて説明する。駐車場に待機している電気自動車は、ドアがロックされているとともに、充電ポストとは、充電ケーブルにより接続されている。図４（ｄ）は、予約された電気自動車内に入るために、会員であることの認証を行うことを示している。これには、２つの手順があり、その１つは、図４（ｄ）に示すように、携帯電話機から直接に管理サーバにアクセスして、送られてきた使用開始のためのページに対して、パスワードや予約された車両番号を入力すること等により、認証を受けることである。もう１つの手順は、図３（ａ）に示すように、各充電ポストに設けられた接続ボックス３５０に携帯電話機を接続することである。以下に、接続ボックス３５０に携帯電話機を接続する手順を例に、予約された電気自動車を使用するまでの処理について、図７に示したシーケンス図を用いて詳しく説明する。

【００１２】電気自動車を予約したユーザは、通知された車両番号の電気自動車が接続されている充電ポストに設けられている接続ボックスに、自分の携帯電話機を接続する（Ｓ７０２：図３（ａ）参照）。駐車場システムは、充電ポストの接続ボックスに接続された携帯電話機から、「自局電話番号」を読み出して、公衆回線等により、管理サーバに読み出した携帯電話機の電話番号を送信する（Ｓ７０４）。管理サーバでは、送られてきた電話番号により予約を確認する（Ｓ７０６）と、充電ポストに対して、充電ケーブルおよび電気自動車のドアに対するアンロック信号を送信する（Ｓ７０８）。充電ポストと充電ケーブルとの接続に対するロックが解除された後に、ユーザが充電ケーブルを抜く（Ｓ７１０）と、駐車場システムは、充電ポストから充電ケーブルが取り外されたこと、即ち使用開始を管理サーバに通知する（Ｓ７１２）。使用開始の通知を受けた管理サーバは、ユーザに対する使用料の課金を開始する（Ｓ７１４）。ユーザは、充電ポストから携帯電話機を抜き、電気自動車内の接続ボックスにセットする（図５（ｅ）参照）。電気自動車内のシステムには、管理サーバから、予約したユーザの電話番号が予め通知されている。このため、電気自動車内の監視システムにおいて、接続した携帯電話機の自局電話番号を読み出して照合することにより、電気自動車は使用可能状態となる（図５（ｆ）参照）。この様にして、ユーザは、予約した電気自動車を受け取り、使用することができる。

【００１３】（実車の返却）ユーザは、図５（ｇ）に示すように、電気自動車を使用した後に、駐車場に返却する。このとき、到着地の最寄りの駐車場を指定されていたときは、指定された充電ポストに対して、電気自動車を駐車する。この返却の際のシステムにおける処理について、図８のシーケンス図を用いて詳しく説明する。使用を終了したユーザは、携帯電話機を使用していた電気自動車の接続ボックスから取り出して、駐車した充電ポストの接続ボックスに接続する（Ｓ８０２）。駐車場システムは、接続した携帯電話機から自局電話番号を読み出して、使用終了要請とともに管理サーバに送信する（Ｓ８０４）。管理サーバは、予約を確認する（Ｓ８０６）とともに、充電ケーブルの接続要請を送信する（Ｓ８０８）。充電ポストからは、例えば音声で、「充電ケーブルを接続して下さい」と、ユーザに向かって注意喚起を行う（Ｓ８１０）。ユーザが充電ケーブルを接続する（Ｓ８１２）と、充電していることを検知して、充電開始信号を管理サーバに送信する（Ｓ８１４）。充電開始信号を受信した管理サーバは、課金を停止する（Ｓ８１６）とともに、ロック信号を送信する（Ｓ８１８）。駐車場システムがロック信号を受信すると、充電ケーブルとの接続および電気自動車のドアをロックする（Ｓ８２０）。使用が終了して充電ケーブルが接続され、課金が終了すると、管理サーバは、電子メール等で、今回の電気自動車の使用料をユーザの携帯電話機に通知することもできる（図５（ｈ）参照）。このように、充電ケーブルを外してから接続するまでを使用中として、課金を行うようにすることで、電気自動車が駐車中であれば、確実に充電ケーブルが接続されていることになる。

【００１４】＜予約なしでの使用＞本システムは、駐車場で電気自動車が駐車していることを見たユーザが、その場で使用したいと思ったときでも、電気自動車を利用することができる。この場合、ユーザは、携帯電話機で即時使用のページにアクセスし、そのときに見た電気自動車の車両番号や使用予定時間等を管理サーバに通知する。管理サーバは、通知を受けた車両番号の電気自動車が予約されておらず、使用可能である場合は、使用許可をユーザに通知する。このときに、通知した車両番号の電気自動車が使用できないときは、代わりの電気自動車を紹介するようにしてもよい。このような予約なしで使用するときにも、ユーザが使用可能であるかを把握でき

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るように、電気自動車や充電ポストに使用可を表示する緑や使用不可を示す赤の「表示灯」等を設け、電気自動車等が予約されていること等を表示できるようにしてもよい。充電ポストに「表示灯」等を設けることにより、到着する電気自動車に対して、充電ポストが予約されていることを表示することもできる。その後に行う実車引き取りの手順は、図７で説明したものと同様である。

【００１５】＜他の実施形態＞上述の実施形態では、充電ポストを管理する駐車場システムを設ける場合で説明したが、各充電ポストが必要な機能を備えて、直接的に管理サーバに接続する構成としてもよい。また、返却時に、充電ポストに携帯電話機を接続して、使用が終了したことを管理サーバに対して通知しているが、電気自動車からセットしている携帯電話機を取り外すこと、および、電気自動車と充電ポストとを充電ケーブルにより接続することで、使用が終了したことを管理サーバが認識して、この時点で課金を終了するようにしてもよい。上述の実施形態では、充電ポストが予約されているときに、表示灯等で表示しているが、充電ポストの充電のためのコンセントが使用できないようにロックしてもよい。また、充電ポストの充電スペース（駐車スペース）の入り口にロック板を立てる等により、充電スペースに、予約された電気自動車以外の駐車を阻害するようにしてもよい。このときに、この充電ポストを予約した電気自動車が接近したことを検知して、ロック板を下げたり、コンセントのロックを解除する。電気自動車の接近は、例えば、ユーザが予約を行った携帯電話から通信を行ったり、充電ポストと接近した電気自動車とが自動的に通信を行うこと等により、検知することができる。上述の実施形態では、充電ケーブルを、使用不可の状態である時や充電中は、充電ポストから外れないようにロックしているが、このロック機構を設けなくてもよい。上述の実施形態では、携帯電話機の電話番号をユーザのＩＤとしているが、ユーザＩＤを別に設定してもよい。携帯電話機をユーザの識別に用いているが、ユーザＩＤを設定している磁気カード等を用いてもよい。電気自動車に位置を識別できる機器を搭載するとともに、管理サーバと携帯電話網等により直接通信できるようにして、管理サーバが常に電気自動車の位置を把握できるようにしてもよい。このような構成とすることで、駐車場以外の場所で乗り捨てられた電気自動車の位置を知ることが可能となる。管理サーバは、電気自動車の配置を常時把握しているので、需要に対して電気自動車の配置がアンバランスとなったときは、電気自動車の再配置を管理者等に対して指示するようにしてもよい。

【００１６】

【発明の効果】本発明においては、上述する様に、携帯電話機を利用することにより、電気自動車を手軽に利用できる共同利用システムを構築することができる。

【図面の簡単な説明】

【図１】電気自動車の共同利用システム構成の概略図である。

【図２】電気自動車用駐車場を示す図である。

【図３】携帯電話機の利用形態を示す図である。

【図４】ユーザが、どの様にして共同利用するかを説明するための図である。

【図５】ユーザが、どの様にして共同利用するかを説明するための図である。

【図６】予約のシステム動作を説明する図である。

【図７】電気自動車の使用開始時のシステム動作を説明する図である。

【図８】電気自動車の使用終了時のシステム動作を説明する図である。

【符号の説明】

１００	管理サーバ
２００	携帯電話機
３００	充電ポスト
３１０，３２０	充電ポスト
３３２，３３４，３３６，３３８	充電ポスト
３４２，３４４，３４６，３４８	充電ポスト
３５０	接続ボックス
４００	電気自動車
４１０	接続ボックス

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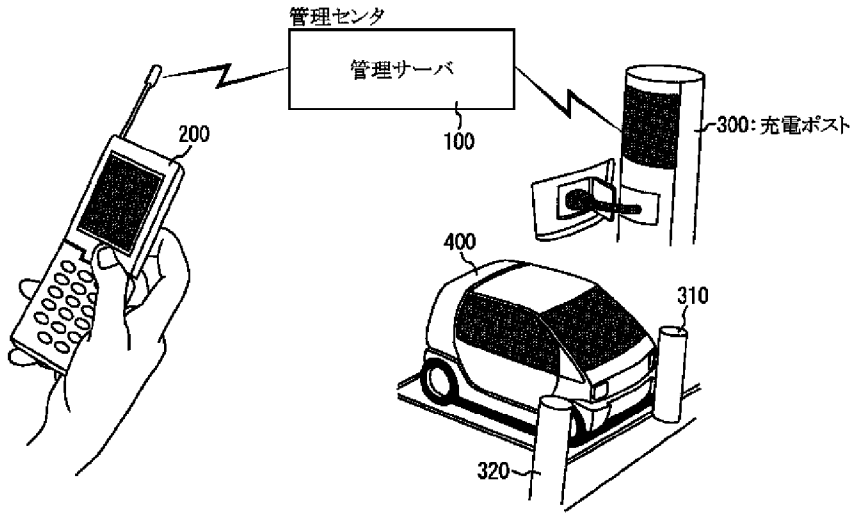
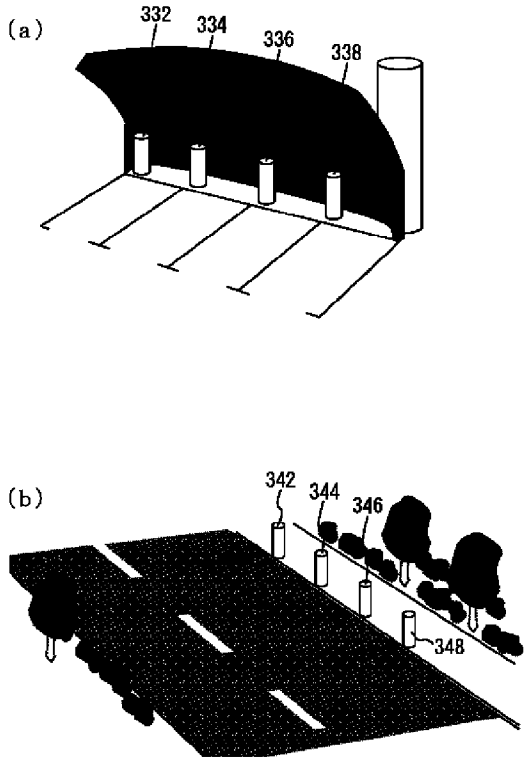
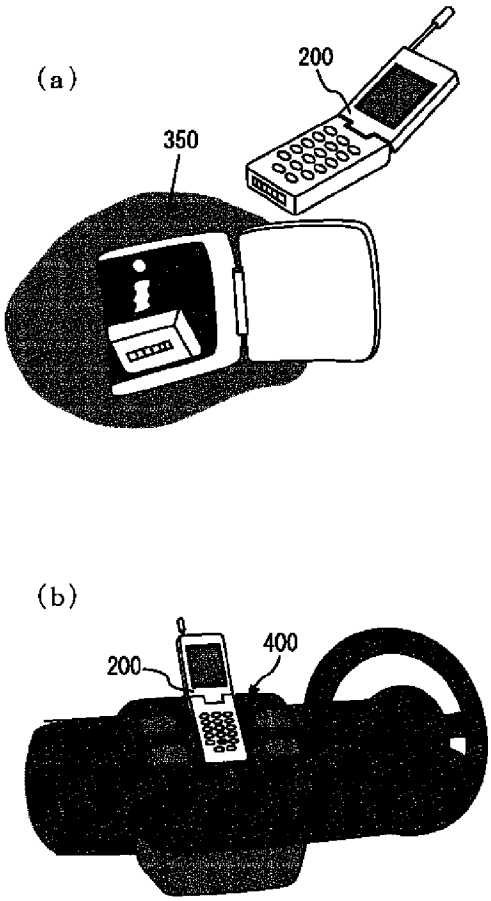
【図１】



【図２】



【図３】



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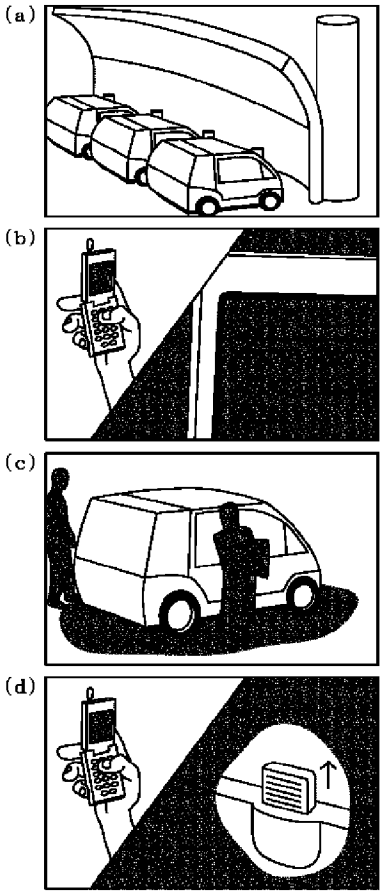
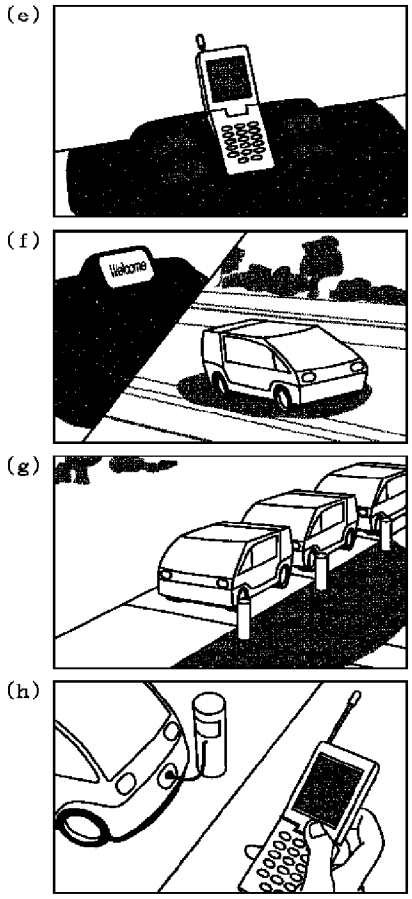
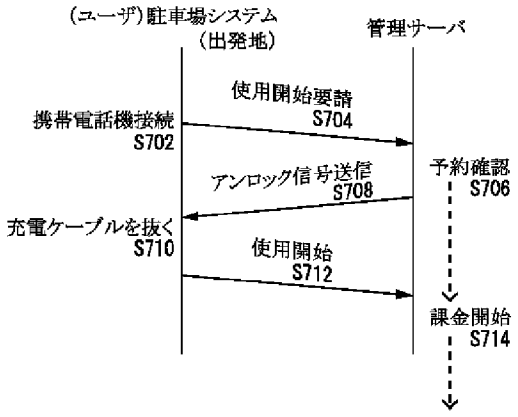
【図４】



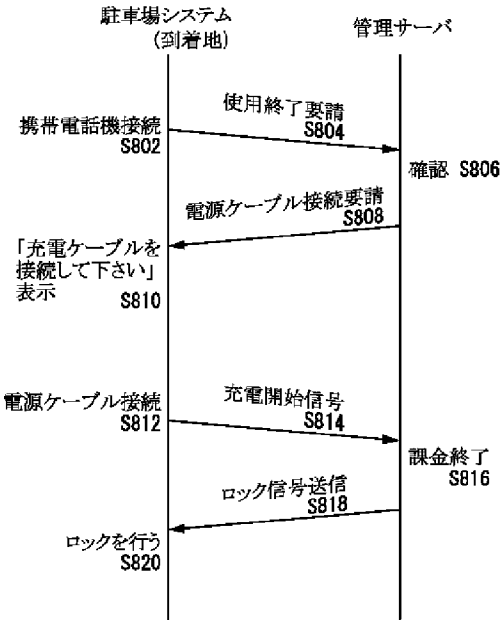
【図５】



【図７】



【図８】



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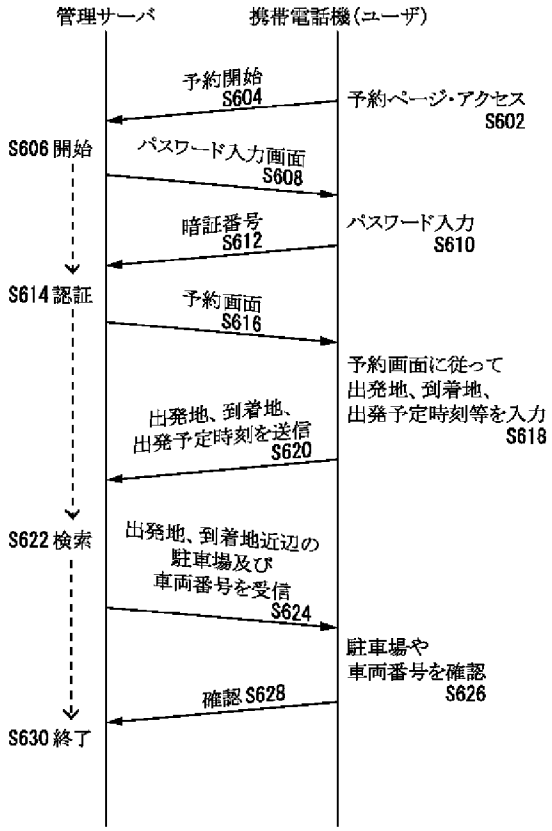
【図６】



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요약

1. 청구범위에 기재된 발명이 속한 기술분야

본 발명은 전원 잔여용량 표시장치 및 그 방법에 관한 것임.

2. 발명이 해결하려고 하는 기술적 과제

본 발명은 전자 기기에 장착되는 전원 공급 장치(예 : 태터리)의 잔여전압을 기설정된 기준전압과 비교하여, 그 비교 결과에 상응하도록 전원 공급 장치 외면에 구비되는 발광소자를 점등시켜 전원 공급 장치의 잔여용량을 표시함으로써, 전자 기기에 전원 공급 장치를 장착하지 않고서 독립적으로 전원 잔여용량을 확인할 수 있도록 한, 전원 잔여용량 표시장치 및 그 방법을 제공하는데 그 목적이 있음.

3. 발명의 해결방법의 요지

본 발명은, 전원 잔여용량 표시장치에 있어서, 전원을 저장하고 있는 전원 저장수단; 외부 입력에 따라 상기 전원 저장수단과 전압비교수단을 연결시키기 위한 연결수단; 상기 연결수단을 통해 인가되는 상기 전원 저장수단으로부터의 잔여전압과 각각의 기준전압을 비교하여 그에 상응하는 비교값을 출력하기 위한 상기 전압비교수단; 상기 전압비교수단으로부터 비교값을 전달받아 표시수단을 제어하기 위한 제어수단; 및 상기 제어수단의 제어에 따라 전원 잔여용량을 표시하기 위한 상기 표시수단을 포함함.

4. 발명의 중요한 용도

본 발명은 전자 기기에 장착되는 전원 공급 장치 등에 이용됨.

대표도

도 2

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색인어

전원 잔여용량, 잔여전압, 기준전압, 연결부, 전압 비교부, 발광소자, 전원 공급 장치

명세서

도면의 간단한 설명

도 1a는 종래의 무선통신 단말기에서 배터리 잔여용량 표시장치에 대한 구성도,

도 1b 및 도 1c는 종래의 무선통신 단말기에서 배터리 잔여용량 표시방법을 설명하기 위한 도면,

도 2는 본 발명에 따른 전원 잔여용량 표시장치에 대한 일실시예 구성도,

도 3은 본 발명에 따른 전원 잔여용량 표시장치에 대한 일실시예 상세 구성도,

도 4a 내지 도 4c는 본 발명에 따른 잔여용량 표시기능을 가지는 배터리의 외면을 나타낸 세 가지 실시예 도면,

도 5는 본 발명에 따른 전원 잔여용량 표시방법에 대한 일실시예 흐름도,

도 6은 본 발명에 따른 전원 잔여용량 표시방법에 대한 다른 실시예 흐름도,

도 7은 본 발명에 따른 전원 잔여용량 표시방법에 대한 또 다른 실시예 흐름도이다.

* 도면의 주요 부분에 대한 부호의 설명

20 : 전원 저장부 21 : 연결부

22 : 전압 비교부 221 : 4.0V 전압 발생기(LDO)

222 : 제 1 비교기 223 : 3.5V 전압 발생기(LDO)

224 : 제 2 비교기 23 : 제어부

24 : 표시부 241 : 제 1 발광소자

242 : 제 2 발광소자

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 전원 잔여용량 표시장치 및 그 방법에 관한 것으로, 더욱 상세하게는 전자 기기에 장착되는 전원 공급 장치(예 : 배터리)의 잔여전압을 기설정된 기준전압과 비교하여, 그 비교 결과에 상응하도록 전원 공급 장치 외면에 구비되는 발광소자를 점등시켜 전원 공급 장치의 잔여용량을 표시함으로써, 전자 기기에 전원 공급 장치를 장착하지 않고서 독립적으로 전원 잔여용량을 확인할 수 있도록 한, 전원 잔여용량 표시장치 및 그 방법에 관한 것이다.

본 발명에서 전원 공급 장치란 전기를 저장하고 있다가 전자 기기 등에 장착되면 전원을 공급해주는 장치로서 전자 기기에 전원을 공급할 수 있는 장치를 의미하며, 본 발명에서는 전원 공급 장치의 일예로 배터리를 예로 들어 설명하기로 한다.

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여기서, 배터리란 전기를 보관하는 장치를 말하는 것으로서 PC, 노트북에서부터 이동전화기 등 휴대용 기기를 사용할 때 미리 전기를 축전지에 보관해 뒀다가 전원으로 축전지를 연결해 사용하는 장치를 말한다.

한편, 본 발명에서는 배터리가 상착되는 전자 기기 중 무선통신 단말기를 일예로 들어 설명하도록 한다.

여기서, 무선통신 단말기란 이동통신 단말기, 개인 휴대통신 단말기(PCS), 개인용 디지털 단말기(PDA), 차세대 무선통신 단말기(IMT-2000), 무선랜 단말기, 스마트폰 등과 같은 개인이 휴대하면서 무선통신이 가능한 단말기를 말한다.

무선통신 시스템에서 무선통신 단말기는 무선채널을 통하여 기지국과 무선통신 신호를 교환하여 일반적인 음성통화 기능을 수행하는 동시에 단문 메세지 서비스와 데이터 서비스 등의 다양한 부가기능을 수행하며, LCD(Liquid Crystal Display) 등으로 구성된 표시부를 이용하여 무선통신 단말기의 현재 상태 및 다양한 부가정보를 표시한다.

도 1a는 종래의 무선통신 단말기에서 배터리 잔여용량 표시장치에 대한 구성도이다.

도 1a에 도시된 바와 같이, 종래의 무선통신 단말기에서 배터리 잔여용량 표시장치는 배터리(10), 상기 배터리(10)로부터 출력되는 전류값에 상응하는 아날로그 신호를 아날로그/디지털 변환기(이하, ADC라 함)(12)로 전달하는 멀티플렉서(11), 상기 멀티플렉서(11)로부터 전달받은 아날로그 신호를 디지털 신호로 변환하는 ADC(12), 상기 ADC(12)로부터 디지털 신호를 전달받아 배터리의 잔여용량의 레벨을 결정하는 제어부(13), 상기 제어부(13)로부터 잔여용량의 레벨에 상응하는 신호를 전달받아 디스플레이하기 위한 표시부(14)를 포함한다.

도 1b는 무선통신 단말기가 대기 모드인 경우 표시부(14)에 표시되는 화면을 나타낸 도면으로서, 도 1b에 도시된 바와 같이 무선통신 단말기의 표시부(14)는 수신신호의 세기를 나타내는 안테나 바(15)와 배터리 잔여용량 표시 아이콘(16) 등을 항상 표시한다.

여기서, 상기 배터리 잔여용량 표시 아이콘(16)은 도 1c에 도시된 바와 같이, 배터리 잔여용량 표시 아이콘(16) 내의 패턴 개수에 따라 배터리 잔여용량을 표시한다. 즉, 표시부(14)에 표시된 배터리 잔여용량 표시 아이콘(16) 내의 패턴의 개수가 많을수록 배터리 잔여용량이 많음을 의미한다.

그러나, 상기와 같은 종래의 무선통신 단말기의 배터리 잔여용량 표시장치에서는 배터리 잔여용량 표시 아이콘(16)을 시간정보나 초기화면 등의 다른 정보들과 함께 표시부(14)에 표시하기 때문에 상대적으로 배터리 잔여용량 표시 아이콘(16)이 매우 작게 표시되어 배터리 잔여용량을 확인하는데 불편함이 있었으며, 이에 따라 사용자가 미처 인지하지 못하는 사이에 배터리 잔여용량이 모두 소모될 수 있다는 문제점이 있었다.

또한, 상기와 같은 방식으로 배터리의 잔여용량을 확인하기 위해서는 배터리를 무선통신 단말기에 장착하여 전원을 온시킨 후 디스플레이되는 패턴의 개수를 확인해야만 했으므로, 무선통신 단말기와 배터리가 분리되어 있는 경우에는 배터리의 잔여용량이 얼마나 남았는지 확인할 수 없는 문제점이 있었다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기 문제점을 해결하기 위하여 제안된 것으로, 전자 기기에 장착되는 전원 공급 장치(예 : 배터리)의 잔여전압을 기설정된 기준전압과 비교하여, 그 비교 결과에 상응하도록 전원 공급 장치 외면에 구비되는 발광소자를 점등시켜 전원 공급 장치의 잔여용량을 표시함으로써, 전자 기기에 전원 공급 장치를 장착하지 않고서 독립적으로 전원 잔여용량을 확인할 수 있도록 한, 전원 잔여용량 표시장치 및 그 방법을 제공하는데 그 목적이 있다.

본 발명의 다른 목적 및 장점들은 하기의 설명에 의해서 이해될 수 있으며, 본 발명의 실시예에 의해 보다 분명하게 알게 될 것이다. 또한, 본 발명의 목적 및 장점들은 특허 청구 범위에 나타낸 수단 및 그 조합에 의해 실현될 수 있음을 쉽게 알 수 있을 것이다.

발명의 구성 및 작용

상기 목적을 달성하기 위한 본 발명의 장치는, 전원 잔여용량 표시장치에 있어서, 전원을 저장하고 있는 전원 저장수단; 외부 입력에 따라 상기 전원 저장수단과 전압비교수단을 연결시키기 위한 연결수단; 상기 연결수단을 통해 인가되는 상기 전

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원 저장수단으로부터의 잔여전압과 각각의 기준전압을 비교하여 그에 상응하는 비교값을 출력하기 위한 상기 전압비교수단; 상기 전압비교수단으로부터 비교값을 전달받아 표시수단을 제어하기 위한 제어수단; 및 상기 제어수단의 제어에 따라 전원 잔여용량을 표시하기 위한 상기 표시수단을 포함하는 것을 특징으로 한다.

한편, 본 발명의 방법은, 전원 잔여용량 표시방법에 있어서, 외부 입력에 따라 전원 저장수단과 전압비교수단을 연결시키는 연결 단계; 상기 전원 저장수단과 상기 전압비교수단이 연결됨에 따라, 상기 전원 저장수단으로부터의 잔여전압과 각각의 기준전압을 비교하여, 전원 잔여용량에 따라 표시수단을 제어하는 비교/제어 단계; 및 상기 전원 잔여용량을 표시하는 표시 단계를 포함하는 것을 특징으로 한다.

상술한 목적, 특징 및 장점은 첨부된 도면과 관련한 다음의 상세한 설명을 통하여 보다 분명해 질 것이며, 그에 따라 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자가 본 발명의 기술적 사상을 용이하게 실시할 수 있을 것이다. 또한, 본 발명을 설명함에 있어서 본 발명과 관련된 공지 기술에 대한 구체적인 설명이 본 발명의 요지를 불필요하게 흐릴 수 있다고 판단되는 경우에 그 상세한 설명을 생략하기로 한다. 이하, 첨부된 도면을 참조하여 본 발명에 따른 바람직한 일실시예를 상세히 설명하기로 한다.

도 2는 본 발명에 따른 전원 잔여용량 표시장치에 대한 일실시예 구성도이다.

도 2에 도시된 바와 같이, 본 발명에 따른 전원 잔여용량 표시장치는 전원 저장부(예 : 배터리 셀)(20), 연결부(예 : 스위치)(21), 전압 비교부(22), 제어부(23), 표시부(24)를 포함한다.

상기 전원 저장부(20)는 배터리 셀이라고도 하며, 전원 공급 장치(예 : 배터리)의 충전단자를 통해 외부의 충전 장치로부터 공급되는 전원을 저장하고 있다가 무선통신 단말기에 전원 공급 장치(배터리)가 장착되는 경우 내부 단자를 통해 무선통신 단말기로 전원을 공급하는 역할을 한다.

상기 연결부(21)는 외부 입력에 따라 즉, 전원 잔여용량을 확인하고자 하는 사용자로부터 터치동작을 입력받음에 따라 상기 전원 저장부(배터리 셀)(20)와 전압 비교부(22)를 연결시켜주는 역할을 한다.

이 때, 상기 연결부(21)는 그 일예로 스위치를 들 수 있으며, 상기 무선통신 단말기의 사용자가 전원 잔여용량을 확인하고자 하는 경우에 상기 연결부(21) 즉, 스위치를 온시키면 상기 전원 저장부(20)의 잔여전압을 전압 비교부(22)로 인가시키는 것이다.

그러면, 잔여전압을 인가받은 상기 전압 비교부(22)는 잔여전압과 기설정된 각 기준전압을 비교하여 그에 상응하는 비교값들을 출력하는 역할을 한다.

이 때, 상기 전압 비교부(22)는 잔여전압과 각 기준전압을 비교하기 위한 다수 개의 비교기와 각 기준전압을 발생시켜 해당 비교기로 인가시키기 위한 다수 개의 전압 발생기(LDO : Low Drop Out voltage regulator)를 포함한다.

여기서, 상기 전압 발생기(LDO)는 상기 비교기의 일입력단에 연결되어, 기설정된 각 기준전압을 발생시켜 비교기에 인가시키는 역할을 한다.

한편, 상기 제어부(23)는 상기 전압 비교부(22)로부터 비교값을 전달받아 그에 상응하도록 표시부(24)를 제어하는 역할을 한다.

여기서, 상기 제어부(23)는 그 일예로 멀티플렉서(MUX : Multiplexer)를 들수 있으며, 상기 멀티플렉서는 복수회로에서 입력되는 신호 중 어느 하나의 입력신호를 선택하여 출력회로에 실어 주는 기능을 수행하는 데이터 선택 논리회로로서 상기 전압 비교부(22)의 비교기를 통해 입력받은 비교신호들을 선택적으로 출력하여 표시부(24)를 제어하는 것이다.

상기 표시부(24)는 상기 제어부(23)의 제어에 따라 발광되는 발광소자(예 : LED)를 이용하여 전원 잔여용량을 표시하는 역할을 하며, 한 개 또는 다수 개의 발광소자를 포함한다.

상기 발광소자는 하나의 발광소자가 여러 가지 컬러로 발광하는 세븐 컬러 엘이디(LED : Light Emitting Diode)와 단일 컬러로 발광하는 원 컬러 엘이디 모두 사용이 가능하며, 전원 잔여용량을 표시하는 방식이나, 표시부(24)에 사용되는 발광소자의 개수에 따라서 적절히 변경하여 활용할 수 있으며, 그에 대한 설명은 도 3에서 상세히 후술하기로 한다.

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도 3은 본 발명에 따른 전원 잔여용량 표시장치에 대한 일실시예 상세 구성도로서, 특히 전압 비교부(22)와 표시부(24)를 상세히 설명하기 위한 도면이다.

도 3에 도시된 바와 같이, 상기 전압 비교부(22)는 4.0V 기준전압을 발생시키는 4.0V 전압 발생기(LDO)(221), 3.5V 기준전압을 발생시키는 3.5V 전압 발생기(LDO)(223), 상기 4.0V 전압 발생기(LDO)(221)로부터 인가되는 4.0V 기준전압과 연결부(21)를 통해 인가되는 전원 저장부(배터리 셀)(20)로부터의 잔여전압을 비교하여 그에 상응하는 비교값을 출력하는 제 1 비교기(222), 및 상기 3.5V 전압 발생기(LDO)(223)로부터 인가되는 3.5V 기준전압과 상기 연결부(21)를 통해 인가되는 전원 저장부(20)로부터의 잔여전압을 비교하여 그에 상응하는 비교값을 출력하는 제 2 비교기(224)를 포함한다.

본 발명에서는 무선통신 단말기를 구동시킬 수 있는 배터리의 전압을 3.5V~4.2V라고 가정하여, 4.0V 전압 발생기(LDO)(221)와 3.5V 전압 발생기(LDO)(223)를 사용하였으나, 상기와 상이한 배터리를 사용하는 경우(예를 들어, 무선통신 단말기를 구동시킬 수 있는 배터리의 전압 3.3V~4.2V인 경우)에는 그에 적합하도록 다른 전압 발생기를 사용하거나, 본 발명에서 사용되는 두 개의 전압 발생기에 추가적으로 다른 전압 발생기(LDO)를 더 첨가하여 사용할 수도 있다.

예를 들어, 3.3V~4.2V의 구동전압 레벨을 가지는 배터리라면 4.0V 전압 발생기(221)와 3.3V 전압 발생기(도시되지 않음)를 사용하여 각 비교기에 해당 기준전압을 인가할 수도 있고, 상기 4.0V 전압 발생기(221)와 3.5V 전압 발생기(223)에 3.3V 전압 발생기를 더 추가하여 해당 비교기에 4.0V, 3.5V, 3.3V 기준전압 중 어느 하나를 인가할 수도 있다.

이 때, 상기 비교기의 개수는 상기 전압 발생기의 개수와 동일하므로, 전술한 바와 같이 배터리의 전압 특성에 따라 전압 발생기의 개수가 달라지면 비교기의 개수 역시 달라진다.

한편, 상기 표시부(24)는 잔여전압이 4.0V 기준전압 이상임에 따라 녹색으로 점등되는 제 1 발광소자(241), 잔여전압이 3.5V 기준전압 이상이고 4.0V 기준전압 미만임에 따라 노란색으로 점등되는 제 2 발광소자(242)를 포함한다.

이 때, 상기 발광소자의 컬러는 임의로 설정한 것이며, 전원 표시장치 설계시 얼마든지 다른 컬러로 변경 가능하다.

따라서, 본 발명에서는 점등되는 발광소자의 컬러를 확인함으로써, 전원 잔여용량을 확인할 수 있는 것이다.

또한, 만약 잔여전압이 3.5V 기준전압 미만이라면 발광소자는 점등되지 않고, 배터리 사용자는 그것을 보고 전원 잔여용량이 없음을 판단하게 된다.

여기서, 상기 표시부(24)를 통해 전원 잔여용량을 확인하는 방식은 상이한 컬러의 발광소자들을 이용하여 잔여전압에 따라 다른 컬러로 발광되는 발광소자로 배터리의 잔여용량을 표시하는 방식이었으나 그에 한정되지 않으며, 다른 실시예로서 동일한 컬러의 발광소자를 사용하여 점등되는 발광소자의 개수를 보고 잔여용량을 판단하거나, 한 개의 발광소자(예 : 세븐 컬리 엘이디)를 이용하여 잔여전압에 따라 다른 컬리로 점등되도록 하여 잔여용량을 판단하는 방식을 사용할 수도 있음을 밝혀 둔다.

도 4a 내지 도 4c는 본 발명에 따른 잔여용량 표시기능을 가지는 배터리의 외면을 나타낸 세 가지 실시예 도면이다.

도 4a는 본 발명에 따른 잔여용량 표시기능을 가지는 배터리의 외면에 두 개의 상이한 컬러(녹색, 노란색) 엘이디를 구비하는 경우를, 도 4b는 두 개의 동일한 컬러의 엘이디를 구비하는 경우를, 도 4c는 한 개의 세븐 컬러 엘이디를 구비하는 경우를 나타낸 것이다.

이 때, 도 4a에서와 같이 표시부(24)가 두 개의 상이한 컬리(녹색, 노란색)의 엘이디로 구성되는 경우에는 배터리의 잔여용량의 레벨에 따라 각각 하나의 엘이디가 점등되어 점등되는 엘이디의 컬러를 보고 즉, 녹색 엘이디가 점등되었는지 노란색 엘이디가 점등되었는지를 확인하여 잔여용량을 파악하고, 도 4b에서와 같이, 상기 표시부(24)가 두 개의 동일한 컬러의 엘이디로 구성되는 경우에는 엘이디의 컬러가 동일하므로 점등되는 엘이디의 개수를 보고 즉, 한 개의 엘이디가 점등되었는지 두 개의 엘이디가 점등되었는지를 확인하여 잔여용량을 파악하며, 도 4c에서와 같이 상기 표시부(24)가 한 개의 세븐 컬러 엘이디로 구성되는 경우에는 잔여용량의 레벨에 따라 다른 컬러로 발광되는 발광소자를 보고 즉, 세븐 컬러 엘이디의 컬러가 녹색인지, 노란색인지 등을 확인하여 잔여용량을 파악한다.

또한, 전압 비교부(22)에서 잔여전압을 좀 더 세부적으로 나누어 비교를 하게 되면 상기 도 4a와 도 4b의 경우에는 그와 비례하여 엘이디의 개수가 늘어나게 된다.

예를 들어, 전압 비교부(22)에서 비교기를 세 개 사용하여 세 가지 범위로 나누어 잔여전압을 비교하게 되면 엘이디의 개수 또한 세 개를 사용하여야 한다.

한편, 본 발명에서 상기 표시부(24)는 도 4에서와 같이, 가로로 구비되었으나, 이에 한정되지 않고 세로, 사선 또는 곡선의 형태로 구비될 수도 있으며, 그 위치 또한 상하좌우 어디든 상관없이 구비될 수 있다.

또한, 이는 배터리 설계시의 변수, 무선통신 단말기의 미관 및 사용자들의 기호 등에 따라 변형이 가능함을 밝혀둔다.

도 5는 본 발명에 따른 전원 잔여용량 표시방법에 대한 일실시예 흐름도로서, 배터리 사용자가 전원 잔여용량을 확인하기 위하여 연결부(21)를 온시키는 과정에서부터 시작된다.

먼저, 배터리 사용자가 연결부(21)를 온시켜 전원 저장부(배터리 셀)(20)와 전압 비교부(22)를 연결시킨다(510).

이후, 전압 비교부(22)가 상기 전원 저장부(20)로부터의 잔여전압과 전압 발생기로부터의 각 기준전압을 인가받는다(520).

이후, 상기 전압 비교부(22)가 잔여전압이 4.0V 기준전압 이상인지를 비교한다(530).

상기 비교 결과(530), 잔여전압이 4.0V 이상임에 따라 제어부(23)는 표시부(24)를 제어하여 녹색 발광소자(LED)를 점등시킨다(531).

그러나, 상기 비교 결과(530), 잔여전압이 4.0V 미만임에 따라 상기 전압 비교부(22)는 다시 잔여전압이 3.5V 기준전압 이상인지를 비교한다(540).

상기 비교 결과(540), 잔여전압이 3.5V 이상임에 따라 상기 제어부(23)는 표시부(24)를 제어하여 노란색 발광소자(LED)를 점등시킨다(541).

그러나, 상기 비교 결과(540), 잔여전압이 3.5V 미만임에 따라 상기 제어부(23)는 표시부(24)를 제어하여 발광소자(LED)를 오프(off)시킨다(550). 즉, 어느 발광소자도 온시키지 않는다.

따라서, 상기와 같은 과정을 통해 배터리 사용자는 배터리의 외면에 구비된 발광소자가 점등되는 컬러를 보고 배터리의 잔여용량을 확인할 수 있는 것이다.

여기서, 잔여전압이 4.0V 이상인 경우에는 녹색 발광소자를, 3.5V~4.0V인 경우에는 노란색 발광소자를 점등시키는 대신 잔여전압이 4.0V 이상인 경우에는 동일한 컬리의 두 개의 발광소자를, 3.5V~4.0V인 경우에는 한 개의 발광소자를 점등시키는 방법을 사용할 수도 있다.

또한, 상기와 같이 발광소자를 두 개 사용하지 않고 세븐 컬러 엘이디 하나만을 사용하여 각 잔여진압 레벨에 따라 다른 컬러로 점등시키는 방법도 사용할 수 있다.

한편, 배터리의 진압 범위가 3.3V~4.2V인 배터리인 경우에는 잔여진압 비교 범위를 3.3V 미만, 3.3V 이상 4.0V 미만, 4.0V 이상의 세 가지의 범위로 나누거나, 3.3V 미만, 3.3V 이상 3.5V 미만, 3.5V 이상 4.0V 미만, 4.0V 이상의 네 가지 범위로 나누어 전원 잔여용량을 확인할 수 있다.

상기와 같이 잔여전압 비교 범위를 3.3V 미만, 3.3V 이상 4.0V 미만, 4.0V 이상의 세 가지의 범위로 나누는 경우의 과정은 도 6에서와 같이 3.5V 대신 3.3V 기준전압을 사용하여 전압 비교부로부터의 잔여전압 3.5V 이상인지를 비교하는 과정(540) 대신 잔여진압이 3.3V 이상인지를 비교하는 과정(640)으로 바뀌었다는 것만 다르고 모든 과정이 동일하다.

또한, 잔여전압 비교 범위를 3.3V 미만, 3.3V 이상 3.5V 미만, 3.5V 이상 4.0V 미만, 4.0V 이상의 네 가지 범위로 나누는 경우는 도 7에서와 같이, 잔여진압이 3.3V 이상인지를 판단(750)하여, 3.3V 이상 3.5V 미만임에 따라 붉은색(또는 녹색과 노란색을 제외한 다른 컬러) 발광소자를 발광시키는 과정(751)을 더 포함시키면 된다.

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이상에서 설명한 본 발명은, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에게 있어 본 발명의 기술적 사상을 벗어나지 않는 범위 내에서 여러 가지 치환, 변형 및 변경이 가능하므로 전술한 실시예 및 첨부된 도면에 의해 한정되는 것이 아니다.

발명의 효과

상기와 같은 본 발명은, 전원 공급 장치(예 : 배터리) 자체에 전원 잔여용량 표시장치를 구비할 수 있는 효과가 있으며, 이로 인하여 전원 잔여용량을 확인하기 위하여 배터리를 전자 기기에 장착하여야 하는 번거로움을 없앨 수 있는 효과가 있다.

또한, 본 발명은 연결부(예 : 스위치)를 이용하여 전원 저장부의 잔여전압을 전원 표시장치로 인가함으로써, 배터리 사용자가 원하는 경우에만 배터리의 잔여용량을 확인할 수 있는 효과도 있다.

(57) 청구의 범위

청구항 1.

전원 잔여용량 표시장치에 있어서,

전원을 저장하고 있는 전원 저장수단;

외부 입력에 따라 상기 전원 저장수단과 전압 비교수단을 연결시키기 위한 연결수단;

상기 연결수단을 통해 인가되는 상기 전원 저장수단으로부터의 잔여전압과 각각의 기준전압을 비교하여 그에 상응하는 비교값을 출력하기 위한 상기 전압 비교수단;

상기 전압 비교수단으로부터 전달받은 비교값에 따라 표시수단을 제어하기 위한 제어수단; 및

상기 제어수단의 제어에 따라 전원 잔여용량을 표시하기 위한 상기 표시수단

을 포함하는 전원 잔여용량 표시장치.

청구항 2.

제 1항에 있어서,

상기 전압 비교수단은,

기준전압을 발생시키기 위한 전압 발생기(LDO : Low drop out voltage regulator); 및

일 입력단을 통해 상기 연결수단으로부터 잔여전압을 인가받고, 타 입력단을 통해 상기 전압 발생기로부터 기준전압을 인가받아 서로 비교하기 위한 비교기

를 포함하는 전원 잔여용량 표시장치.

청구항 3.

제 1항 또는 제 2항에 있어서,

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상기 표시수단은,

상기 제어수단의 제어에 따라 전원 잔여용량에 상응하도록 발광하는 발광소자를 포함하는 것을 특징으로 하는 전원 잔여용량 표시장치.

청구항 4.

전원 잔여용량 표시방법에 있어서,

외부 입력에 따라 전원 저장수단과 전압 비교수단을 연결시키는 연결 단계;

상기 전원 저장수단과 상기 전압 비교수단이 연결됨에 따라, 상기 전원 저장수단으로부터의 잔여전압과 각각의 기준전압을 비교하는 비교 단계;

상기 비교 결과에 따른 전원 잔여용량에 따라 표시수단을 제어하는 제어 단계; 및

상기 전원 잔여용량을 표시하는 표시 단계

를 포함하는 전원 잔여용량 표시방법.

청구항 5.

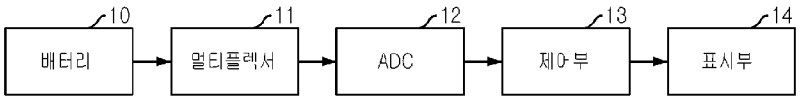
제 4항에 있어서,

상기 표시 단계는,

상기 제어수단의 제어에 따라 전원 잔여용량에 상응하도록 발광소자를 발광시키는 것을 특징으로 하는 전원 잔여용량 표시방법.

도면

도면1a



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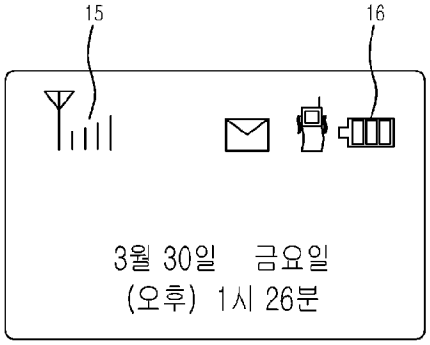

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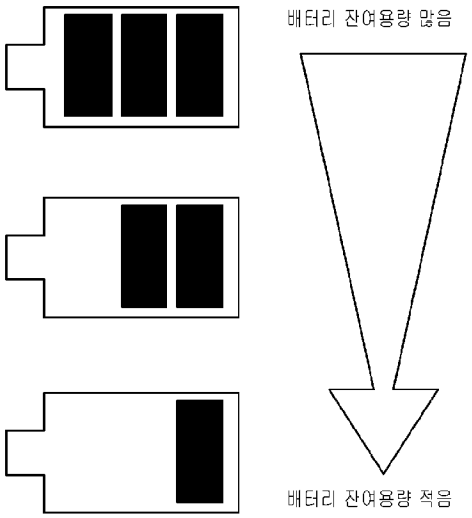

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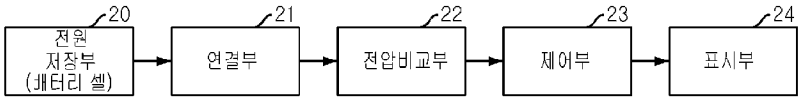

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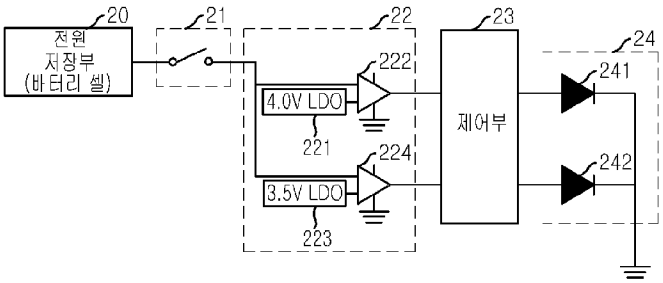

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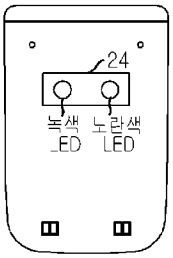
도면4a



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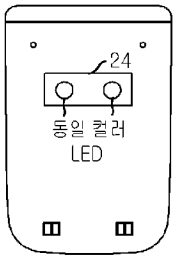

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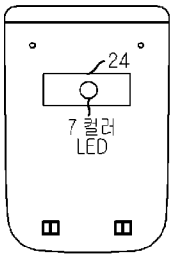

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도면5

도면6

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도 7

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UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**06/01/2023 01:33:07 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Eliana Carter
PATENT CENTER #	62191432	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 8

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57_IDS_as_filed_06-01-23.pdf	5	Information Disclosure Statement (IDS) Form (SB08)	1011 KB
KR102006-0016417-FOR.pdf	12	Foreign Reference	684 KB
NPL_Machine_Translation_KR10-2006-0016417_9_Pages_2006.pdf	9	Non Patent Literature	923 KB
NPL_Machine_Translation_JP2002369315_7_Pages_2002.pdf	7	Non Patent Literature	952 KB

JP2006331405-FOR.pdf	26	Foreign Reference	2491 KB
NPL_Machine_Translation_JP2006331405_19_Pages_2006.pdf	19	Non Patent Literature	2778 KB
JP2002369315-FOR.pdf	9	Foreign Reference	930 KB
WO2006076498A2-FOR.pdf	124	Foreign Reference	5504 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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JP2002369315-FOR.pdf	427F9BAD8CCB27687102C449E3E8B9395F7D657CAC36ADFD3C9119666A22032E08A7CBDCB689D465C52FE7BFFF914D4718CDB18DB840DEEA6A83450CBC9D8DFA
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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
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/949,911	Filing Date 09/21/2022	☐ 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 $240 =	
☐ 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	06/06/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $192 =	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".	/ANTJUAN M RIVERA/
*** 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.

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

In re

Patent Application of

Christopher B. Austin

Application No. 17/949,911

Filing Date: September 21, 2022

Confirmation No. 6463

Examiner: Nathaniel R. Pelton

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION"

Attorney Docket No. 013350-9003-US57

RESPONSE TO OFFICE ACTION

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

Commissioner:

This paper is filed in response to the non-final Office action dated March 24, 2023, concerning the above-identified patent application, and is being filed within the three-month shortened statutory period set for reply. Please charge any required fees for this communication to Deposit Account No. 13-3080.

Amendments to the Claims are reflected in the Listing of Claims beginning on page 2 of this paper.

Remarks begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of the claims replaces all prior versions and listings of claims in the application.

1-20. (Canceled)

21. (Currently Amended) A system for charging a battery of a vehicle with a vehicular battery charger, the system comprising:

a controller configured to:

establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger,

receive a wireless signal from the portable controller,

responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and

during charging of the battery with the vehicular battery charger:

repeatedly receive at least one signal indicative of a level of charge of the battery,

repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and

repeatedly display <u>on a display mounted within the vehicle and within view of a user seated in the vehicle</u>:

information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and

information indicative of the level of charge of the battery.

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22. (Currently Amended) The system of claim 21, wherein the ~~controller is configured to display information indicative of the amount of time remaining to charge the battery by displaying the information on a~~ display is electrically coupled to the controller.

23. (Canceled)

24. (Previously Presented) The system of claim 21, wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery.

25. (Previously Presented) The system of claim 21, wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

26. (Previously Presented) The system of claim 21, wherein the controller is further configured to receive data indicative of a cost of power and, based on the received data indicative of the cost of power, stop charging of the battery of the vehicle.

27. (Previously Presented) The system of claim 21, wherein the controller is included in the vehicular battery charger.

28. (Previously Presented) The system of claim 21, wherein the wireless signal includes a time of day and wherein the controller is configured to supply electricity from the source of power to the battery based on the time of day.

29. (Previously Presented) The system of claim 28, wherein the time of day includes at least one selected from a group consisting of a time of day to start charging and a time of day to complete charging.

30. (Previously Presented) The system of claim 21, wherein the wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold.

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

receiving, at a controller, at least one signal indicative of a level of charge of the battery;

transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller, a first wireless signal including data ~~the at least one signal~~ indicative of the level of charge of the battery and data ~~at least one signal~~ indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery;

displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller; and

receiving, at the controller, a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

32. (Previously Presented) The method of claim 31, wherein the portable remote controller is defined at least in part by a phone.

33. (Previously Presented) The method of claim 31, wherein the level of charge is a full charge of the battery.

34. (Previously Presented) The method of claim 31, wherein the display is a first display, the method further comprising displaying, on a second display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery.

35. (Previously Presented) The method of claim 34, further comprising displaying, on the second display, the amount of time remaining to charge the battery.

36. (Previously Presented) The method of claim 31, further comprising repeatedly sending, with the controller, signals to update the level of charge of the battery on the display.

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Tesla EX1002 Page 544

37. (Previously Presented) The method of claim 31, further comprising displaying, on the display electrically coupled to the portable remote controller during charging of the battery, the amount of time remaining to charge the battery received by the portable controller.

38. (Currently Amended) The method of claim 31, further comprising receiving, at the controller, a third wireless signal from the portable controller.

39. (Currently Amended) The method of claim 38, wherein receiving the third wireless signal from the portable controller includes receiving a time of day and further comprising supplying, with the controller, electricity to the battery based on the time of day.

40. (Currently Amended) The method of claim 38, wherein receiving the third wireless signal from the portable controller includes receiving a cost threshold and further comprising supplying, with the controller, electricity to the battery based on the cost threshold.

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REMARKS

Prior to the filing of this response, claims 21-40 were pending in the present application, with claims 1-20 being previously canceled. By this response, Applicant hereby amends claims 21, 22, 31, and 38-40, and cancels claim 23. Thus, claims 21-22 and 24-40 remain pending. Applicant respectfully requests reconsideration of the pending claims in view of the following remarks.

I. Claim Rejections – 35 U.S.C. § 103

a. Claims 21-24 and 27-29

In the Office action dated March 24, 2023 (the "Office Action"), the Examiner rejects claims 21-24 and 27-29 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Published Application No. 2008/0007202 ("Pryor") in view of U.S. Patent No. 5,757,595 ("Ozawa").

i. Independent Claim 21

Solely to advance prosecution and without conceding the appropriateness of the current claim rejections, Applicant has amended claim 21 in the present response to recite:

> 21. A system for charging a battery of a vehicle with a vehicular battery charger, the system comprising:
>
> a controller configured to:
>
> establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger,
>
> receive a wireless signal from the portable controller,
>
> responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and
>
> during charging of the battery with the vehicular battery charger:
>
> repeatedly receive at least one signal indicative of a level of charge of the battery,

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repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and

repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle:

information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and

information indicative of the level of charge of the battery.

In rejecting claim 23, which originally recited that the "controller is configured to display information indicative of the amount of time remaining to charge the battery by displaying the information on a display mounted within the vehicle," the Examiner asserts that Ozawa discloses a display mounted within the vehicle because Ozawa discloses a display positioned within a cavity 18 (*Office Action, p. 4*). Applicant disagrees. The cavity 18 disclosed in Ozawa is part of a "rear outer side panel of the vehicle body 12" (*see FIGS. 1-2 reproduced below and col. 3, lines 9-11*).

FIG. 1

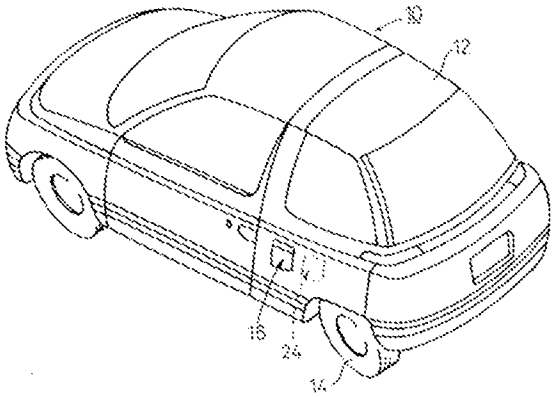
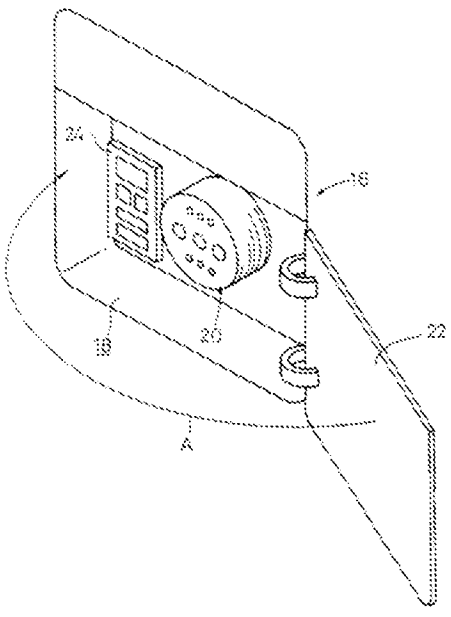


FIG 2



Accordingly, the display 24 mounted within the cavity 18 in Ozawa is not mounted "within the vehicle" as originally recited in claim 23 and recited in amended claim 21 but, rather, is mounted on an exterior surface of the vehicle. Furthermore and, again, solely to advance prosecution, Applicant hereby amends claim 21 in the present response to clarify that the display is mounted within the vehicle "and within view of a user seated in the vehicle." The display 24 disclosed in Ozawa is clearly not within view of a user seated in the vehicle, as the display 24 is on an exterior surface of the vehicle.

Thus, for at least the above reasons, Pryor and Ozawa, taken individually or in combination at least fail to teach or suggest "a controller configured to," "during charging of the battery with the vehicular battery charger," "repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and information indicative of the level of charge of the battery," as recited in amended claim 21. Therefore, claim 21 and the claims that depend from claim 21 are allowable for at least these reasons.

ii. Dependent Claim 24

Claim 24 depends from claim 21 and, thus, is allowable for at least the reasons set forth above with respect to claim 21. Claim 24 also recites additional allowable subject matter.

Claim 24 recites:

> 24. The system of claim 21, wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery.

In rejecting claim 24, the Examiner acknowledges that "Pryor fails to discloses [sic] wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery" but asserts that "such a modification would be within the level of ordinary skill to a person having ordinary skill in the art as the solution is a simple math problem, i.e., adding the time remaining to the current time" and, in particular, asserts that "it would have been obvious to a person

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having ordinary skill in the art…to modify Pryor…such that the estimated remaining time is displayed as a time of day for the benefit [of] quickly identifying to the user the exact time the charging will be completed" (*Office Action, p. 4*).

Applicant respectfully disagrees. Whether a person skilled in the art "could" take some action is not enough to support an obviousness rejection of a claim (*see, e.g.*, *In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967) (holding "[t]he legal conclusion of obviousness *must be supported by facts*"); *Graham,* 383 U.S. at 18, 86 S.Ct. at 694 (holding a "rejection based on section 103 clearly must rest on a factual basis, and these facts must be interpreted without hindsight reconstruction of the invention from the prior art"); *In re Schweickert,* Case No. 16-1266 (Fed. Cir., decided January 26, 2017) (holding that "the Board did not substantiate its decision. Rather, the Board, at best, merely posited that a skilled artisan could combine, notwithstanding any difficulties, and would do so because these references were within the knowledge of a skilled artisan. But in view of the record, this broadly stated conclusion suffers from hindsight bias.").

Furthermore, as Pryor is unconcerned with informing a user of a status of an on-going charge (i.e., Pryor only uses a user interface to obtain user selections, and makes no mention whatsoever of providing any type of on-going charging information to a user) and actually discloses allowing a user to set, for example, an end-time for charging, Applicant fails to see how a person having ordinary skill in the art would be motivated to modify Pryor as suggested by the Examiner without the use of improper hindsight bias using the claims as a blueprint. Further still, given the programmed charging disclosed in Pryor, displaying a time of day at which charging will be completed is not a simple math problem as proposed by the Examiner, as such a calculation would need to take into account programmed start times, programmed stop times, and other minimum charge thresholds.

Accordingly, for at least all of the above reasons, the cited references, taken individually or in combination, fail to teach or suggest the subject matter of claim 24, and claim 24 is allowable for at least these additional reasons.

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b. Claim 25

In the Office Action, the Examiner rejects claim 25 under 35 U.S.C. § 103(a) as being unpatentable over Pryor and Ozawa and further in view of U.S. Published Application No. 2010/0228405 ("Morgal").

Claim 25, which depends from Claim 21, recites:

> 25. The system of claim 21, wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

In rejecting claim 25, the Examiner acknowledges that "Pryor fails to explicitly disclose wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle" but asserts that Paragraphs [0222]-[0223] of Morgal solves these deficiencies (*Office Action, p. 5*).

Applicant respectfully disagrees. The only wireless signals disclosed in Paragraphs [0222]-[0223] of Morgal are a from an EVMS central computer 610 to a personal electric vehicle being charged via a charging port. The EVMS central computer 610, however, is not a portable device or portable controller and, thus, the cited portions of Morgal fail to solve the deficiencies of Pryor identified by the Examiner.

Accordingly, Claim 25 is allowable for at least these reasons.

c. Claim 26

In the Office Action, the Examiner rejects claim 26 under 35 U.S.C. § 103(a) as being unpatentable over Pryor and Ozawa and further in view of U.S. Patent No. 5,548,200 ("Nor").

Claim 26 depends from claim 21 and, therefore, is allowable for at least the reasons set forth above with respect to claim 21. Furthermore, Nor fails to solve the deficiencies of Pryor and Ozawa set forth above with respect to claim 21. In particular, Nor makes no mention

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whatsoever of any type of display mounted within a vehicle or displaying any information on such a display.

Accordingly, claim 26 is allowable for at least these reasons.

d. Claim 30

In the Office Action, the Examiner rejects claim 30 under 35 U.S.C. § 103(a) as being unpatentable over Pryor and Ozawa and further in view of U.S. Published Application No. 2009/0313174 ("Hafner").

Claim 30 depends from claim 21 and, therefore, is allowable for at least the reasons set forth above with respect to claim 21. Furthermore, Hafner fails to solve the deficiencies of Pryor and Ozawa set forth above with respect to claim 21. In particular, Hafner makes no mention whatsoever of displaying an amount of time remaining to charge a battery. Like Pryor, Hafner instead discloses establishing a charging plan for a battery with designated start and stop times and, thus, has no reason to display charging time remaining information.

Accordingly, claim 30 is allowable for at least these reasons.

e. Claims 31, 33, and 36-39

In the Office Action, the Examiner rejects claims 31, 33, and 36-39 under 35 U.S.C. § 103(a) as being unpatentable over Pryor in view of U.S. Patent No. 8,193,766 ("Rondoni").

Solely to advance prosecution and without conceding the appropriateness of the current claim rejections, Applicant hereby amends claim 31 to recite:

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31. A method of charging a battery of a vehicle with a battery charger, the method comprising:

receiving, at a controller, at least one signal indicative of a level of charge of the battery;

transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller, a first wireless signal including data indicative of the level of charge of the battery and data indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery;

displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller; and

receiving, at the controller, a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

As described above with respect to claim 25, the Examiner acknowledges that "Pryor fails to explicitly disclose wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle" (*Office Action, p. 5*). Accordingly, Pryor clearly fails to teach or suggest "receiving, at the controller, a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle," as recited in amended claim 31.

Rondoni fails to solve this deficiency of Pryor. First, even assuming for the pure sake of argument that the teachings of Pryor and Rondoni could be combined (which Applicant does not concede), Rondoni fails to teach a controller that, in response to receiving a wireless signal from a portable controller, stops charging of a battery. Even if Rondoni discloses a "remote device/programmer," Rondoni makes no mention whatsoever of such a device transmitting wireless signals that, when received by another controller, stops charging of a battery. In fact, Rondoni makes no mention whatsoever of how charging of a battery could be stopped and, thus, clearly fails to teach or suggest, among other things, stopping such charging in response to receiving a wireless signal from a portable controller.

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Thus, claim 31 and the claims that depend from claim 31 are allowable for at least the above reasons.

f. Claim 32

In the Office Action, the Examiner rejects claim 32 under 35 U.S.C. § 103(a) as being unpatentable over Pryor and Rondoni in further view of U.S. Published Application No. 2008/0052145 ("Kaplan").

First, claim 32 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Kaplan fails to solve the deficiencies of Pryor and Rondoni as set forth above with respect to claim 31. In particular, Kaplan fails to teach or suggest, among other things, stopping charging of a battery in response to receiving a wireless signal from a portable controller.

Furthermore, even assuming that Kaplan discloses that a user interface may be provided on a cell phone or portable computer, the user interface disclosed in Kaplan is only described as being used to set preferences constraints for a power aggregation scenario (power exchanges for electrical power) and makes no mention whatsoever of what could be included in such a user interface. Mere disclosure of a user interface on a phone is not enough to teach all possible uses or the specific use of a phone as called for in claim 32 (e.g., to display (and control) charging information). In fact, Kaplan makes no mention whatsoever of providing (1) information during charging of a battery or (2) control for stopping in-progress charging.

Accordingly, amended claim 32 is allowable for at least all of these reasons.

g. Claim 34

In the Office Action, the Examiner rejects claim 34 under 35 U.S.C. § 103(a) as being unpatentable over Pryor and Rondoni, in further view of U.S. Published Application No. 2008/0054845 ("Wang").

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Claim 34 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Wang fails to solve the deficiency of Pryor and Rondoni set forth above with respect to claim 31. In particular, Wang fails to teach or suggest, among other things, stopping charging of a battery in response to receiving a wireless signal from a portable controller.

Accordingly, claim 34 is allowable for at least these reasons.

i. Claim 35

In the Office Action, the Examiner rejects claim 35 under 35 U.S.C. § 103(a) as being unpatentable over Pryor, Rondoni, and Wang and in further view of U.S. Patent No. 6,963,186 ("Hobbs").

Claim 35 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Hobbs fails to solve the deficiency of Pryor and Rondoni set forth above with respect to claim 31. In particular, Hobbs fails to teach or suggest, among other things, stopping charging of a battery in response to receiving a wireless signal from a portable controller.

Accordingly, claim 35 is allowable for at least these reasons.

j. Claim 40

In the Office Action, the Examiner rejects claim 40 under 35 U.S.C. § 103(a) as being unpatentable over Pryor and Rondoni, and in further view of Hafner.

Claim 40 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Hafner fails to solve the deficiency of Pryor and Rondoni set forth above with respect to claim 31. In particular, Hafner fails to teach or suggest, among other things, stopping charging of a battery in response to receiving a wireless signal from a portable controller.

Accordingly, claim 40 is allowable for at least these reasons.

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II. Conclusion

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

Respectfully submitted,

/molly s. lawson/

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UNITED STATES
PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**06/06/2023 01:38:23 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Dorothy Hauser
PATENT CENTER #	62216631	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Molly Lawson

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57 As Filed Response.pdf		15	-	317 KB
013350-9003-US57 As Filed Response-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	103 KB
013350-9003-US57 As Filed Response-CLM.pdf	(2-5)	4	Claims	83 KB
013350-9003-US57 As Filed Response-REM.pdf	(6-15)	10	Applicant Arguments/Remarks Made in an Amendment	308 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57 As Filed Response.pdf	F189AB467C8EDD8B7BE4F5EC5A4D9E8D0BD172EAFB0D012 AB2B59016C8631431C4DC4422D2938BD20A0B4745CE329939 CEAC8E3E89EB2F45A9CD69EBF0333716
013350-9003-US57 As Filed Response-A....pdf	BD58D49C1D8E0755D14889F2C99F2CFDF1F2536CDD7428639 E7071D133AC253B188895AD0B83EB7E6A9F5349A60AFFCD93 75C068C968EC289C3D3965C9EAB2D4
013350-9003-US57 As Filed Response-CLM.pdf	0473129ADAAF8C07D5448A7C77F8D2EDEE02D5CDD2D8D4A5 9AF0D237729BFBE027C87027B84F120D05EC7E75144DCE1FD A851DECD83B0CE0BF81CB3B8DCA8B67
013350-9003-US57 As Filed Response-REM.pdf	B0611F058BA37BB078E334F8147D45438E6C9D3A2582F7F64C 82E3B2758DE1AE5DAEA261C59864836AD96BE9BC967156856 7A89B8BC5AAAF6A849A2F8E420809

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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.

Notice of References Cited	Application/Control No. 17/949,911	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-20100228405-A1	09-2010	Morgal; Richard	B62H3/00	701/1
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		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)
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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
	17/949,911	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	03/21/2023	07/19/2023							
	1	-	-							
	2	-	-							
	3	-	-							
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	36	✓	✓							
	37	✓	✓							
	38	✓	✓							
	39	✓	✓							
	40	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M 10/44	03/21/2023	nrp
B60L 53/68,14,305,18,38,63	03/21/2023	nrp
H01M 10/44	07/19/2023	nrp
B60L 53/68,14,305,18,38,63	07/19/2023	nrp

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
320	109	03/21/2023	nrp
320	109	07/19/2023	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	03/21/2023	nrp
A.I. Similarity searches on spec and claims	03/21/2023	nrp
text searched for key concepts	03/21/2023	nrp
updated SEARCH (see attached)	07/19/2023	nrp

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

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

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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	5563491		1996-10-08	Tseng	
	2					
	3	7265520		2007-09-04	Kosuda et al.	
	4	8040430		2011-10-18	Ogawa	
	5	8135443		2012-03-13	Aleksic et al.	

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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	20030120442		2003-06-26	Pellegrino et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.R.P./

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

	2	20090062967		2009-03-05	Kressner et al.	
	3	20100121507		2010-05-13	Ishii et al.	
	4	20120126619		2012-05-24	Singh	

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	1	2002369315	JP	A	2002-12-20	Ono, Masaro		☒
	2	KR10-2006-0016417	KR	A	2006-02-22	Byun Jin Sub		☒
	3	JP2006331405	JP	A	2006-12-07	Hiraoka, Masamitsu		☒
	4	WO2006076498	WO	A	2006-07-20	Gibson, et al.		☐

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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]

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-US57

	1	Machine Translation of JP 2002369315, 7 Pages (Year: 2002)
	2	Machine Translation of KR 10-2006-0016417, 9 Pages (Year: 2006)
	3	Machine Translation of JP 2006331405, 19 Pages (Year: 2006)

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EXAMINER SIGNATURE

Examiner Signature	/NATHANIEL R PELTON/	Date Considered	07/19/2023

*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	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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)	2023-06-01
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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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.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	221	((("AUSTIN") near3 ("Christopher"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/20 05:42 PM
L2	20	L1 AND (repeat$3 OR repeated$3).clm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/20 07:02 PM
L3	2	"US 20110175569"	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2013/07/14 09:18 PM
L4	0	302/109.ccls.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2013/07/14 09:18 PM
L5	1050	320/109.ccls.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2013/07/14 09:18 PM
L6	48	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2013/07/14 09:18 PM
L7	138	US-5194799-$.DID. OR US-5760569-$.DID. OR US-4389608-$.DID. OR US-5765656-$.DID. OR US-5793185-$.DID. OR US-5772309-$.DID. OR US-5444352-$.DID. OR US-5798630-$.DID. OR US-5631536-$.DID. OR US-5803760-$.DID. OR US-5670861-$.DID. OR US-5844384-$.DID. OR US-5773962-$.DID. OR US-5889384-$.DID. OR US-4248942-$.DID. OR US-5905360-$.DID. OR US-4334819-$.DID. OR US-5933010-$.DID. OR US-5202617-$.DID. OR US-6036574-$.DID. OR US-5219034-$.DID. OR US-6087805-$.DID. OR US-5229703-$.DID. OR US-6104312-$.DID. OR US-5397991-$.DID. OR US-6114833-$.DID. OR US-5402056-$.DID. OR US-6154005-$.DID. OR US-5528148-$.DID. OR US-6160374-$.DID. OR US-5545046-$.DID. OR US-6242889-$.DID. OR US-5548200-$.DID. OR US-5583418-$.DID. OR US-3603860-$.DID. OR US-5602459-$.DID. OR US-3694729-$.DID. OR US-5610499-$.DID. OR	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2013/07/14 09:19 PM

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L14	1	L13 and ((vehicle or car or automobile) with (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:29 AM
L15	3	L13 and (charg$5 or recharg$5)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:30 AM
L16	7153	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:38 AM
L17	2140	L16 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:38 AM
L18	287	L17 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:39 AM
L19	2	"6963186".pn. or "5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/21 11:39 AM
L20	1	"2007029965".pn. or "7495414".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/22 02:56 PM
L21	1	"20070029965".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/22 02:57 PM
L22	2	"20100194336".pn. or "7180265".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/03/22 03:00 PM
L23	32353	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	ON	2016/04/27 01:15 PM
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L26	2	"6963186".pn. or "5548200".pn. or "7243746".pc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 01:24 PM
L27	3	"6963186".pn. or "5548200".pn. or "7243746".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/04/27 01:24 PM
L28	12280	L23 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 01:27 PM
L29	369	L28 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 01:28 PM
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L33	39	L28 and (automatic$4 near3 communicat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 02:55 PM
L34	6	"20140253024".pn. or "20130214931".pn. or "20100194336".pn.	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2016/04/27 03:44 PM
L35	3	"20140253024".pn. or "20130214931".pn. or "20100194336".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 03:45 PM
L36	1	"8193769".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 04:00 PM
L37	1	"20150229158".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 07:35 PM
L38	3	"9054749".pn. or "20090096422".pn. or "20110234157".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 07:51 PM
L39	7940	320/108 or h02j7/025.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/04/27 07:59 PM
L40	20884	320/108 or h02j7/025.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:00 PM
L41	10630	L40 and @ad<"20120321"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:00 PM
L42	42	L41 and ((first and second) near5 regulat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2016/04/27 08:04 PM
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L44	33	L43 and ((first and second) near5 regulat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:26 PM
L45	127	L43 and ((first and second) near5 (regulat$3 or convert$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:27 PM
L46	265	L41 and ((first and second) near5 (regulat$3 or convert$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:27 PM
L47	368	L45 or L46	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2016/04/27 08:27 PM

			JPO; DERWENT; IBM_TDB)				
L48	1	"US 20110175569"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/08/09 04:11 PM
L49	29042	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	ON	2016/08/09 04:17 PM
L50	8357	L49 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:19 PM
L51	16	L50 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	ON	2016/08/09 04:22 PM
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L54	1	"20090243549".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/08/09 04:32 PM
L55	10	L50 and (overrid$3 with (below or lower or less))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:35 PM
L56	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	ON	2016/08/09 04:39 PM
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L58	38844	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	ON	2017/04/14 02:21 PM
L59	9252	L58 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/14 02:21 PM
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L63	3	"6963186".pn. or "20090243549".pn. or "5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/16 09:33 AM
L64	1	"20020079868".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/16 09:48 AM
L65	38868	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	ON	2017/04/16 10:53 AM
L66	9253	L65 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/16 10:53 AM
L67	10	L66 and (overrid$3 with (below or lower or less))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/16 10:53 AM
L68	41747	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	ON	2017/09/30 10:39 AM
L69	9450	L68 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 10:39 AM
L70	0	L69 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	ON	2017/09/30 10:42 AM
L71	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	ON	2017/09/30 10:43 AM
L72	83	L69 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (below or	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 10:59 AM

		lower or less))					
L73	2	"20040164711".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 11:53 AM
L74	1	"20040164711".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:53 AM
L75	171	"320".clas. and (decrypt$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:56 AM
L76	5	"320".clas. and (decrypt$3 with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:57 AM
L77	1	"20100076825".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:00 PM
L78	2222	(decrypt$3 with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:04 PM
L79	1513	L78 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:04 PM
L80	1216	((decrypt$3 near5 key) with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:05 PM
L81	856	L80 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:05 PM
L82	82	((decrypt$3 near5 key) with (manufacturer or supplier) with server)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:07 PM
L83	47	L82 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:07 PM
L84	242	((decrypt$3 near5 key) with (manufacturer or supplier) with request$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:13 PM
L85	131	L84 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:13 PM
L86	11740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L87	2157	L86 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L88	293	L87 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L89	50398	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	ON	2018/10/02 01:43 PM
L90	9772	L89 and	(US-PGPUB; USPAT;	OR	ON	ON	2018/10/02

		@ad<"20080818"	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				01:43 PM
L91	372	L90 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	ON	2018/10/02 01:43 PM
L92	1291	((decrypt$3 near5 key) with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 05:10 PM
L93	2233	dunn.xa.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L94	1675	L93 and @ad<"20080101"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L95	1401	L93 and @ad<"20040101"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L96	410	(drew near2 dunn).xa.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:23 PM
L97	2033	320/109.ccls.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2018/10/03 05:09 PM
L98	53838	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	ON	2018/10/03 05:09 PM
L99	1324	(L97 or L98) 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	ON	2018/10/03 05:09 PM
L100	11740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L101	2157	L100 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L102	293	L101 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L103	2	"20110175569".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2018/10/13 02:00 PM
L104	1	"20110175569".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:00 PM
L105	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:48 PM
L106	11629	320/109 or h02j7/0042.cpc. or	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:49 PM

		h02j7/0047.cpc.					
L107	4808	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:50 PM
L108	3622	(L106 or L107) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:50 PM
L109	194	L108 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	ON	2018/10/13 02:55 PM
L110	40433	(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	ON	2018/10/13 03:36 PM
L111	876	L110 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 03:36 PM
L112	2	"20180375175".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/06/16 03:26 PM
L113	103122	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	ON	2020/06/17 02:03 PM
L114	5602	L113 and ((coil or core or inductiv$3) near5 (position$3 or align$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/06/17 02:05 PM
L115	262	L114 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/06/17 02:05 PM
L116	6	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$).did.	(US-PGPUB)	OR	OFF	OFF	2020/09/14 08:56 AM
L117	2	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB)	OR	OFF	OFF	2020/09/14 08:58 AM
L118	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/14 08:58 AM
L119	31994	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	OFF	2020/09/14 09:02 AM

			IBM_TDB)				
L120	7985	L119 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:02 AM
L121	39132	b60l53/68,126,14,305,18,38,63.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:03 AM
L122	3591	L121 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:03 AM
L123	103	(L120 or L122) 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	OFF	2020/09/14 09:06 AM
L124	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	OFF	2020/09/14 09:32 AM
L125	6	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/14 09:32 AM
L126	93	(L120 or L122) 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	OFF	2020/09/14 09:33 AM
L127	27	(L120 or L122) and ((input$4 or user) with (time near2 day))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:54 AM
L128	2	"20180375175".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 10:33 AM
L129	192	(US-16056043-$ | US-3603860-$ | US-3624723-$ | US-3673379-$ | US-3740896-$ | US-3870855-$ | US-3898547-$ | US-3900784-$ | US-3911284-$ | US-4012681-$ | US-4146825-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 12:25 PM

		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-$).DID.					
L130	194	(US-16056043-$ | US- 4245640-$ | US- 4320333-$ | US- 4380725-$ | US- 4389608-$ | US- 4402524-$ | US- 4430569-$ | US- 4446680-$ | US- 4449049-$ | US- 4468605-$ | US- 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-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 12:25 PM

		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-$).DID.					
L131	1	"20190148794".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:25 AM
L132	11666	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:36 AM
L133	20499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:37 AM
L134	4231	(L132 or L133) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:38 AM
L135	4	"20080007202".pn. or "7243746".pn. or "5548200".pn. or "20080103370".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:03 AM
L136	10	(US-20090243549-$ 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-$).did.	(US-PGPUB)	OR	OFF	OFF	2020/09/29 10:07 AM
L137	12	(US-20090243549-$ 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-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:08 AM
L138	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:08 AM

		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-$).did.					
L139	1	"6983186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:09 AM
L140	1	"6963186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:10 AM
L141	13	(US-20090243549-$ 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-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:10 AM
L142	1	"20080052145".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:15 AM
L143	14	(US-20090243549-$ 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	OFF	2020/09/29 10:17 AM
L144	410	L134 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:40 AM
L145	236	L134 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	OFF	2020/09/29 11:32 AM
L146	1	"20080103370".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 11:45 AM
L147	1551	(((data or information) near5 (progress)) with (indicator))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 11:49 AM

L148	437	L147 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 11:50 AM
L149	1	"20190148785".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 02:42 PM
L150	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	OFF	2020/09/29 02:49 PM
L151	11666	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L152	20499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L153	4231	(L151 or L152) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L154	4	L153 and ((controller or display) near3 (on or within or built$1in) with (cord or cable or plug))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 03:58 PM
L155	1716	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 04:06 PM
L156	219	L155 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 04:07 PM
L157	1	"20070164704".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/30 08:48 AM
L158	1	"10090567".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/30 08:57 AM
L159	2049	((charg$5 or recharg$5) adj4 (cable or plug)) with (display or transmit$4 or reciev$3)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/30 09:03 AM
L160	2290	((charg$5 or recharg$5) adj4 (cable or plug or cord)) with (display or transmit$4 or reciev$3)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/30 09:03 AM
L161	328	L160 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/09/30 09:03 AM
L162	131	((Christopher) near2 (Austin)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:29 AM

L163	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	OFF	2020/10/23 09:30 AM
L164	11732	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L165	20693	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L166	4231	(L164 or L165) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L167	236	L166 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	OFF	2020/10/23 09:30 AM
L168	410	L166 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/10/23 10:35 AM
L169	133	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:14 AM
L170	11784	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L171	20795	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L172	4231	(L170 or L171) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L173	410	L172 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 11:52 AM
L174	677	L172 and ((interrupt$3 or disconnect$3) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 12:57 PM
L175	1	"10014703".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 01:03 PM
L176	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 09:54 AM

		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-$).did.					
L177	19	(US-20090243549-$ 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; USOCR)	OR	ON	ON	2020/12/16 09:54 AM
L178	17	L177 and ((tim$3 or length or long or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/16 09:57 AM
L179	1746	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:21 AM
L180	1122	vasant.in.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L181	7	L180 and voltage and lcd	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L182	139	L180 and voltage	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L183	68	L182 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/16 11:59 AM
L184	2	"7243746".pn.	(US-PGPUB; USPAT;	OR	ON	ON	2020/12/16

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:01 PM
L185	11973	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L186	21117	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L187	4231	(L185 or L186) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L188	410	L187 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 12:18 PM
L189	14	g01r31/371 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	OFF	2020/12/16 02:42 PM
L190	21	g01r31/371 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 02:42 PM
L191	33	L190 or L189	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 02:42 PM
L192	49137	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	ON	2020/12/17 08:31 AM
L193	8033	L192 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 08:31 AM
L194	17898	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L195	5661	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L196	3727	(L194 or L195) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L197	11978	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L198	21147	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L199	4231	(L197 or L198) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L200	5269	L199 or L193 or L196	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 08:31 AM
L201	121	L200 and ((send$3 or signal$3 or notify$3)	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 08:36 AM

		near6 interrupt$3)					
L202	861	((display$3) near6 (interrupt$3 or error or fault)) with (charg$5 or recharg$5) with (power or energy or voltage or current)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/12/17 09:14 AM
L203	157	L202 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 09:15 AM
L204	135906	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:45 AM
L205	103	L200 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 09:46 AM
L206	701	L204 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 09:46 AM
L207	791	L204 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:47 AM
L208	104	L207 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:47 AM
L209	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/17 09:51 AM

		5594318-$).did.					
L210	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 09:52 AM
L211	14	L204 and ((display$3 or indicat$3) near5 loss near5 (communicat$3 or signal))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:50 AM
L212	11203	((display$3 or indicat$3) near5 loss near5 (communicat$3 or signal))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:52 AM
L213	5022	L212 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:52 AM
L214	285	L213 and (charg$3 or recharg$3) and (vehicle or car or auto or automobile)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:56 AM
L215	194	(US-17005819-$ | US-4245640-$ | US-4320333-$ | US-4380725-$ | US-4389608-$ | US-4402524-$ | US-4430569-$ | US-4446680-$ | US-4449049-$ | US-4468605-$ | US-4591778-$ | US-4602204-$ | US-4616169-$ | US-4774449-$ | US-4873160-$ | US-4956563-$ | US-4990099-$ | US-5194799-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 11:59 AM

		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-$).DID.					
L216	162	(US-10587127-$ | US- 17005819-$ | US- 20180198289-$ | US- 3582942-$ | US- 3584893-$ | US- 3584921-$ | US- 3589692-$ | US- 3594642-$ | US- 3602881-$ | US- 3612491-$ | US- 3614564-$ | US- 3621929-$ | US- 3623159-$ | US- 3624480-$ | US- 3624482-$ | US- 3624723-$ | US- 3628284-$ | US- 3638054-$ | US- 3639896-$ | US- 3651452-$ | US- 3653729-$ | US- 3654538-$ | US- 3656135-$ | US- 3665501-$ | US- 3671843-$ | US- 3673588-$ | US- 3683624-$ | US- 3684255-$ | US- 3694890-$ | US- 3695731-$ | US- 3704446-$ | US- 3718849-$ | US- 3727994-$ | US- 3740637-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 12:00 PM

		3746988-$ | US- 3758031-$ | US- 3758166-$ | US- 3765555-$ | US- 3767065-$ | US- 3790806-$ | US- 3792709-$ | US- 3794968-$ | US- 3800771-$ | US- 3809995-$ | US- 3811526-$ | US- 3815088-$ | US- 3828235-$ | US- 3842288-$ | US- 3848933-$ | US- 3851305-$ | US- 3866168-$ | US- 3866702-$ | US- 3867647-$ | US- 3881128-$ | US- 3898547-$ | US- 3898809-$ | US- 3900784-$ | US- 3904920-$ | US- 3906330-$ | US- 3909685-$ | US- 3916376-$ | US- 3918543-$ | US- 3952511-$ | US- 3962677-$ | US- 3962870-$ | US- 3966266-$ | US- 3973238-$ | US- 3976158-$ | US- 3988041-$ | US- 3992695-$ | US- 3997830-$ | US- 4008423-$ | US- 4010410-$ | US- 4012681-$ | US- 4019120-$ | US- 4025126-$ | US- 4033629-$ | US- 4033632-$ | US- 4034369-$ | US- 4067259-$ | US- 4078798-$ | US- 4082988-$ | US- 4086564-$ | US- 4088937-$ | US- 4089564-$ | US- 4094556-$ | US- 4109193-$ | US- 4125826-$ | US- 4127308-$ | US- 4128800-$ | US- 4139812-$ | US- 4143926-$ | US-					

		4146825-$ | US-4153168-$ | US-4156836-$ | US-4159467-$ | US-4159854-$ | US-4168866-$ | US-4207511-$ | US-4218624-$ | US-4218644-$).DID.					
L217	356	L215 or L216	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 12:00 PM
L218	337	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2021/03/10 11:55 AM
L219	2	"20200395637".pn.	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2021/05/05 08:44 AM
L220	1	"20200395637".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2021/05/05 08:45 AM
L221	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/05/05 10:05 AM
L222	142845	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:08 AM
L223	1842	L222 and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:08 AM
L224	220	L223 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:09 AM

L225	52046	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	ON	2021/05/05 11:36 AM
L226	8131	L225 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 11:36 AM
L227	19179	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L228	5910	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L229	3790	(L227 or L228) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L230	305	(L226 or L229) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L231	53599	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	ON	2021/06/23 04:13 PM
L232	8476	L231 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/06/23 04:13 PM
L233	19760	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L234	5999	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L235	3869	(L233 or L234) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L236	308	(L232 or L235) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L237	56047	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	ON	2021/08/19 09:31 AM
L238	8890	L237 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/08/19 09:31 AM

			JPO; DERWENT; IBM_TDB)				
L239	20469	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L240	6139	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L241	3956	(L239 or L240) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L242	304	(L238 or L241) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L243	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 10:14 AM
L244	1914	L243 and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 10:14 AM
L245	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 01:46 PM
L246	40	L245 and ((display$3 or indicat$3) near5 (input$3) near5 (delay$3 or program$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 01:46 PM
L247	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 02:58 PM
L248	4354	L247 and ((display$3 or indicat$3) near5 (input$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 02:58 PM
L249	457	L248 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 02:59 PM
L250	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 08:18 AM
L251	0	L250 and ((delay$4 near5 session) near5 (input$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 08:18 AM
L252	18	L250 and ((delay$4 near5 charg$5) near5	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/08/20 08:19 AM

		(input$3))	JPO; DERWENT; IBM_TDB)				
L253	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 09:39 AM
L254	46	L253 and ((delay$4 near5 charg$5) and (manual near4 (input$3 or restart$3 or stop$4)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 09:39 AM
L255	79223	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	ON	2021/08/23 08:43 AM
L256	15711	L255 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/23 08:43 AM
L257	389	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/23 08:43 AM
L258	46	("20020079868"|"20030015995"|"20030127155"|"20030209375"|"20050046387"|"20060276938"|"20070080827"|"20070144605"|"20070164704"|"20080040223"|"20080040296"|"20080052017"|"20080052145"|"20080054845"|"20080103370"|"20080156553"|"20080203973"|"20080265684"|"20080281168"|"20080296978"|"20090021213"|"20090063193"|"20090139781"|"20090237034"|"20090243538"|"20090278492"|"20090313034"|"20090313103"|"20090313174"|"20100010698"|"20100030389"|"20100081378"|"20100169008"|"20100228405"|"20100281183"|"20110266996"|"4532418"|"4742283"|"5202617"|"5311973"|"5461298"|"5462439"|"5595271"|"5650710"|"6281663"|"6421600").PN.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/10/04 12:24 PM
L259	46	("20020079868"|"20030015995"|"20030127155	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/10/08 12:54 PM

		"|"20030209375"|"2005 0046387"|"2006027693 8"|"20070080827"|"200 70144605"|"200701647 04"|"20080040223"|"20 080040296"|"20080052 017"|"20080052145"|"2 0080054845"|"2008010 3370"|"20080156553"|" 20080203973"|"200802 65684"|"20080281168"| "20080296978"|"20090 021213"|"20090063193 "|"20090139781"|"2009 0237034"|"2009024353 8"|"20090278492"|"200 90313034"|"200903131 03"|"20090313174"|"20 100010698"|"20100030 389"|"20100081378"|"2 0100169008"|"2010022 8405"|"20100281183"|" 20110266996"|"453241 8"|"4742283"|"5202617" |"5311973"|"5461298"|" 5462439"|"5595271"|"5 650710"|"6281663"|"64 21600").PN.					
L260	4	"6424158".pn. OR "7917179".pn. OR "20090063183".pn. OR "20100106631".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/01/19 11:20 AM
L261	380	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/19 12:42 PM
L263	24	((US-20080156553-A1 OR US-20080275600-A1 OR US-20080040296-A1 OR US-20100102776-A1 OR US-20110266996-A1 OR US-20070164704-A1 OR US-20080054845-A1 OR US-20090313174-A1 OR US-20080052145-A1 OR US-20080007202-A1 OR US-20090139781-A1 OR US-20100010698-A1 OR US-20100090524-A1 OR US-20090243538-A1 OR US-20090313034-A1 OR US-20060276938-A1	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/20 07:35 PM

		OR US-20020079868-A1 OR US-20090243549-A1 OR US-20100228405-A1 OR US-20090313103-A1).did. AND PGPB.dbnm.) OR ((US-5594318-A OR US-6963186-B2 OR US-7243746-B1 OR US-5548200-A).did. AND USPT.dbnm.)					
L264	7	("20060028178" OR "20070145830" OR "20080122402" OR "20090079386" OR "20090229900" OR "20090315512" OR "5646500").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/21 08:29 AM
L265	64	("20020079868" OR "20030015995" OR "20030127155" OR "20030209375" OR "20050046387" OR "20060276938" OR "20070080827" OR "20070144605" OR "20070164704" OR "20080007202" OR "20080039989" OR "20080040223" OR "20080040296" OR "20080052017" OR "20080052145" OR "20080054845" OR "20080103370" OR "20080156553" OR "20080203973" OR "20080238355" OR "20080265684" OR "20080281168" OR "20080296978" OR "20090021213" OR "20090047991" OR "20090063183" OR "20090063193" OR "20090139781" OR "20090237034" OR "20090243538" OR "20090243549" OR "20090278492" OR "20090312903" OR "20090313034" OR "20090313103" OR "20090313174" OR "20100010698" OR "20100030389" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/21 08:30 AM

		"20100081378" OR "20100106631" OR "20100169008" OR "20100228405" OR "20100281183" OR "20110266996" OR "4532418" OR "4742283" OR "5202617" OR "5311973" OR "5461298" OR "5462439" OR "5548200" OR "5594318" OR "5595271" OR "5650710" OR "6281663" OR "6421600" OR "6424158" OR "6928372" OR "6963186" OR "7243746" OR "7782021" OR "7881957" OR "7917179" OR "8193766").pn.					
L266	71	L265 OR l264	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 08:30 AM
L267	34	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time near3 remain$3) near9 display$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 09:57 AM
L268	6	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:31 AM
L269	1838	@ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:39 AM
L270	13	@ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3)) near9 (charg$5 OR recharg$5)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:39 AM
L271	19	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((phone) near9	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 12:28 PM

		display$3)					
L272	5365	B60L53/68,14,305,18,38,63.cpc. AND @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/21 01:11 PM
L273	229	l272 AND ((display$3 OR indicat$3) near5 (time OR length OR duration OR period) near5 (charg$5 OR recharg$5))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/21 01:11 PM
L274	49	(Artificial Intelligence) Similar to: 17/949,911 with 0 CPC Selections and 0 Text Selections Text: (US-20220209313-A1 OR US-11258112-B2 OR US-20220209318-A1 OR US-20230020418-A1 OR US-11258107-B2 OR US-11482734-B2 OR US-20220238931-A1 OR US-11258108-B2 OR US-20220238928-A1 OR US-11355791-B2 OR US-20220209315-A1 OR US-11349157-B2 OR WO-2010022059-A1 OR EP-2329559-A1 OR US-20220209314-A1 OR US-20220216530-A1 OR US-20230013807-A1 OR US-20210234205-A1 OR US-20220247000-A1 OR US-11588191-B2 OR US-11515581-B2 OR US-11515582-B2 OR US-20220238929-A1 OR US-11489207-B2 OR US-20220216529-A1 OR US-20220200066-A1 OR US-20230016705-A1 OR US-11489208-B2 OR US-20220209316-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

		OR US-11251471-B2 OR US-11482736-B2 OR US-20230014364-A1 OR US-20200395636-A1 OR US-11482735-B2 OR US-20210126296-A1 OR US-20220209317-A1 OR US-20210135296-A1 OR US-11258110-B2 OR US-20220246999-A1 OR US-11264652-B2 OR US-11355792-B2 OR US-11258109-B2 OR US-20200395637-A1 OR US-20230012593-A1 OR US-20190148785-A1 OR US-20190148787-A1 OR US-20190148786-A1 OR US-20110175569-A1 OR US-20190148791-A1 OR US-20190148789-A1).did.					
L275	49	(Artificial Intelligence) Similar to: 17/949,911 with 0 CPC Selections and 2 Text Selections Text: (US-20230020418-A1 OR US-20190148786-A1 OR US-11258112-B2 OR US-11489207-B2 OR US-20190148785-A1 OR US-20230016705-A1 OR US-20190148787-A1 OR JP-2010110101-A OR US-20220209318-A1 OR JP-5267050-B2 OR JP-2012244768-A OR US-20220209315-A1 OR JP-2011112617-A OR US-11482735-B2 OR US-11258108-B2 OR US-20220209313-A1 OR US-11482734-B2 OR US-11515581-B2 OR EP-2329559-A1 OR WO-2010022059-A1 OR US-20190148791-A1 OR US-20160059716-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

		JP-2018137838-A OR KR-102013155-B1 OR KR-20110000011-A OR KR-20150022511-A OR US-11258107-B2 OR US-20210135295-A1 OR US-20220216530-A1 OR US-20200395638-A1 OR US-11355792-B2 OR US-20220238928-A1 OR US-20220247000-A1 OR JP-5328304-B2 OR JP-2010119224-A OR JP-6826320-B2 OR US-20220246999-A1 OR CN-103580093-A OR KR-101113425-B1 OR US-10090567-B2 OR JP-2016025390-A OR DE-10353839-A1 OR US-20230012593-A1 OR US-20230014364-A1 OR JP-2005253269-A OR JP-2000102104-A OR US-11349157-B2 OR KR-102048714-B1 OR US-6992464-B2 OR US-20040135548-A1).did.					
L276	73	L274 OR l275	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM
L277	322	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 11:40 AM
L278	24	((US-20030015995-A1 OR US-20080156553-A1 OR US-20020079868-A1 OR US-20060276938-A1 OR US-20090313034-A1 OR US-20090243538-A1 OR US-20100090524-A1 OR US-20100010698-A1 OR US-20090139781-A1 OR US-20080007202-A1 OR US-20090243549-A1 OR US-20080052145-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:09 PM

		US-20090313174-A1 OR US-20080054845-A1 OR US-20070164704-A1 OR US-20110266996-A1 OR US-20100170411-A1 OR US-20080136371-A1).did. AND PGPB.dbnm.) OR ((US-7243746-B1 OR US-6963186-B2 OR US-5594318-A OR US-5548200-A OR US-6081205-A OR US-5757595-A).did. AND USPT.dbnm.)					
L279	1	"8193766".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/19 01:11 PM
L280	31	L247 AND (((display$3 OR indicat$3) near5 (time)) WITH ((inside OR interior OR cabin OR dash) near8 (vehicle OR car OR automobile OR auto)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:37 PM
L281	1583	(((display$3 OR indicat$3) near5 (time)) WITH ((inside OR interior OR cabin OR dash) near8 (vehicle OR car OR automobile OR auto)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:37 PM
L282	1345	@ad<"20080818" AND l281	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:38 PM
L284	14	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND (send$3 near9 (portable OR pda OR mobile))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/07/19 02:00 PM
L286	1449	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time$1of$1day OR (time near3 day) OR time) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 02:39 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	378	((vehicle or auto or car or automobile)(charg$5 or recharg$5)(display$3 or lcd or monitor or led or screen)(program$3)(time or period or length or long)(manual or user)(input$3 or switch$3 or button)).clm.	(US-PGPUB; USPAT)	AND	ON	ON	2021/08/23 10:47 AM

PE2E SEARCH - Search History (Similarity Search)

Ref #	Sort and Retrieval Information	Text Selections	CPC Selections
L274	Sort results by: Similarity to Application # 17/949,911 Retrieve results by: Application # 17/949,911	No selections	No selections
L275	Sort results by: Similarity to Application # 17/949,911 Retrieve results by: Application # 17/949,911	(Claims) establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger, receive a wireless signal from the portable controller, responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery, repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and repeatedly display: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and	No selections

		information indicative of the level of charge of the battery. (Claims) receiving, at a controller, at least one signal indicative of a level of charge of the battery; transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller the at least one signal indicative of the level of charge of the battery and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery; displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller.	

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

23409 7590 07/25/2023

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EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
07/25/2023	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mkeipdocket@michaelbest.com

Office Action Summary	Application No. 17/949,911	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 amendment filed on 06/06/2023.

☐ 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) 21-22 and 24-40 is/are pending in the application.

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

6) ☑ Claim(s) 21-22 and 24-30 is/are allowed.

7) ☑ Claim(s) 31-40 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 _____ 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 06/01/2023.

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.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 06/01/2023 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Response to Amendment

Acknowledgement is made of the amendment filed on 06/06/2023 in which claims 21, 22, 31, and 38-40 were amended and claim 23 canceled. No new claims were added, therefore claims 21-22 and 24-40 are pending for examination below.

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 31, 33, and 36-39 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202] in view of Rondoni et al. [US 8,193,766] and Morgal et al. [US 2010/0228405].

With respect to claims 31 and 37, Pryor discloses a method of charging a battery of a vehicle with a battery charger [**Figs 1-2**], the method comprising: receiving, at a controller [**110/114**], at least one signal indicative of a level of charge of the battery and transmitting it to a controller remote from the vehicle and the battery charger [**par. 0023-0025; i.e. at least current charge level**], via a transmitter electrically coupled to the controller a first wireless data indicative of the level of charge of the battery [**via 124/126**]; and receiving, at the controller, a second wireless signal from the controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle [**par. 0023-0025; i.e. reception of the**]. However, Pryor fails to disclose sending the level of charge during charging and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery; displaying, on a display electrically coupled to a portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller and receiving a second wireless signal from a portable controller to stop charging the battery.

Rondoni relates to the field of charging batteries and discloses sending a level of charge during charging and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery and displaying, on a display electrically coupled to a portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller [**Figs. 7-9; col. 8 lines 30-55, the display is part of a remote device/programmer; col. 9 line 38 to col. 10 line 67; signals sent for display include level of charge of the battery and time remaining to charge the battery**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include sending and display of battery level and time remaining information to the portable controller for the benefit of providing the relevant charging information to the remote user over any distance thereby providing control to the user/management system without

being constraint to the particular location of each electric vehicle allowing for more efficient load management and charging with the grid.

Furthermore, Morgal teaches an electrical vehicle charging system that includes wireless communication between the electric vehicle and a remote management server via a portable controller (phone), wherein a wireless signal is received at a controller of the electric vehicle from the portable phone and in response to receiving the signal, stop charging of a battery or the vehicle [**par. 0221-0223**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include sending/receiving of a wireless signal to stop charging of the battery as taught by Morgal for the benefit of identifying a particular vehicle in the fleet of vehicles as stated by Morgal.

With respect to claim 33, Rondoni as applied above further discloses wherein the level of charge is a full charge of the battery [**Fig. 8 shows transmission of full charge signal**].

With respect to claim 36, Rondoni further discloses repeatedly sending, with the controller, signals to update the level of charge of the battery on the display [**Fig. 7 shows an update to date charge status, i.e. some bars are black and other shaded as the charging progresses**].

With respect to claims 38-39, Pryor further discloses receiving, at the controller, a third wireless signal from the portable controller wherein receiving the wireless signal from the portable controller includes receiving a time of day and further comprising supplying, with the controller, electricity to the battery based on the time of day [**par. 0023-0025; CIT**].

Claim 32 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202], Rondoni et al. [US 8,193,766], and Morgal et al. [US 2010/0228405] as applied above, and further in view of Kaplan et al. [US 2008/0052145].

With respect to claim 32, Pryor fails to disclose wherein the portable remote controller is defined at least in part by a phone.

Kaplan relates to electric vehicle charging with remote user controlling wherein the remote user interface is define at least in part by a phone [**par. 0227**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor such that the remote controller included a phone for the benefit of using a device with a reliable network for the user and also for using a device that is mainstream in society thereby facilitating the ease at which a user can adapt/use the remote controller for their vehicle recharging operation controls.

Claim 34 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202], Rondoni et al. [US 8,193,766], and Morgal et al. [US 2010/0228405] as applied above, and further in view of Wang [US 2008/0054845].

With respect to claim 34, Pryor discloses wherein the display is a first display [**see above**], but fails to disclose displaying, on a second display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery.

Wang teaches displaying, on a display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery [**Fig. 1**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include another display for displaying the level of battery charge

in a housing of the battery charger for the benefit of providing a more user friendly display in a convenient manner as stated by Wang [**par. 0009**].

Claim 35 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202], Rondoni et al. [US 8,193,766], Morgal et al. [US 2010/0228405], and Wang [US 2008/0054845] as applied above, and further in view of Hobbs [US 6,963,186].

With respect to claim 35, Wang as applied above fails to disclose displaying, on the second display, the amount of time remaining to charge the battery.

Hobbs relates to the field of recharging vehicles with a vehicle charger having a display and wherein displaying, on the display located in a charger housing, the amount of time remaining to charge the battery [**col. 7 lines 1-30**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to include on the charger display the amount of time remaining to charge the battery for the benefit of providing a more user friendly display in a convenient location that can be quickly and readily seen by the user of the electric vehicle.

Claim 40 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Pryor [US 2008/0007202], Rondoni et al. [US 8,193,766], and Morgal et al. [US 2010/0228405] as applied above, and further in view of Hafner et al. [US 2009/0313174].

With respect to claim 40, Pryor fails to disclose wherein receiving the wireless signal from the portable controller includes receiving a cost threshold and further comprising supplying, with the controller, electricity to the battery based on the cost threshold.

Hafner relates to the field of recharging electric vehicles based on financial plans and discloses a wireless signal includes a cost threshold and wherein the controller is configured to supply electricity

from the source of power to the battery based on the cost threshold [**par. 0033, 0050, 0054-0056, 0081 Figs. 10-12; i.e. user selected pricing thresholds**].

Therefore, it would have been obvious to a person having ordinary skill in the art before the invention was made to modify Pryor to further be configured to wirelessly receive a cost threshold for control of the charging operation for the benefit of minimizing the cost to the user based on their individual price sensitivities.

Allowable Subject Matter

Claims 21-22 and 24-30 are allowed.

The following is an examiner's statement of reasons for allowance:

With respect to claim 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 a wireless signal from the portable controller, responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery, repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and information indicative of the level of charge of the battery."

Claims 22 and 24-30 depend from claim 21 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

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**10/02/2023 02:49:25 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Dorothy Hauser
PATENT CENTER #	62911494	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Molly Lawson

Documents

TOTAL DOCUMENTS: 4

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57 As Filed AFCP.pdf		2	After Final Consideration Program Request	205 KB
013350-9003-US57 As Filed Response.pdf		12	-	504 KB
013350-9003-US57 As Filed Response-A.NE.pdf	(1-1)	1	Response After Final Action	105 KB
013350-9003-US57 As Filed Response-CLM.pdf	(2-5)	4	Claims	86 KB
013350-9003-US57 As Filed Response-REM.pdf	(6-12)	7	Applicant Arguments/Remarks Made in an Amendment	494 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57 As Filed AFCP.pdf	8BD93A43CA3A439D2B0ED9ADDF5D0271F16CECE64C1C01F B86FCFE09E697FEF1CEE92F4DAD54935F087ED95277BBE97 A15AE5D52ECF2AC049D0FE7C7D6058A33
013350-9003-US57 As Filed Response.pdf	54B3C897D3FDD221E2DE23053BCF6F25362D67648189AC0A7 C8D159AC445A0E0C00ABB15EC685BDE54ED807108473F016 D1A63FF53502A56DC767746DCD7C1F9
013350-9003-US57 As Filed Response-A.NE.pdf	AD6A45C4FB1E97AB949449B1E3EA06EF18CDA9D0E5E59CE2 E50E50CFB8DF24D17D2FB6B8204C096F0B198F470A0C6D193 8DD123E46E9BA4DDA467697F4D4A3AF
013350-9003-US57 As Filed Response-CLM.pdf	F91D2F74E8A486C64EFD4EB6C975FF998C24A0C3625ED0BD 35C305F9876A169F4B9D609802CD1500F1777C65FC7CAFFF1 B86046D6BAF30A578B93B5AF0E55004
013350-9003-US57 As Filed Response-REM.pdf	7B74C0B80C0FA54A55EA63013C2D464195994969B4D72A63A8 2D979821EE9DDAC1967CA513A764F6AADA413586B3260249C 25FC7039E7A9BB2F5D50C74950AF3

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.

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Pilot Program Request

PTO/SB/434 (05-13)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
013350-9003-US57	17/949,911	September 21, 2022
First Named Inventor:	**Title:**	
Christopher B. Austin	VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web).
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:
   - Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
   - The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
     - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
     - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
       - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
       - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date
/molly s. lawson/	October 2, 2023
Name (Print/Typed) Molly S. Lawson	**Practitioner Registration No.** 58,890

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.*

[✓] * Total of 1 forms are submitted.

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.

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

In re

Patent Application of

Christopher B. Austin

Application No. 17/949,911

Filing Date: September 21, 2022

Confirmation No. 6463

Examiner: Nathaniel R. Pelton

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION"

Attorney Docket No. 013350-9003-US57

RESPONSE TO FINAL OFFICE ACTION FILED WITH REQUEST FOR CONSIDERATION UNDER AFTER-FINAL 2.0 PROGRAM

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

Commissioner:

This paper is filed in response to the final Office action dated July 25, 2023, concerning the above-identified patent application, and is filed with an After Final Consideration Pilot (AFCP) 2.0 Request. Please charge any required fees for this communication to Deposit Account No. 13-3080.

Amendments to the Claims are reflected in the Listing of Claims beginning on page 2 of this paper.

Remarks begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of the claims replaces all prior versions and listings of claims in the application.

1-20. (Canceled)

21. (Previously Presented) A system for charging a battery of a vehicle with a vehicular battery charger, the system comprising:

a controller configured to:

establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger,

receive a wireless signal from the portable controller,

responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and

during charging of the battery with the vehicular battery charger:

repeatedly receive at least one signal indicative of a level of charge of the battery,

repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and

repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle:

information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and

information indicative of the level of charge of the battery.

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Tesla EX1002 Page 620

22. (Previously Presented) The system of claim 21, wherein the display is electrically coupled to the controller.

23. (Canceled)

24. (Previously Presented) The system of claim 21, wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery.

25. (Previously Presented) The system of claim 21, wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

26. (Previously Presented) The system of claim 21, wherein the controller is further configured to receive data indicative of a cost of power and, based on the received data indicative of the cost of power, stop charging of the battery of the vehicle.

27. (Previously Presented) The system of claim 21, wherein the controller is included in the vehicular battery charger.

28. (Previously Presented) The system of claim 21, wherein the wireless signal includes a time of day and wherein the controller is configured to supply electricity from the source of power to the battery based on the time of day.

29. (Previously Presented) The system of claim 28, wherein the time of day includes at least one selected from a group consisting of a time of day to start charging and a time of day to complete charging.

30. (Previously Presented) The system of claim 21, wherein the wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold.

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

receiving, at a controller, at least one signal indicative of a level of charge of the battery;

transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller, a first wireless signal including data indicative of the level of charge of the battery and data indicative of an amount of time remaining to charge the battery estimated at least partially based ~~at least in part~~ upon the level of charge of the battery;

displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller; and

receiving, at the controller, a second wireless signal from the portable controller generated in response to user input received at the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

32. (Previously Presented) The method of claim 31, wherein the portable remote controller is defined at least in part by a phone.

33. (Previously Presented) The method of claim 31, wherein the level of charge is a full charge of the battery.

34. (Previously Presented) The method of claim 31, wherein the display is a first display, the method further comprising displaying, on a second display located in a housing of the battery charger and electrically coupled to the controller, the level of charge of the battery.

35. (Previously Presented) The method of claim 34, further comprising displaying, on the second display, the amount of time remaining to charge the battery.

36. (Previously Presented) The method of claim 31, further comprising repeatedly sending, with the controller, signals to update the level of charge of the battery on the display.

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Tesla EX1002 Page 622

37. (Previously Presented) The method of claim 31, further comprising displaying, on the display electrically coupled to the portable remote controller during charging of the battery, the amount of time remaining to charge the battery received by the portable controller.

38. (Previously Presented) The method of claim 31, further comprising receiving, at the controller, a third wireless signal from the portable controller.

39. (Previously Presented) The method of claim 38, wherein receiving the third wireless signal from the portable controller includes receiving a time of day and further comprising supplying, with the controller, electricity to the battery based on the time of day.

40. (Previously Presented) The method of claim 38, wherein receiving the third wireless signal from the portable controller includes receiving a cost threshold and further comprising supplying, with the controller, electricity to the battery based on the cost threshold.

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Tesla EX1002 Page 623

REMARKS

Prior to the filing of this response, claims 21-22 and 24-40 were pending in the present application. By this response, Applicant hereby amends claim 31. Thus, claims 21-22 and 24-40 remain pending. Applicant respectfully requests reconsideration of the pending claims in view of the following remarks.

I. Allowable Subject Matter

In the Office action dated July 25, 2023 (the "Office Action"), the Examiner indicates that claims 21-22 and 24-30 are allowed. Applicant appreciates the Examiner's indication of allowable subject matter. No amendments have been made to these claims in the present response, and, thus, these claims remain allowable.

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

a. Claims 31, 33, and 36-39

In the Office Action, the Examiner rejects claims 31, 33, and 36-39 under U.S.C. §103(a) as being unpatentable over U.S. Published Application No. 2008/0007202 ("Pryor") in view of U.S. Patent No. 8,193,766 ("Rondoni") and U.S. Published Application No. 2010/0228405 ("Morgal").

In rejecting claim 31, the Examiner acknowledges that "Pryor fails to disclose sending the level of the charge during charging and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially based at least in part upon the level of charge of the battery; displaying, on a display electrically coupled to a portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller and receiving a second wireless signal from a portable controller to stop charging the battery" (*Office Action, p. 3*). However, the Examiner asserts that Rondoni discloses sending a level of charge during charging and at least one signal indicative of an amount of time remaining to charge the battery and displaying, on a display electrically coupled to a portable remote controller during charging of the battery, at least the level of charge of the battery received by the

portable controller (*Office Action, p. 3*) and asserts that "Morgal teaches an electrical vehicle charging system that includes wireless communication between the electric vehicle and a remote management server via a portable controller (phone), wherein a wireless signal is received at a controller of the electric vehicle from the portable phone and in response to receiving the signal, stop charging of the battery or the vehicle" (*Office Action, p. 4, citing to Paragraphs [0221]-[0223] of Morgal*).

Applicant respectfully disagrees. Morgal discloses a rental system for personal-sized electric vehicles (PEVs) (e.g., bicycles, scooters, and the like) (*see, e.g.*, Paragraph [0005]). As described in Morgal, a vehicle accessory pack (VAP) is attached to the PEV that allows the PEV to be rented (*see, e.g.*, Paragraph [0076]). The VAP may include a mobile phone (*Id. and FIG. 18*).

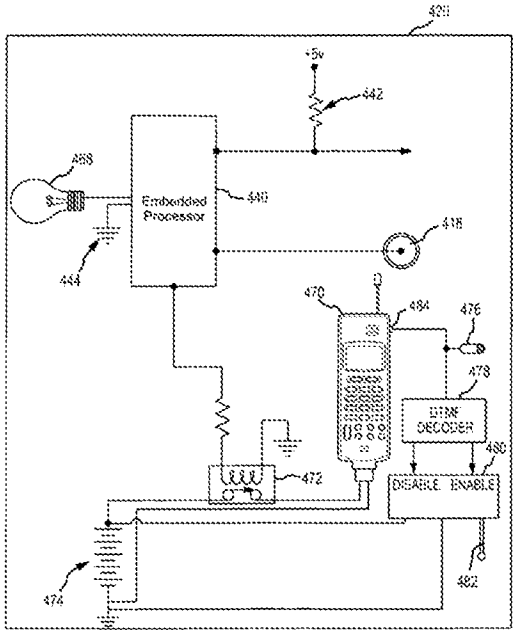

FIG.18

The PEV is charged at a PEV rental or subscriber station 100. The station 100 includes a kiosk 102 and a plurality of lock-charge ports 106a-n (see, e.g., Paragraph [0056] and FIG. 1).

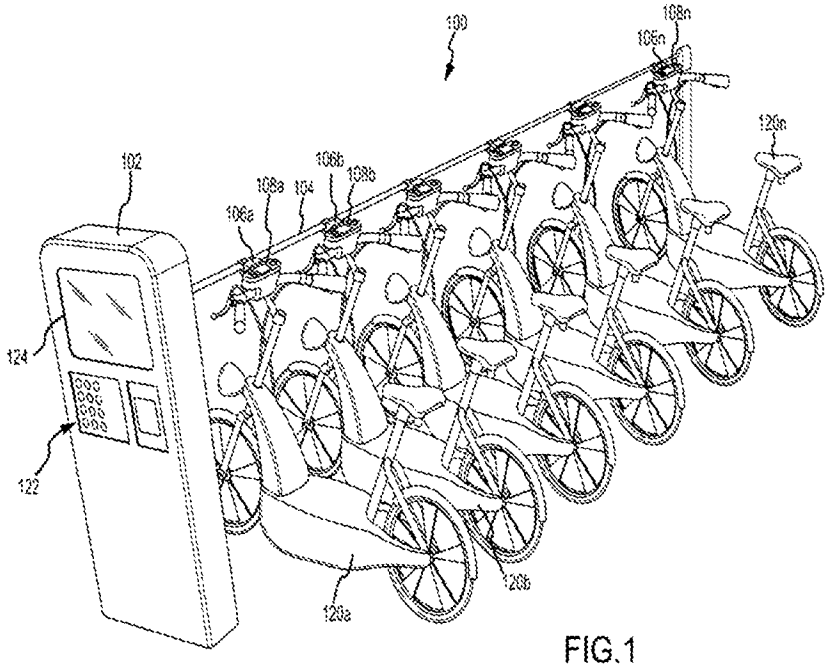

FIG.1

The portions of Morgal cited by the Examiner describe how to detect when a PEV has been plugged into a particular charging port (*see, e.g., Paragraph [0221]*) at a charging station. In particular, a charging port may report power information to a central computer, which the central computer associates with PEV identification provided to the kiosk at approximately the same time, wherein the kiosk also communicates with the central computer (*Id.*). As described in Morgal, "if multiple PEVs 602 are plugged into the system almost instantaneously, it might not be possible to positively identify which PEV 602 was plugged into which charging port 624)" (*Id.*). Accordingly, Morgal describes how halting grid power to each charging port can be used to positively identify which PEV was plugged into each charging port (*Id.*).

For example, as described in Morgal, the central computer may communicate with a PEV to halt incoming power to the PEV battery (*see, e.g., Paragraph [0222]*). When the PEV's charging power halts, the central computer can query the charging ports regarding power passing through each port. Accordingly, the charging port "that suddenly shows an interruption in charging current coinciding with the PEV 602 halting the power to its batteries could then be

suspected of supplying electric power to the PEV 602 that was requested to stop charging its batteries" (*Id.*).

It appears that the Examiner is equating the communication from the central server to the PEV as being equivalent to "receiving, at the controller, a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle," as recited in claim 31. As an initial manner, the central server in Morgal clearly is not a "portable controller." Furthermore, even if the communication in Morgal occurs between the central server and a mobile phone included in the VAP of the PEV, this mobile phone is not "remote from the vehicle" as recited in claim 31.

Additionally, claim 31 recites, among other things, "transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller, a first wireless signal including data indicative of the level of charge of the battery and data indicative of an amount of time remaining to charge the battery estimated at least partially…based upon the level of charge of the battery," "displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller," and "receiving, at the controller, a second wireless signal ***from the portable controller*** and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle" (***emphasis added***). In other words, claim 31 recites that the portable controller that displays the received level of charge is also the portable controller that is the source of a second wireless signal received at the controller. Even assuming for the pure sake of argument that Morgal discloses the mobile phone in the VAP communicating a signal for stopping battery charging (and also assuming for the pure sake of argument that this mobile phone can be equated to the claimed "portable controller," which Applicant does not concede per the above arguments), this mobile phone is not described as providing any type of display of information, but is merely described as being used for wireless communication (e.g., with the kiosk or central server). Accordingly, the "mobile phone" disclosed in Morgal is (1) not remote from the vehicle and (2) does not both display information received from a vehicle controller and provide a wireless signal to this vehicle controller for stopping charging. Pryor and Rondoni suffer from the same deficiencies and, thus, none of the cited

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references teach or suggest a portable controller as recited in claim 31, and any proposed combination of the cited references to arrive at the claimed portable controller relies on improper hindsight bias using the claims as a blueprint.

Furthermore, solely to advance prosecution and without conceding the appropriateness of the current claim rejections, Applicant hereby amends claim 31 in the present response to recite "receiving, at the controller, a second wireless signal from the portable controller *generated in response to user input received at the portable controller* and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle." As described above, to the extent the Examiner is asserting that the mobile phone disclosed in Morgal is a "portable controller," Morgal makes no mention whatsoever of any type of user input being received at the mobile phone. Furthermore, even to the extent that the central computer disclosed in Morgal transmits wireless signals halting battery charging, this transmission occurs as part of a PEV identification process, and is not described as being performed in response to any type of user input.

Accordingly, claim 31 as amended, and the claims that depend from claim 31 are allowable for at least all of the above reasons.

b. Claim 32

In the Office Action, the Examiner rejects claim 32 under 35 U.S.C. §103(a) as being unpatentable over Pryor, Rondoni, and Morgal, and further in view of U.S. Published Application No. 2008/0052145 ("Kaplan").

First, claim 32 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Kaplan fails to solve the deficiencies of Pryor, Rondoni, and Morgal as set forth above with respect to claim 31. In particular, Kaplan fails to teach or suggest, among other things, a portable controller remote from the vehicle that both displays received battery information and provides a wireless signal for stopping battery charging.

Furthermore, even assuming that Kaplan discloses that a user interface may be provided on a cell phone or portable computer, the user interface disclosed in Kaplan is only described as being used to set preferences constraints for a power aggregation scenario (power exchanges for

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electrical power), and makes no mention whatsoever of what could be included in such a user interface. Mere disclosure of a user interface on a phone is not enough to teach all possible uses or the specific use of a phone as called for in claim 32 (e.g., to display (and control) charging information). In fact, Kaplan makes no mention whatsoever of providing (1) information during charging of a battery or (2) control for stopping in-progress charging.

Accordingly, amended claim 32 is allowable for at least all of these reasons.

c. Claim 34

In the Office Action, the Examiner rejects claim 34 under 35 U.S.C. §103(a) as being unpatentable over Pryor, Rondoni, and Morgal and in further view of U.S. Published Application No. 2008/0054845 ("Wang").

Claim 34 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Wang fails to solve the deficiency of Pryor, Rondoni, and Morgal set forth above with respect to claim 31. In particular, Wang fails to teach or suggest, among other things, a portable controller remote from the vehicle that both displays received battery information and provides a wireless signal for stopping battery charging.

Accordingly, claim 34 is allowable for at least these reasons.

d. Claim 35

In the Office Action, the Examiner rejects claim 35 under 35 U.S.C. §103(a) as being unpatentable over Pryor, Rondoni, Morgal, and Wang, and further in view of U.S. Patent No. 6,963,186 ("Hobbs").

Claim 35 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Hobbs fails to solve the deficiency of Pryor, Rondoni, and Morgal set forth above with respect to claim 31. In particular, Hobbs fails to teach or suggest, among other things, a portable controller remote from the vehicle that both displays received battery information and provides a wireless signal for stopping battery charging.

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Accordingly, claim 35 is allowable for at least these reasons.

e. Claim 40

In the Office Action, the Examiner rejects claim 40 under 35 U.S.C. §103(a) as being unpatentable over Pryor, Rondoni, and Morgal and in further view of U.S. Published Application No. 2009/0313174 ("Hafner").

Claim 40 depends from claim 31 and, therefore, is allowable for at least the reasons set forth above with respect to claim 31. Furthermore, Hafner fails to solve the deficiency of Pryor, Rondoni, and Morgal set forth above with respect to claim 31. In particular, Hafner fails to teach or suggest, among other things, a portable controller remote from the vehicle that both displays received battery information and provides a wireless signal for stopping battery charging.

Accordingly, claim 40 is allowable for at least these reasons.

III. Conclusion

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

Respectfully submitted,

/molly s. lawson/

Molly S. Lawson
Reg. No. 58,890

Attorney Docket No. 013350-9003-US57
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Tesla EX1002 Page 630

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**10/03/2023 05:00:09 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Eliana Carter
PATENT CENTER #	62922055	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57_IDS_as_filed_10-03-23.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	1010 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57_IDS_as_filed_10-03-23.pdf	571A76C9DDAC233C832B960F2A32BF546532B21EA381B46E647E936A84888D66F709B1A712A31E587B8A85931B6BFDA5D938FDAA1AA16CAD7FF7F709B97185ED

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

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New International Application Filed with the USPTO as a Receiving Office

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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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
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(**Not for submission under 37 CFR 1.99)**

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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)	2023-10-03
Name/Print	Christopher B. Austin	Registration Number	41,592

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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.

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APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**10/03/2023 05:00:09 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Eliana Carter
PATENT CENTER #	62922055	AUTHORIZED BY	Christopher Austin
CUSTOMER #	23409	FILING DATE	09/21/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Christopher B. Austin

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 6504	**E202303H01009008**	**Eliana Carter**

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PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

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Application Number	Filing Date
17/949,911	September 21, 2022

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

☑ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/christopher b. austin/	Date (Optional)	October 19, 2023
Name	Christopher B. Austin		
Title	Inventor		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**10/20/2023 03:18:16 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Dorothy Hauser
PATENT CENTER #	63045899	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57 As Filed Power.pdf	1	Power of Attorney	131 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57 As Filed Power.pdf	1CEB06CCBDD85CF89A5A853895717EF2BED1D314D858A11D95424200CB5B0FEFF8D648C21EF8CD0339374683C8C25FBA39158CC879ED2A16A15CFE829D15D534

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

23409 7590 10/23/2023

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
10/23/2023	ELECTRONIC

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mkeipdocket@michaelbest.com

IPR2026-00382
Tesla EX1002 Page 642

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 17/949,911	**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 --

THE REPLY FILED 02 October 2023 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☑ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☑ The period for reply expires 3 months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection.The current period for reply expires ____ months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☑ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☑ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☑ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: See Continuation Sheet (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☑ For purposes of appeal, the proposed amendment(s):(a) ☑ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
13. ☑ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). 10/03/2023
14. ☑ Other: See pto-2323 and pto-413 forms.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
    Claim(s) allowed:21-22 and 24-30.
    Claim(s) objected to:_____.
    Claim(s) rejected:31-40.
    Claim(s) withdrawn from consideration:_____.

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Continuation of 3. NOTE: A new reference was found during the limited search that may read on the proposed claim. See interview summary.

Examiner-Initiated Interview Summary	**Application No.** 17/949,911	**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: 18 October 2023

Issues Discussed:

Proposed Amendment(s)

In response to the afcp amendment an updated search found US 20090174365 to Lowenthal which discloses a network controlled charging of electric vehicles wherein a user uses a mobile device to set up charging profiles that are connected to the vehicle via a communication link and control charging based on the user preferences such as "not charge" during high demand which the Examiner interprets as reading on the proposed amendment of a portable controller generating a user response and therefore is not considered to place the application in allowance. See at least paragraphs 0054, 0059

/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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AFCP 2.0 Decision

Application No.	Applicant(s)	
17/949,911	Austin, Christopher B.	
Examiner	**Art Unit**	**AIA (FITF) Status**
NATHANIEL R PELTON	2859	No

This is in response to the After Final Consideration Pilot request filed 02 October 2023.

1. **Improper Request** – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

   ☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.

   ☐ A non-broadening amendment to at least one independent claim was not submitted.

   ☐ The request is not the first proper AFCP 2.0 request submitted in response to the most recent final rejection.

   ☐ Other: _____

2. **Proper Request**

   A. After final amendment submitted with the request will not be treated under AFCP 2.0.
   The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.

   ☐ The after final amendment will be treated under pre-pilot procedure.

   B. Updated search and/or completed additional consideration.
   The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

   ☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.

   ☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action . See attached interview summary for further details.

   ☐ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.

   ☑ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.

   ☐ 5. Other: _____

   Examiner Note: Please attach an interview summary when necessary as described above.

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DO NOT ENTER: /N.R.P/

10/18/2023

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

In re

Patent Application of

Christopher B. Austin

Application No. 17/949,911

Filing Date: September 21, 2022

Confirmation No. 6463

Examiner: Nathaniel R. Pelton

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION"

Attorney Docket No. 013350-9003-US57

RESPONSE TO FINAL OFFICE ACTION FILED WITH REQUEST FOR CONSIDERATION UNDER AFTER-FINAL 2.0 PROGRAM

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

Commissioner:

This paper is filed in response to the final Office action dated July 25, 2023, concerning the above-identified patent application, and is filed with an After Final Consideration Pilot (AFCP) 2.0 Request. Please charge any required fees for this communication to Deposit Account No. 13-3080.

Amendments to the Claims are reflected in the Listing of Claims beginning on page 2 of this paper.

Remarks begin on page 6 of this paper.

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	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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	8704485		2014-04-22	Tsukamoto et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

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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	20090051223		2009-02-26	Woo	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

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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							☐

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]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.R.P./

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Tesla EX1002 Page 648

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

	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	10/06/2023

*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./

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Tesla EX1002 Page 649

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(**Not for submission under 37 CFR 1.99)**

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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)	2023-10-03
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 650

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.

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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57

CONFIRMATION NO. 6463

23409
MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

POA ACCEPTANCE LETTER

OC000000063709814

Date Mailed: 10/25/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/20/2023.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

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**.

/zretta/

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Tesla EX1002 Page 652

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

In re

Patent Application of

Christopher B. Austin

Application No. 17/949,911

Filing Date: September 21, 2022

Confirmation No. 6463

Examiner: Nathaniel R. Pelton

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION"

Attorney Docket No. 013350-9003-US57

RESPONSE TO FINAL OFFICE ACTION

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

Commissioner:

This paper is filed in response to the final Office action dated July 25, 2023, concerning the above-identified patent application. Please charge any required fees for this communication to Deposit Account No. 13-3080.

Amendments to the Claims are reflected in the Listing of Claims beginning on page 2 of this paper.

Remarks begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of the claims replaces all prior versions and listings of claims in the application.

1-20. (Canceled)

21. (Previously Presented) A system for charging a battery of a vehicle with a vehicular battery charger, the system comprising:

a controller configured to:

establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger,

receive a wireless signal from the portable controller,

responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and

during charging of the battery with the vehicular battery charger:

repeatedly receive at least one signal indicative of a level of charge of the battery,

repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and

repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle:

information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and

information indicative of the level of charge of the battery.

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22. (Previously Presented) The system of claim 21, wherein the display is electrically coupled to the controller.

23. (Canceled)

24. (Previously Presented) The system of claim 21, wherein the controller is further configured to display a time of day at which charging will be completed based at least in part upon the amount of time remaining to charge the battery.

25. (Previously Presented) The system of claim 21, wherein the controller is further configured to receive a second wireless signal from the portable controller and, in response to receiving the second wireless signal, stop charging of the battery of the vehicle.

26. (Previously Presented) The system of claim 21, wherein the controller is further configured to receive data indicative of a cost of power and, based on the received data indicative of the cost of power, stop charging of the battery of the vehicle.

27. (Previously Presented) The system of claim 21, wherein the controller is included in the vehicular battery charger.

28. (Previously Presented) The system of claim 21, wherein the wireless signal includes a time of day and wherein the controller is configured to supply electricity from the source of power to the battery based on the time of day.

29. (Previously Presented) The system of claim 28, wherein the time of day includes at least one selected from a group consisting of a time of day to start charging and a time of day to complete charging.

30. (Previously Presented) The system of claim 21, wherein the wireless signal includes a cost threshold and wherein the controller is configured to supply electricity from the source of power to the battery based on the cost threshold.

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31-40. (Canceled)

41. (New) The system of claim 21, wherein the portable controller is defined at least in part by a phone.

42. (New) The system of claim 21, wherein the display is a first display, and wherein the controller is further configured to display on a second display, during the charging of the battery, at least one selected from a group consisting of the information indicative of the amount of time remaining to charge the battery and the information indicative of the level of charge of the battery.

43. (New) The system of claim 42, wherein the second display is electrically coupled to the portable controller.

44. (New) The system of claim 21, wherein the controller is a first controller and the portable controller is a second controller, and wherein the first controller is configured to receive data indicative of a cost of power from a third controller remote from the vehicle and the vehicular battery charger.

45. (New) The system of claim 44, wherein the first controller is configured to receive the information indicative of the cost of power from the third controller through the second controller.

46. (New) The system of claim 21, wherein the controller is further configured to display information indicative of a cost of power on the display.

47. (New) The system of claim 46, wherein the information indicative of the cost of power includes a cost of power per unit of power.

48. (New) The system of claim 21, wherein the wireless signal includes a signal to start a manual charge of the battery.

49. (New) The system of claim 21, wherein the controller is further configured to:

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estimate a latest time of day to begin charging of the battery;

determine whether a cost of power satisfies a cost threshold; and

in response to the cost of power not satisfying the cost threshold, automatically start charging the battery based on at least the estimated latest time of day.

50. (New) The system of claim 21, wherein the wireless signal is a first wireless signal and wherein the controller is further configured to transmit a second wireless signal to the portable controller, the second wireless signal including a power interruption notification.

51. (New) The system of claim 50, wherein the power interruption notification indicates at least one selected from a group consisting of an interruption based on a cost of power, an interruption based on a demand surge, and an interruption based on a time of day.

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REMARKS

Prior to the filing of this response, claims 21-22 and 24-40 were pending in the present application. By this response, Applicant hereby cancels claims 31-40 and adds new claims 41-51. Thus, claims 21-22, 24-30, and 41-51 are pending, and Applicant respectfully requests reconsideration of the pending claims in view of the following remarks.

I. Allowable Subject Matter

In the Office action dated July 25, 2023 (the "Office Action"), the Examiner indicates that claims 21-22 and 24-30 are allowed. Applicant appreciates the Examiner's indication of allowable subject matter. In the present response, Applicant has canceled claims 31-40, which renders all of the pending claims allowable. Applicant has also added new claims 41-51 that depend from allowable claim 21. Thus, pending claims 21-22, 24-30, and 41-51 are allowable.

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

As noted in Section I, in the present response, Applicant has canceled claims 31-40 (without conceding the appropriateness of these rejections), which leaves only allowable claims 21-22, 24-30, and 41-51 pending.

III. Conclusion

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

Respectfully submitted,

/molly s. lawson/

Molly S. Lawson
Reg. No. 58,890

Michael Best & Friedrich LLP
790 North Water Street, Suite 2500
Milwaukee, Wisconsin 53202
414.271.6560

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Tesla EX1002 Page 659

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**10/25/2023 12:56:36 PM ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Dorothy Hauser
PATENT CENTER #	63077145	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Molly Lawson

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57 As Filed Response.pdf		7	-	102 KB
013350-9003-US57 As Filed Response-A.NE.pdf	(1-1)	1	Response After Final Action	90 KB
013350-9003-US57 As Filed Response-CLM.pdf	(2-5)	4	Claims	82 KB
013350-9003-US57 As Filed Response-REM.pdf	(6-7)	2	Applicant Arguments/Remarks Made in an Amendment	78 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57 As Filed Response.pdf	4DBCF4F4DB3DA052F97DC98F59D190C50AEB56F5F64859647 4416F92BFE4F982D24DEE9A7E7EDAABA3BD4DE32314CE9B0 798379B1E9D7BE59B5FC900EFB1351E
013350-9003-US57 As Filed Response-A.NE.pdf	8744DBA23CFBF08247E42B9B39D18AC420FEB36DF06603727 3F75850632A68CE7DAB387C4771D187215BE424A55E5A6C551 95A65D0105024EFE1397C756799B2
013350-9003-US57 As Filed Response-CLM.pdf	C2088133A041F95064DEA435F80441F16898233CD1204E58F28 D80C01A242402293826215C84F751ACF6529111EBE916F2123 0A253CFD5180B7E41311CA58B9E
013350-9003-US57 As Filed Response-REM.pdf	560B5381627512C5B4EAB9E6EB7642C056832FE967C0B63BA9 3E3798922AFA96E75038D05D5B6A023670D562330E06B8C730 B4C8973B7022F2A7E72BA290D23F

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.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

CPC - Searched*		
Symbol	**Date**	**Examiner**
H01M 10/44	03/21/2023	nrp
B60L 53/68,14,305,18,38,63	03/21/2023	nrp
H01M 10/44	07/19/2023	nrp
B60L 53/68,14,305,18,38,63	07/19/2023	nrp

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
320	109	03/21/2023	nrp
320	109	07/19/2023	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	03/21/2023	nrp
A.I. Similarity searches on spec and claims	03/21/2023	nrp
text searched for key concepts	03/21/2023	nrp
updated SEARCH (see attached)	07/19/2023	nrp
updated SEARCH (see attached)	10/30/2023	nrp

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	Art Unit
	NATHANIEL R PELTON	2859

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	((vehicle or auto or car or automobile)(charg$5 or recharg$5)(display$3 or lcd or monitor or led or screen)(time or period or length or long)(soc or (state adj2 charge) or charge)(wireless$2)).clm.	10/30/2023	nrp

/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

CPC						
Symbol					**Type**	**Version**
H01M	/	10	/	44	F	2013-01-01
B60L	/	53	/	14	I	2019-02-01
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
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Y02T	/	10	/	70	A	2013-01-01
Y02T	/	10	/	7072	A	2013-01-01
Y02T	/	90	/	12	A	2013-01-01
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CPC Combination Sets							
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NONE		**Total Claims Allowed:**	
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/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	30 October 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	19

U.S. Patent and Trademark Office

Part of Paper No.: 20231030

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	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)	20	
/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	30 October 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	19

U.S. Patent and Trademark Office

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	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	-	11	-	20	8	29	-	38	16	47				
-	3	-	12	1	21	9	30	-	39	17	48				
-	4	-	13	2	22	-	31	-	40	18	49				
-	5	-	14	-	23	-	32	10	41	19	50				
-	6	-	15	3	24	-	33	11	42	20	51				
-	7	-	16	4	25	-	34	12	43						
-	8	-	17	5	26	-	35	13	44						
-	9	-	18	6	27	-	36	14	45						

NONE		**Total Claims Allowed:**	
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/NATHANIEL R PELTON/ Primary Examiner, Art Unit 2859	30 October 2023	O.G. Print Claim(s)	O.G. Print Figure
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U.S. Patent and Trademark Office

Part of Paper No.: 20231030

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	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

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/949,911	Austin, Christopher B.
	Examiner	**Art Unit**
	NATHANIEL R PELTON	2859

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PE2E SEARCH - Search History (Prior Art)

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L44	33	L43 and ((first and second) near5 regulat$3)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:26 PM
L45	127	L43 and ((first and second) near5 (regulat$3 or convert$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:27 PM
L46	265	L41 and ((first and second) near5 (regulat$3 or convert$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/04/27 08:27 PM
L47	368	L45 or L46	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2016/04/27 08:27 PM

			JPO; DERWENT; IBM_TDB)				
L48	1	"US 20110175569"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/08/09 04:11 PM
L49	29042	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	ON	2016/08/09 04:17 PM
L50	8357	L49 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:19 PM
L51	16	L50 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	ON	2016/08/09 04:22 PM
L52	5	"5548200".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:23 PM
L53	1	"5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2016/08/09 04:23 PM
L54	1	"20090243549".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2016/08/09 04:32 PM
L55	10	L50 and (overrid$3 with (below or lower or less))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 04:35 PM
L56	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	ON	2016/08/09 04:39 PM
L57	2	"20020079868".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2016/08/09 05:33 PM
L58	38844	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	ON	2017/04/14 02:21 PM
L59	9252	L58 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/14 02:21 PM
L60	363	L59 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	ON	2017/04/14 02:21 PM

L61	3	"8772970".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/15 01:19 PM
L62	1	"8772970".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/15 01:20 PM
L63	3	"6963186".pn. or "20090243549".pn. or "5548200".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/16 09:33 AM
L64	1	"20020079868".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/04/16 09:48 AM
L65	38868	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	ON	2017/04/16 10:53 AM
L66	9253	L65 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/16 10:53 AM
L67	10	L66 and (overrid$3 with (below or lower or less))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/04/16 10:53 AM
L68	41747	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	ON	2017/09/30 10:39 AM
L69	9450	L68 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 10:39 AM
L70	0	L69 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	ON	2017/09/30 10:42 AM
L71	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	ON	2017/09/30 10:43 AM
L72	83	L69 and (((cost$3 or pric$3 or money) near5 (power or electricity or energy)) with (below or	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 10:59 AM

		lower or less))					
L73	2	"20040164711".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2017/09/30 11:53 AM
L74	1	"20040164711".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:53 AM
L75	171	"320".clas. and (decrypt$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:56 AM
L76	5	"320".clas. and (decrypt$3 with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 11:57 AM
L77	1	"20100076825".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:00 PM
L78	2222	(decrypt$3 with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:04 PM
L79	1513	L78 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:04 PM
L80	1216	((decrypt$3 near5 key) with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:05 PM
L81	856	L80 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:05 PM
L82	82	((decrypt$3 near5 key) with (manufacturer or supplier) with server)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:07 PM
L83	47	L82 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:07 PM
L84	242	((decrypt$3 near5 key) with (manufacturer or supplier) with request$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:13 PM
L85	131	L84 and @ad<"20110114"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2017/09/30 12:13 PM
L86	11740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L87	2157	L86 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L88	293	L87 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 09:06 AM
L89	50398	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	ON	2018/10/02 01:43 PM
L90	9772	L89 and	(US-PGPUB; USPAT;	OR	ON	ON	2018/10/02

		@ad<"20080818"	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				01:43 PM
L91	372	L90 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	ON	2018/10/02 01:43 PM
L92	1291	((decrypt$3 near5 key) with (manufacturer or supplier))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/02 05:10 PM
L93	2233	dunn.xa.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L94	1675	L93 and @ad<"20080101"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L95	1401	L93 and @ad<"20040101"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:22 PM
L96	410	(drew near2 dunn).xa.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/03 12:23 PM
L97	2033	320/109.ccls.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2018/10/03 05:09 PM
L98	53838	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	ON	2018/10/03 05:09 PM
L99	1324	(L97 or L98) 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	ON	2018/10/03 05:09 PM
L100	11740	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc. or h02j7/0088.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L101	2157	L100 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L102	293	L101 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/05 08:44 AM
L103	2	"20110175569".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2018/10/13 02:00 PM
L104	1	"20110175569".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:00 PM
L105	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:48 PM
L106	11629	320/109 or h02j7/0042.cpc. or	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:49 PM

		h02j7/0047.cpc.					
L107	4808	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:50 PM
L108	3622	(L106 or L107) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 02:50 PM
L109	194	L108 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	ON	2018/10/13 02:55 PM
L110	40433	(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	ON	2018/10/13 03:36 PM
L111	876	L110 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/10/13 03:36 PM
L112	2	"20180375175".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/06/16 03:26 PM
L113	103122	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	ON	2020/06/17 02:03 PM
L114	5602	L113 and ((coil or core or inductiv$3) near5 (position$3 or align$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/06/17 02:05 PM
L115	262	L114 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/06/17 02:05 PM
L116	6	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or US-20060276938-$ or US-20090313034-$ or US-20090243538-$).did.	(US-PGPUB)	OR	OFF	OFF	2020/09/14 08:56 AM
L117	2	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB)	OR	OFF	OFF	2020/09/14 08:58 AM
L118	4	"6963186".pn. or "20090243549".pn. or "5548200".pn. or "20090313034".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/14 08:58 AM
L119	31994	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	OFF	2020/09/14 09:02 AM

			IBM_TDB)				
L120	7985	L119 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:02 AM
L121	39132	b60l53/68,126,14,305,18,38,63.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:03 AM
L122	3591	L121 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:03 AM
L123	103	(L120 or L122) 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	OFF	2020/09/14 09:06 AM
L124	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	OFF	2020/09/14 09:32 AM
L125	6	"6983186".pn. or "5462439".pn. or "7243746".pn. or "5548200".pn. or "20070164704".pn. or "20080052145".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/14 09:32 AM
L126	93	(L120 or L122) 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	OFF	2020/09/14 09:33 AM
L127	27	(L120 or L122) and ((input$4 or user) with (time near2 day))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 09:54 AM
L128	2	"20180375175".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 10:33 AM
L129	192	(US-16056043-$ | US-3603860-$ | US-3624723-$ | US-3673379-$ | US-3740896-$ | US-3870855-$ | US-3898547-$ | US-3900784-$ | US-3911284-$ | US-4012681-$ | US-4146825-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 12:25 PM

		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-$).DID.					
L130	194	(US-16056043-$ | US- 4245640-$ | US- 4320333-$ | US- 4380725-$ | US- 4389608-$ | US- 4402524-$ | US- 4430569-$ | US- 4446680-$ | US- 4449049-$ | US- 4468605-$ | US- 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-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/09/14 12:25 PM

		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-$).DID.					
L131	1	"20190148794".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:25 AM
L132	11666	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:36 AM
L133	20499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:37 AM
L134	4231	(L132 or L133) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 09:38 AM
L135	4	"20080007202".pn. or "7243746".pn. or "5548200".pn. or "20080103370".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:03 AM
L136	10	(US-20090243549-$ 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-$).did.	(US-PGPUB)	OR	OFF	OFF	2020/09/29 10:07 AM
L137	12	(US-20090243549-$ 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-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:08 AM
L138	12	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:08 AM

		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-$).did.					
L139	1	"6983186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:09 AM
L140	1	"6963186".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 10:10 AM
L141	13	(US-20090243549-$ 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-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:10 AM
L142	1	"20080052145".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:15 AM
L143	14	(US-20090243549-$ 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	OFF	2020/09/29 10:17 AM
L144	410	L134 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 10:40 AM
L145	236	L134 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	OFF	2020/09/29 11:32 AM
L146	1	"20080103370".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 11:45 AM
L147	1551	(((data or information) near5 (progress)) with (indicator))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 11:49 AM

L148	437	L147 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 11:50 AM
L149	1	"20190148785".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 02:42 PM
L150	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	OFF	2020/09/29 02:49 PM
L151	11666	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L152	20499	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L153	4231	(L151 or L152) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 03:58 PM
L154	4	L153 and ((controller or display) near3 (on or within or built$1in) with (cord or cable or plug))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 03:58 PM
L155	1716	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/29 04:06 PM
L156	219	L155 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/29 04:07 PM
L157	1	"20070164704".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/30 08:48 AM
L158	1	"10090567".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/09/30 08:57 AM
L159	2049	((charg$5 or recharg$5) adj4 (cable or plug)) with (display or transmit$4 or reciev$3)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/30 09:03 AM
L160	2290	((charg$5 or recharg$5) adj4 (cable or plug or cord)) with (display or transmit$4 or reciev$3)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/09/30 09:03 AM
L161	328	L160 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/09/30 09:03 AM
L162	131	((Christopher) near2 (Austin)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:29 AM

L163	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	OFF	2020/10/23 09:30 AM
L164	11732	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L165	20693	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L166	4231	(L164 or L165) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/10/23 09:30 AM
L167	236	L166 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	OFF	2020/10/23 09:30 AM
L168	410	L166 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/10/23 10:35 AM
L169	133	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:14 AM
L170	11784	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L171	20795	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L172	4231	(L170 or L171) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/11/05 11:15 AM
L173	410	L172 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 11:52 AM
L174	677	L172 and ((interrupt$3 or disconnect$3) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 12:57 PM
L175	1	"10014703".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/11/05 01:03 PM
L176	19	(US-20090243549-$ or US-20080156553-$ or US-20020079868-$ or	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 09:54 AM

		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-$).did.					
L177	19	(US-20090243549-$ 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; USOCR)	OR	ON	ON	2020/12/16 09:54 AM
L178	17	L177 and ((tim$3 or length or long or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/16 09:57 AM
L179	1746	((charg$5 or recharg$5) near3 (cable or plug)) with (connected or attached) with (control$3 or display)	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:21 AM
L180	1122	vasant.in.	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L181	7	L180 and voltage and lcd	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L182	139	L180 and voltage	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 11:59 AM
L183	68	L182 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/16 11:59 AM
L184	2	"7243746".pn.	(US-PGPUB; USPAT;	OR	ON	ON	2020/12/16

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)				12:01 PM
L185	11973	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L186	21117	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L187	4231	(L185 or L186) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/16 12:18 PM
L188	410	L187 and ((cost or price) near5 (power or energy))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 12:18 PM
L189	14	g01r31/371 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	OFF	2020/12/16 02:42 PM
L190	21	g01r31/371 and (tim$3 near5 (end$3 or complet$4 or finish$3))	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 02:42 PM
L191	33	L190 or L189	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/16 02:42 PM
L192	49137	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	ON	2020/12/17 08:31 AM
L193	8033	L192 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 08:31 AM
L194	17898	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L195	5661	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L196	3727	(L194 or L195) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/12/17 08:31 AM
L197	11978	320/109 or h01m10/44.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L198	21147	b60l53/68,126,14,305,18,38,63.cpc. or h02j7/0042,0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L199	4231	(L197 or L198) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 08:31 AM
L200	5269	L199 or L193 or L196	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 08:31 AM
L201	121	L200 and ((send$3 or signal$3 or notify$3)	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 08:36 AM

		near6 interrupt$3)					
L202	861	((display$3) near6 (interrupt$3 or error or fault)) with (charg$5 or recharg$5) with (power or energy or voltage or current)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2020/12/17 09:14 AM
L203	157	L202 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 09:15 AM
L204	135906	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:45 AM
L205	103	L200 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 09:46 AM
L206	701	L204 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2020/12/17 09:46 AM
L207	791	L204 and ((send$3 or signal$3 or notify$3 or display$3) with (interrupt$3 near6 (power or energy or charg$5 or recharg$3)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:47 AM
L208	104	L207 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 09:47 AM
L209	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-	(US-PGPUB; USPAT)	OR	OFF	OFF	2020/12/17 09:51 AM

		5594318-$).did.					
L210	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2020/12/17 09:52 AM
L211	14	L204 and ((display$3 or indicat$3) near5 loss near5 (communicat$3 or signal))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:50 AM
L212	11203	((display$3 or indicat$3) near5 loss near5 (communicat$3 or signal))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:52 AM
L213	5022	L212 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:52 AM
L214	285	L213 and (charg$3 or recharg$3) and (vehicle or car or auto or automobile)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 10:56 AM
L215	194	(US-17005819-$ | US-4245640-$ | US-4320333-$ | US-4380725-$ | US-4389608-$ | US-4402524-$ | US-4430569-$ | US-4446680-$ | US-4449049-$ | US-4468605-$ | US-4591778-$ | US-4602204-$ | US-4616169-$ | US-4774449-$ | US-4873160-$ | US-4956563-$ | US-4990099-$ | US-5194799-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 11:59 AM

		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-$).DID.					
L216	162	(US-10587127-$ | US- 17005819-$ | US- 20180198289-$ | US- 3582942-$ | US- 3584893-$ | US- 3584921-$ | US- 3589692-$ | US- 3594642-$ | US- 3602881-$ | US- 3612491-$ | US- 3614564-$ | US- 3621929-$ | US- 3623159-$ | US- 3624480-$ | US- 3624482-$ | US- 3624723-$ | US- 3628284-$ | US- 3638054-$ | US- 3639896-$ | US- 3651452-$ | US- 3653729-$ | US- 3654538-$ | US- 3656135-$ | US- 3665501-$ | US- 3671843-$ | US- 3673588-$ | US- 3683624-$ | US- 3684255-$ | US- 3694890-$ | US- 3695731-$ | US- 3704446-$ | US- 3718849-$ | US- 3727994-$ | US- 3740637-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 12:00 PM

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		3746988-$ | US- 3758031-$ | US- 3758166-$ | US- 3765555-$ | US- 3767065-$ | US- 3790806-$ | US- 3792709-$ | US- 3794968-$ | US- 3800771-$ | US- 3809995-$ | US- 3811526-$ | US- 3815088-$ | US- 3828235-$ | US- 3842288-$ | US- 3848933-$ | US- 3851305-$ | US- 3866168-$ | US- 3866702-$ | US- 3867647-$ | US- 3881128-$ | US- 3898547-$ | US- 3898809-$ | US- 3900784-$ | US- 3904920-$ | US- 3906330-$ | US- 3909685-$ | US- 3916376-$ | US- 3918543-$ | US- 3952511-$ | US- 3962677-$ | US- 3962870-$ | US- 3966266-$ | US- 3973238-$ | US- 3976158-$ | US- 3988041-$ | US- 3992695-$ | US- 3997830-$ | US- 4008423-$ | US- 4010410-$ | US- 4012681-$ | US- 4019120-$ | US- 4025126-$ | US- 4033629-$ | US- 4033632-$ | US- 4034369-$ | US- 4067259-$ | US- 4078798-$ | US- 4082988-$ | US- 4086564-$ | US- 4088937-$ | US- 4089564-$ | US- 4094556-$ | US- 4109193-$ | US- 4125826-$ | US- 4127308-$ | US- 4128800-$ | US- 4139812-$ | US- 4143926-$ | US-					

		4146825-$ | US-4153168-$ | US-4156836-$ | US-4159467-$ | US-4159854-$ | US-4168866-$ | US-4207511-$ | US-4218624-$ | US-4218644-$).DID.					
L217	356	L215 or L216	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2020/12/17 12:00 PM
L218	337	((CHRISTOPHER) near2 (AUSTIN)).INV.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	OFF	OFF	2021/03/10 11:55 AM
L219	2	"20200395637".pn.	(US-PGPUB; USPAT; USOCR; DERWENT)	OR	OFF	OFF	2021/05/05 08:44 AM
L220	1	"20200395637".pn.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2021/05/05 08:45 AM
L221	21	(US-20090243549-$ 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-$ or US-20100170411-$ or US-20030015995-$).did. or (US-5548200-$ or US-7243746-$ or US-6963186-$ or US-5594318-$).did.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/05/05 10:05 AM
L222	142845	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:08 AM
L223	1842	L222 and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:08 AM
L224	220	L223 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 10:09 AM

L225	52046	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	ON	2021/05/05 11:36 AM
L226	8131	L225 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/05/05 11:36 AM
L227	19179	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L228	5910	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L229	3790	(L227 or L228) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L230	305	(L226 or L229) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/05/05 11:36 AM
L231	53599	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	ON	2021/06/23 04:13 PM
L232	8476	L231 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/06/23 04:13 PM
L233	19760	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L234	5999	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L235	3869	(L233 or L234) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L236	308	(L232 or L235) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/06/23 04:13 PM
L237	56047	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	ON	2021/08/19 09:31 AM
L238	8890	L237 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/08/19 09:31 AM

			JPO; DERWENT; IBM_TDB)				
L239	20469	320/109 or h02j7/0042.cpc. or h02j7/0047.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L240	6139	h01m10/44.cpc. or g01r31/3689.cpc.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L241	3956	(L239 or L240) and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L242	304	(L238 or L241) and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 09:31 AM
L243	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 10:14 AM
L244	1914	L243 and ((display$3 or indicat$3) near5 (time or length or duration or period) near5 (charg$5 or recharg$5))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 10:14 AM
L245	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 01:46 PM
L246	40	L245 and ((display$3 or indicat$3) near5 (input$3) near5 (delay$3 or program$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 01:46 PM
L247	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 02:58 PM
L248	4354	L247 and ((display$3 or indicat$3) near5 (input$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/19 02:58 PM
L249	457	L248 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2021/08/19 02:59 PM
L250	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 08:18 AM
L251	0	L250 and ((delay$4 near5 session) near5 (input$3))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 08:18 AM
L252	18	L250 and ((delay$4 near5 charg$5) near5	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/08/20 08:19 AM

		(input$3))	JPO; DERWENT; IBM_TDB)				
L253	151373	b60l53/$$.cpc. or b60l58/$$.cpc.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 09:39 AM
L254	46	L253 and ((delay$4 near5 charg$5) and (manual near4 (input$3 or restart$3 or stop$4)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/20 09:39 AM
L255	79223	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	ON	2021/08/23 08:43 AM
L256	15711	L255 and @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/23 08:43 AM
L257	389	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2021/08/23 08:43 AM
L258	46	("20020079868"|"20030015995"|"20030127155"|"20030209375"|"20050046387"|"20060276938"|"20070080827"|"20070144605"|"20070164704"|"20080040223"|"20080040296"|"20080052017"|"20080052145"|"20080054845"|"20080103370"|"20080156553"|"20080203973"|"20080265684"|"20080281168"|"20080296978"|"20090021213"|"20090063193"|"20090139781"|"20090237034"|"20090243538"|"20090278492"|"20090313034"|"20090313103"|"20090313174"|"20100010698"|"20100030389"|"20100081378"|"20100169008"|"20100228405"|"20100281183"|"20110266996"|"4532418"|"4742283"|"5202617"|"5311973"|"5461298"|"5462439"|"5595271"|"5650710"|"6281663"|"6421600").PN.	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/10/04 12:24 PM
L259	46	("20020079868"|"20030015995"|"20030127155	(US-PGPUB; USPAT)	OR	OFF	OFF	2021/10/08 12:54 PM

		"|"20030209375"|"2005 0046387"|"2006027693 8"|"20070080827"|"200 70144605"|"200701647 04"|"20080040223"|"20 080040296"|"20080052 017"|"20080052145"|"2 0080054845"|"2008010 3370"|"20080156553"|" 20080203973"|"200802 65684"|"20080281168"| "20080296978"|"20090 021213"|"20090063193 "|"20090139781"|"2009 0237034"|"2009024353 8"|"20090278492"|"200 90313034"|"200903131 03"|"20090313174"|"20 100010698"|"20100030 389"|"20100081378"|"2 0100169008"|"2010022 8405"|"20100281183"|" 20110266996"|"453241 8"|"4742283"|"5202617" |"5311973"|"5461298"|" 5462439"|"5595271"|"5 650710"|"6281663"|"64 21600").PN.					
L260	4	"6424158".pn. OR "7917179".pn. OR "20090063183".pn. OR "20100106631".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/01/19 11:20 AM
L261	380	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/19 12:42 PM
L263	24	((US-20080156553-A1 OR US-20080275600-A1 OR US-20080040296-A1 OR US-20100102776-A1 OR US-20110266996-A1 OR US-20070164704-A1 OR US-20080054845-A1 OR US-20090313174-A1 OR US-20080052145-A1 OR US-20080007202-A1 OR US-20090139781-A1 OR US-20100010698-A1 OR US-20100090524-A1 OR US-20090243538-A1 OR US-20090313034-A1 OR US-20060276938-A1	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/20 07:35 PM

		OR US-20020079868-A1 OR US-20090243549-A1 OR US-20100228405-A1 OR US-20090313103-A1).did. AND PGPB.dbnm.) OR ((US-5594318-A OR US-6963186-B2 OR US-7243746-B1 OR US-5548200-A).did. AND USPT.dbnm.)					
L264	7	("20060028178" OR "20070145830" OR "20080122402" OR "20090079386" OR "20090229900" OR "20090315512" OR "5646500").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/21 08:29 AM
L265	64	("20020079868" OR "20030015995" OR "20030127155" OR "20030209375" OR "20050046387" OR "20060276938" OR "20070080827" OR "20070144605" OR "20070164704" OR "20080007202" OR "20080039989" OR "20080040223" OR "20080040296" OR "20080052017" OR "20080052145" OR "20080054845" OR "20080103370" OR "20080156553" OR "20080203973" OR "20080238355" OR "20080265684" OR "20080281168" OR "20080296978" OR "20090021213" OR "20090047991" OR "20090063183" OR "20090063193" OR "20090139781" OR "20090237034" OR "20090243538" OR "20090243549" OR "20090278492" OR "20090312903" OR "20090313034" OR "20090313103" OR "20090313174" OR "20100010698" OR "20100030389" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/21 08:30 AM

		"20100081378" OR "20100106631" OR "20100169008" OR "20100228405" OR "20100281183" OR "20110266996" OR "4532418" OR "4742283" OR "5202617" OR "5311973" OR "5461298" OR "5462439" OR "5548200" OR "5594318" OR "5595271" OR "5650710" OR "6281663" OR "6421600" OR "6424158" OR "6928372" OR "6963186" OR "7243746" OR "7782021" OR "7881957" OR "7917179" OR "8193766").pn.					
L266	71	L265 OR l264	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 08:30 AM
L267	34	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time near3 remain$3) near9 display$3)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 09:57 AM
L268	6	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:31 AM
L269	1838	@ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:39 AM
L270	13	@ad<"20080818" AND ((time$1of$1day OR (time near3 day)) near4 (complet$3 OR finish$3)) near9 (charg$5 OR recharg$5)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 10:39 AM
L271	19	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((phone) near9	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/21 12:28 PM

		display$3)					
L272	5365	B60L53/68,14,305,18,38,63.cpc. AND @ad<"20080818"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/21 01:11 PM
L273	229	l272 AND ((display$3 OR indicat$3) near5 (time OR length OR duration OR period) near5 (charg$5 OR recharg$5))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/03/21 01:11 PM
L274	49	(Artificial Intelligence) Similar to: 17/949,911 with 0 CPC Selections and 0 Text Selections Text: (US-20220209313-A1 OR US-11258112-B2 OR US-20220209318-A1 OR US-20230020418-A1 OR US-11258107-B2 OR US-11482734-B2 OR US-20220238931-A1 OR US-11258108-B2 OR US-20220238928-A1 OR US-11355791-B2 OR US-20220209315-A1 OR US-11349157-B2 OR WO-2010022059-A1 OR EP-2329559-A1 OR US-20220209314-A1 OR US-20220216530-A1 OR US-20230013807-A1 OR US-20210234205-A1 OR US-20220247000-A1 OR US-11588191-B2 OR US-11515581-B2 OR US-11515582-B2 OR US-20220238929-A1 OR US-11489207-B2 OR US-20220216529-A1 OR US-20220200066-A1 OR US-20230016705-A1 OR US-11489208-B2 OR US-20220209316-A1	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

		OR US-11251471-B2 OR US-11482736-B2 OR US-20230014364-A1 OR US-20200395636-A1 OR US-11482735-B2 OR US-20210126296-A1 OR US-20220209317-A1 OR US-20210135296-A1 OR US-11258110-B2 OR US-20220246999-A1 OR US-11264652-B2 OR US-11355792-B2 OR US-11258109-B2 OR US-20200395637-A1 OR US-20230012593-A1 OR US-20190148785-A1 OR US-20190148787-A1 OR US-20190148786-A1 OR US-20110175569-A1 OR US-20190148791-A1 OR US-20190148789-A1).did.					
L275	49	(Artificial Intelligence) Similar to: 17/949,911 with 0 CPC Selections and 2 Text Selections Text: (US-20230020418-A1 OR US-20190148786-A1 OR US-11258112-B2 OR US-11489207-B2 OR US-20190148785-A1 OR US-20230016705-A1 OR US-20190148787-A1 OR JP-2010110101-A OR US-20220209318-A1 OR JP-5267050-B2 OR JP-2012244768-A OR US-20220209315-A1 OR JP-2011112617-A OR US-11482735-B2 OR US-11258108-B2 OR US-20220209313-A1 OR US-11482734-B2 OR US-11515581-B2 OR EP-2329559-A1 OR WO-2010022059-A1 OR US-20190148791-A1 OR US-20160059716-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM

		JP-2018137838-A OR KR-102013155-B1 OR KR-20110000011-A OR KR-20150022511-A OR US-11258107-B2 OR US-20210135295-A1 OR US-20220216530-A1 OR US-20200395638-A1 OR US-11355792-B2 OR US-20220238928-A1 OR US-20220247000-A1 OR JP-5328304-B2 OR JP-2010119224-A OR JP-6826320-B2 OR US-20220246999-A1 OR CN-103580093-A OR KR-101113425-B1 OR US-10090567-B2 OR JP-2016025390-A OR DE-10353839-A1 OR US-20230012593-A1 OR US-20230014364-A1 OR JP-2005253269-A OR JP-2000102104-A OR US-11349157-B2 OR KR-102048714-B1 OR US-6992464-B2 OR US-20040135548-A1).did.					
L276	73	L274 OR l275	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/03/21 01:12 PM
L277	322	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 11:40 AM
L278	24	((US-20030015995-A1 OR US-20080156553-A1 OR US-20020079868-A1 OR US-20060276938-A1 OR US-20090313034-A1 OR US-20090243538-A1 OR US-20100090524-A1 OR US-20100010698-A1 OR US-20090139781-A1 OR US-20080007202-A1 OR US-20090243549-A1 OR US-20080052145-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:09 PM

		US-20090313174-A1 OR US-20080054845-A1 OR US-20070164704-A1 OR US-20110266996-A1 OR US-20100170411-A1 OR US-20080136371-A1).did. AND PGPB.dbnm.) OR ((US-7243746-B1 OR US-6963186-B2 OR US-5594318-A OR US-5548200-A OR US-6081205-A OR US-5757595-A).did. AND USPT.dbnm.)					
L279	1	"8193766".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/19 01:11 PM
L280	31	L247 AND (((display$3 OR indicat$3) near5 (time)) WITH ((inside OR interior OR cabin OR dash) near8 (vehicle OR car OR automobile OR auto)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:37 PM
L281	1583	(((display$3 OR indicat$3) near5 (time)) WITH ((inside OR interior OR cabin OR dash) near8 (vehicle OR car OR automobile OR auto)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:37 PM
L282	1345	@ad<"20080818" AND l281	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 01:38 PM
L284	14	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND (send$3 near9 (portable OR pda OR mobile))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/07/19 02:00 PM
L286	1449	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND ((time$1of$1day OR (time near3 day) OR time) near4 (complet$3 OR finish$3))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/19 02:39 PM
L287	249	(B60l53/$$.cpc. OR b60l58/$$.cpc.) AND @ad<"20080818" AND	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2023/10/06 10:01 AM

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		((remote OR mobile) WITH (send$3 OR transmitt$3) WITH (vehicle OR car OR auto OR automobil))	DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L288	6	(cn near3 "112455286") OR cn112455286	(FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/10 09:46 AM
L289	322	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/30 08:19 AM
L290	322	L256 and ((enter$3 or input$4) near5 time)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/10/30 12:20 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	378	((vehicle or auto or car or automobile)(charg$5 or recharg$5)(display$3 or lcd or monitor or led or screen)(program$3)(time or period or length or long)(manual or user)(input$3 or switch$3 or button)).clm.	(US-PGPUB; USPAT)	AND	ON	ON	2021/08/23 10:47 AM
N257	939	((vehicle OR auto OR car OR automobile)(charg$5 OR recharg$5)(display$3 OR lcd OR monitor OR led OR screen)(time OR period OR length OR long)(soc OR (state adj2 charge) OR charge)(wireless$2)).clm.	(US-PGPUB; USPAT)	AND	ON	ON	2023/10/30 12:22 PM

PE2E SEARCH - Search History (Similarity Search)

Ref #	Sort and Retrieval Information	Text Selections	CPC Selections
L274	Sort results by: Similarity to Application # 17/949,911 Retrieve results by: Application # 17/949,911	No selections	No selections

L275	Sort results by: Similarity to Application # 17/949,911 Retrieve results by: Application # 17/949,911	(Claims) establish wireless communication with a portable controller of a user remote from the vehicle and the vehicular battery charger, receive a wireless signal from the portable controller, responsive to receiving the wireless signal, supply electricity from a source of power to the battery of the vehicle with the vehicular battery charger, and during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery, repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and repeatedly display: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and information indicative of the level of charge of the battery. (Claims) receiving, at a controller, at least one signal indicative of a level of charge of the battery; transmitting, during charging of the battery, to a portable controller remote from the vehicle and the battery charger, via a transmitter electrically coupled to the controller the at least one signal indicative of the level of charge of the battery and at least one signal indicative of an amount of time remaining to charge the battery estimated at least partially	No selections

		based at least in part upon the level of charge of the battery; displaying, on a display electrically coupled to the portable remote controller during charging of the battery, at least the level of charge of the battery received by the portable controller.	

OK TO ENTER: /N.R.P/

10/30/2023

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

In re

Patent Application of

Christopher B. Austin

Application No. 17/949,911

Filing Date: September 21, 2022

Confirmation No. 6463

Examiner: Nathaniel R. Pelton

"VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION"

Attorney Docket No. 013350-9003-US57

RESPONSE TO FINAL OFFICE ACTION

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

Commissioner:

This paper is filed in response to the final Office action dated July 25, 2023, concerning the above-identified patent application. Please charge any required fees for this communication to Deposit Account No. 13-3080.

Amendments to the Claims are reflected in the Listing of Claims beginning on page 2 of this paper.

Remarks begin on page 6 of this paper.

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

23409 7590 11/03/2023

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

EXAMINER	
PELTON, NATHANIEL R	
ART UNIT	**PAPER NUMBER**
2859	

DATE MAILED: 11/03/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

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

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	02/05/2024

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

23409 7590 11/03/2023
MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

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.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

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

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	02/05/2024

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/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 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)

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

❑ Electronic Payment via Patent Center or 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

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.

❑ Applicant asserting small entity status. See 37 CFR 1.27

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.

❑ Applicant changing to regular undiscounted fee 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. _____

IPR2026-00382
Tesla EX1002 Page 710

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

23409 7590 11/03/2023

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

EXAMINER	
PELTON, NATHANIEL R	
ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 11/03/2023

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 711

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.

IPR2026-00382
Tesla EX1002 Page 712

Notice of Allowability	Application No. 17/949,911	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 the after-final amendment filed on 10/25/2023.
   ☐ 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 21-22,24-30 and 41-51 . 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. _____.
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

DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Response to Amendment

Acknowledgment is made of the after-final amendment filed on 10/25/2023 in which claims 31-40 were canceled and dependent claims 41-51 added. Therefore, claims 21-22, 24-30, and 41-51 are pending for examination below.

Allowable Subject Matter

Claims 21-22, 24-30, and 41-51 are allowed.

Claims 21-22 and 24-30 were previously allowed and the newly added claims 41-51 depend therefrom. Since the previously rejected claims 31-40 are now canceled, the application is in condition for allowance as highlighted in the previous action.

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

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	12/29/2023 11:55:19 AM Z ET	013350-9003-US57

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Monica Reida
PATENT CENTER #	63788426	AUTHORIZED BY	Christopher Austin
CUSTOMER #	23409	FILING DATE	09/21/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Christopher B. Austin

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 0976	E2023BSB55447410	Monica Reida

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2806	SUBMISSION OF AN INFORMATION DISCLOSURE STATEMENT	104.00	1	104.00
			TOTAL AMOUNT:	$104.00

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.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**12/29/2023 11:55:19 AM Z ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Monica Reida
PATENT CENTER #	63788426	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57_IDS_as_filed_12-28-23.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	1010 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
013350-9003-US57_IDS_as_filed_12-28-23.pdf	682D0649EE1588B2F9812F9B155F1CA20ED8E73E5F77A754D83EB2E55E356D020C6AC2DEB50BA76A734B1CF5CB60D1ADAFEA5754E484B28C6043AC437B1E9F54

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/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	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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
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If you wish to add additional U.S. Patent citation information please click the Add button. Add

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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	20090174365		2009-07-09	Lowenthal et al.	

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	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]
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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]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
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	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

	1		☐

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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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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)	2023-12-28
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.

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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

23409 7590 11/03/2023
MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

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.

Elizabeth M. Campbell Tressler	(Typed or printed name)
/Elizabeth M. Campbell Tressler/	(Signature)
December 29, 2023	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

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

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	02/05/2024

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/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 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)

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

☒ Electronic Payment via Patent Center or 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

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.

❑ Applicant asserting small entity status. See 37 CFR 1.27

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.

❑ Applicant changing to regular undiscounted fee 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 12/29/23

Typed or printed name Christopher B. Austin Registration No. 41,592

IPR2026-00382
Tesla EX1002 Page 724

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	12/29/2023 06:28:13 PM Z ET	013350-9003-US57

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	6463	FILED BY	Elizabeth Tressler
PATENT CENTER #	63795731	AUTHORIZED BY	Christopher Austin
CUSTOMER #	23409	FILING DATE	09/21/2022
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Christopher B. Austin

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 3755	E2023BSI28579795	Elizabeth Tressler

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
133080	37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2501	UTILITY ISSUE FEE	480.00	1	480.00
			TOTAL AMOUNT:	$480.00

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.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/949,911	**12/29/2023 06:28:13 PM Z ET**	**013350-9003-US57**

Title of Invention

VEHICULAR BATTERY CHARGER, CHARGING SYSTEM, AND METHOD DISPLAYING CHARGE INFORMATION

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CONFIRMATION #	6463	FILED BY	Elizabeth Tressler
PATENT CENTER #	63795731	FILING DATE	09/21/2022
CUSTOMER #	23409	FIRST NAMED INVENTOR	Christopher B. Austin
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Christopher Austin

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
013350-9003-US57 Issue Fee Transmittal filed 12-29-2023.pdf	1	Issue Fee Payment (PTO-85B)	202 KB
013350-9003-US57 Comments filed 12-29-2023.pdf	2	Post Allowance Communication - Incoming	81 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

013350-9003-US57 Issue Fee Transmittal filed 12-29-2023.pdf	518985800E3716196D6F8C923B5493D73D94A07D05BBDF60AD1847C3CAF4D5DCF550ECC6E7C0155D2EC227B6B31F0FCA08F7ECD5B3243B3A8118A02954B2E15A
013350-9003-US57 Comments filed 12-29-2023.pdf	190C9E2DF7D17B1D62B9C61BE9BBAB798C337B982A156EB5E6EE0FB5ACEB2AD4442083375343B27602B0788599D15E986119FDB2FF8327B2590EC825BBA0C0E6

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.

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New International Application Filed with the USPTO as a Receiving Office

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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.: 17/949,911

Confirmation No.: 6463

Filed: September 21, 2022

"VEHICULAR BATTERY CHARGER,
CHARGING SYSTEM, AND METHOD
DISPLAYING CHARGE INFORMATION"

Atty. Docket No. 013350-9003-US57

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 November 3, 2023, and the Examiner's Reasons for Allowance set forth in the final Office Action dated July 25, 2023. In the Notice of Allowance and the final Office Action, the Examiner provides Reasons for Allowance for the allowed claims. Applicant respectfully submits that the Examiner's Reasons for Allowance refers only to certain features found in independent claim 21, and are not the only reasons why allowed claims 21-51 are allowable.

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

IPR2026-00382
Tesla EX1002 Page 730

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

23409 7590 01/19/2024

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

EXAMINER
PELTON, NATHANIEL R

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
01/19/2024	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mkeipdocket@michaelbest.com

Supplemental ***Notice of Allowability***	**Application No.** 17/949,911	**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 the IDS filed on 12/29/2023.
   ☐ 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 21-22,24-30 and 41-51 . 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 12/29/2023.
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.

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Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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IPR2026-00382
Tesla EX1002 Page 733

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17949911
	Filing Date	2022-09-21
	First Named Inventor	Christopher B. Austin
	Art Unit	2859
	Examiner Name	Nathaniel R. Pelton
	Attorney Docket Number	013350-9003-US57

	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/NATHANIEL R PELTON/	Date Considered	01/12/2024

*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./

IPR2026-00382
Tesla EX1002 Page 734

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17949911
Filing Date	2022-09-21
First Named Inventor	Christopher B. Austin
Art Unit	2859
Examiner Name	Nathaniel R. Pelton
Attorney Docket Number	013350-9003-US57

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)	2023-12-28
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.**

IPR2026-00382
Tesla EX1002 Page 735

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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.

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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.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	02/20/2024	11909011	013350-9003-US57	6463

23409 7590 01/31/2024

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

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 0 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 Center (https://patentcenter.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 Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Christopher B. Austin, Grafton, WI;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.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.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/949,911	09/21/2022	Christopher B. Austin	013350-9003-US57	6463

23409 7590 02/20/2024

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
SUITE 2500
MILWAUKEE, WI 53202

EXAMINER	
PELTON, NATHANIEL R	

ART UNIT	PAPER NUMBER
2859	

NOTIFICATION DATE	DELIVERY MODE
02/20/2024	ELECTRONIC

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.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mkeipdocket@michaelbest.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
17/949,911	20-Feb-2024	11909011

MICHAEL BEST & FRIEDRICH LLP (Mke)
790 N WATER ST
MILWAUKEE, WI 53202

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

IPR2026-00382
Tesla EX1002 Page 740

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