

PATENT APPLICATION

ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS

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CLAIM OF PRIORITY

[0001] The present invention claims priority to U.S. Provisional Patent Application No. 61/478,436, filed on April 22, 2011, and entitled Electric Vehicle (EV) Range Extending Charge Systems, Distributed Networks of Charge Kiosks, and Charge Locating Mobile Apps”, which is herein incorporated by reference.

CROSS REFERENCE TO RELATED APPLICATION

[0002] This application is related to US Patent Application No. _____ (Atty. Docket No. VOLTP002) entitled “Methods and Systems for Processing Charge Availability and Route Paths for Obtaining Charge for Electric Vehicles”, filed on the same date as the present application, and which is herein incorporated by reference.

Field of the embodiments

[0003] The present invention relates to systems and methods that enable operators of electric vehicles (EV) to extend their range by utilizing auxiliary charging batteries. Also disclosed are systems for defining a network of charge dispensing kiosks, and mobile applications for obtaining information about available dispensing kiosks, availability of charge, reservations for charge, and purchasing of charge remotely.

BACKGROUND

[0004] Electric vehicles have been utilized for transportation purposes and recreational purposes for quite some time. Electric vehicles require a battery that

powers an electric motor, and in turn propels the vehicle in the desired location. The drawback with electric vehicles is that the range provided by batteries is limited, and the infrastructure available to users of electric vehicles is substantially reduced compared to fossil fuel vehicles. For instance, fossil fuel vehicles that utilize gasoline and diesel to operate piston driven motors represent a majority of all vehicles utilized by people around the world. Consequently, fueling stations are commonplace and well distributed throughout areas of transportation, providing for easy refueling at any time. For this reason, fossil fuel vehicles are generally considered to have unlimited range, provided users refuel before their vehicles reach empty.

[0005] On the other hand, owners of electric vehicles must carefully plan their driving routes and trips around available recharging stations. For this reason, many electric vehicles on the road today are partially electric and partially fossil fuel burning. For those vehicles that are pure electric, owners usually rely on charging stations at their private residences, or specialty recharging stations. However specialty recharging stations are significantly few compared to fossil fuel stations. In fact, the scarcity of recharging stations in and around populated areas has caused owners of electric vehicles to coin the phrase “*range anxiety*,” to connote the possibility that their driving trips may be limited in range, or that the driver of the electric vehicle will be stranded without recharging options. It is this problem of range anxiety that prevents more than electric car enthusiasts from switching to pure electric cars, and abandoning their expensive fossil fuel powered vehicles.

[0006] It is in this context that embodiments of the invention arise.

SUMMARY

[0007] Embodiments are described with reference to methods and systems for providing auxiliary charging mechanisms that can be integrated or coupled to a vehicle, to supplement the main battery of a vehicle. The auxiliary charging mechanism can be in the form of an auxiliary battery compartment that can receive a plurality of charged batteries. The auxiliary battery compartment can be charged without the vehicle, and can be installed or placed in the vehicle to provide supplemental charge to the vehicles main battery. Thus, if the main battery becomes drained/used, the auxiliary battery compartment, having a plurality of charged batteries, can resume providing charge to the vehicle.

[0008] In one embodiment, the auxiliary battery compartment is configured to hold a plurality of smaller batteries, referred to herein as “volt bars.” A volt bar should also be interchangeably viewed to be a “charge unit.” The charge unit is a physical structure that holds charge, as does a battery. A charge unit can also be a fraction of charge, which may be contained in a physical structure.

[0009] Broadly speaking, a volt bar is a battery that can be inserted into an auxiliary battery carrier. The auxiliary battery carrier, or compartment, can be lifted by human and placed into a vehicle, such as the trunk of the vehicle. The auxiliary charging carrier can then be removed from the vehicle to provide charge to the volt bars contained within the auxiliary battery carrier. For instance, owners of electric vehicles can purchase an auxiliary battery carrier and fill the auxiliary battery carrier with a plurality of volt bars.

[0010] In one embodiment, the user will charge all of the volt bars by charging the auxiliary battery carrier before the auxiliary battery carrier is placed into the vehicle. In

one embodiment, the auxiliary battery carrier, and its volt bars can be charged utilizing the charge provided from the main battery. For instance, if the vehicle is charged overnight utilizing the primary charging receptacle, and the auxiliary battery carrier is connected to the vehicle (containing volt bars), the volt bars in the auxiliary battery carrier will also be charged. In one embodiment, once the main battery and the vehicle are charged, the charge will then be transferred to the volt bars contained in the auxiliary battery carrier. As such, charging the vehicle will accomplish the task of charging the main battery as well as the auxiliary battery carrier that includes a plurality of volt bars. In another embodiment, the volt bars can be directly inserted into slots defined on the vehicle itself. In this example, manufacturers will design compartments that can accept one or more volt bars, thus eliminating the need for an auxiliary battery carrier. The compartments can be on the side of a vehicle with or without a door, in the trunk, in the passenger compartment, etc. So long as volt bars can be accepted into a receptacle and the volt bar(s) can provide charge to the vehicle or auxiliary charge to the main battery, the placement of the volt bar(s) is, in one embodiment, a design configuration.

[0011] In one embodiment, the volt bars utilized in the auxiliary battery carrier can be replaced with fresh batteries purchased while the user of the electric vehicle is on a trip or a distance from the user's home base. For instance, volt bars can be sold utilizing a kiosk system. The kiosk system would, in one embodiment, store available volt bars that can be purchased by drivers of electric vehicles while away from their home base. For example, the kiosk system will provide one or a plurality of receptacles for receiving volt bars that are depleted in charge, and dispense charged volt bars to users desiring to extend the range of their trip. The kiosk, in one embodiment, will be

coupled to a power source that can then recharge the volt bars and make them available to other users that trade in their charge de-pleaded volt bars.

[0012] If the user wishes to purchase volt bar without first returning a charged the depleted volt bar, the user can be charged a separate fee that is higher than if the user had returned a depleted volt bar. The kiosk system would preferably be connected to the Internet so that users of electric vehicles could access an application that would identify locations of kiosk systems with available volt bars. In one embodiment, the application would include software that communicates with an application sitting in a central hub that manages all of the kiosk systems deployed in the field. The kiosk systems will also report the status of available volt bars, volt bars returned and in charging mode, available charging slots, inventory of volt bars, discounts available at particular kiosk systems, and potential damage to volt bars that have been returned. By compiling this information, the kiosk system can interface with the central hub, which provides information to users accessing an Internet application (mobile application), so that users can locate the closest kiosk system or the closest kiosk system having discounts.

[0013] In one embodiment, the discounts provided by the specific kiosk systems can be programmed based on the desire to sell more volt bars at certain kiosk systems with excess inventory, or to encourage virtual routing of volt bars throughout geographic regions. For example, if trends are detected by software operating on the central hub that volt bars are migrating from East to West, a depleted inventory may be found in the East. To encourage load-balancing of inventory, discounts can be provided in the West, which would then cause migration of volt bars toward the east. In one embodiment, each of the kiosk systems would be enabled with software that communicates with the central hub, and the software would be utilized to provide the

most efficient information regarding inventory, and operational statistics of each kiosk system deployed throughout a geographic region (e.g., geo-location)

[0014] In another embodiment, each kiosk system may be configured with an interface that receives payment data from the users. Example payment receipts may include credit card swiping interfaces, touchscreens for facilitating Internet payment options (PayPal), coupon verification, and communication of deals with friends through a social networking application. These applications can be facilitated by software operating at the kiosk station, or by software executing on the users mobile device, or a combination of both. In still another embodiment, each of the volt bars that are installed in the various kiosk stations will be tracked using tracking identifiers. In one embodiment, without limitation, the tracking can be facilitated using RFID tags. The RFID tags can be tracked as users purchase, return, and charge the depleted volt bars at the various kiosk stations.

[0015] Additionally, the volt bars will include memory for storing information regarding number of charges, the health of the battery cells, the current charging levels, and other information. Additionally, the volt bars can store information regarding the various kiosk stations that the volt bars have been previously been installed in, or received from. All of this information can be obtained by the software running at the kiosk station, and communicated to the central hub. The central hub can therefore use this information to monitor the health of the various volt bars and can inject new volt bars into the system at various locations when it is detected that the inventory is reaching its end of life.

[0016] In still another embodiment, the central hub can direct maintenance vehicles to remove damaged volt bars from kiosks, or insert new volt bars at certain kiosk locations. Because the central hub will know the frequency of volt bar utilization at

each of the kiosk locations, the central hub can dispatch maintenance vehicles and personnel to the most optimal location in the network of kiosk stations.

[0017] In another embodiment, a system for providing auxiliary charge to a main battery of an electric vehicles is provided. The system includes an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from within the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery. Also provided is a kiosk for storing a plurality of charge units, the kiosk having, (i) slots for storing and recharging the plurality of charge units; (ii) control systems for communicating over a network, the control system includes logic for identifying inventory of charging units in the kiosk and logic for processing payments and fee adjustments for charge units provided or received in the slots of the kiosk. The system also includes a display for providing an interface for enabling transactions to provide or receive charge units to customers. The system further provides a central processing center that communicates with, (i) a plurality of said kiosk over a network, the central processing center configured to provide for centralized rate changes to prices to charge for the charge units at each of the plurality of kiosks, wherein changing the price of the charge units is specific to each of the kiosks and is based on a plurality of metrics, including availability at each kiosk and discounts, and (ii) a plurality of vehicles, the plurality of vehicles being provided with access to availability information of charge units at each of said kiosks, the availability information being custom provided to the plurality of vehicles based on geo-location.

[0018] Another embodiment is for a method for providing charge options to drivers of electric vehicles. The method includes receiving data concerning charge providing

availability from charge locations, receiving a request from processing logic of an electric vehicle, the request identifying a desire to obtain charge, and determining a current location of the electric vehicle. The method further includes determining identification of charge locations in proximity to the electric vehicle and determining any sponsored rewards offered by the charge locations. The method communicates to the electric vehicle a path to one of the charge locations, the path identifying a sponsored reward offered at the charge location for the path.

[0019] Yet another embodiment, a computer processed method for providing charge options to drivers of electric vehicles is provided. The electric vehicles have wireless access to a computer network. The method includes receiving data concerning charge providing availability from charge locations and receiving data concerning sponsored rewards offered by the charge locations and rules for offering the sponsored rewards. The method receives a request from processing logic of an electric vehicle, and the request identifies a desire to obtain charge in route between a current location of the vehicle and a destination location. The method includes generating a plurality of paths that can be traversed by the electric vehicle between the current location and the destination location, where each of the paths identify possible charge locations at which the electric vehicle can be charged. Each of the possible charge locations identifying any sponsored rewards offered if the electric vehicle obtains charge at the possible charge locations. The method includes forwarding the plurality of paths as options to the user of the electric vehicle via a user interface. The sponsored rewards are identified to the user to enable tradeoffs between length of path and reward obtained.

BRIEF DESCRIPTION OF DRAWINGS

[0020] The invention may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

[0021] Figure 1 illustrates a broad embodiment of a vehicle having a main battery and an auxiliary battery carrier, in accordance with one embodiment of the present invention.

[0022] Figure 2 illustrates a more detailed picture of the auxiliary battery carrier, designed to receive one or more batteries (volt bars), in accordance with one embodiment of the present invention.

[0023] Figure 3 illustrates a detailed block diagram of a vehicle interfaced with an auxiliary battery carrier, and interfaced directly with a main battery of the vehicle while being interfaced with a CPU, in accordance with one embodiment of the present invention.

[0024] Figure 4 illustrates a detailed diagram of a vehicle having a main battery that is replaceable or rechargeable, and interfaced with an auxiliary battery carrier, in accordance with one embodiment of the present invention.

[0025] Figure 5 illustrates another detailed diagram of a main battery of the vehicle, partitioned into a plurality of segments, in accordance with one embodiment of the present invention.

[0026] Figure 6 illustrates a main battery of a vehicle capable of being interfaced with an auxiliary battery carrier that can receive volt bars, and can be interfaced to a power source, in accordance with one embodiment of the present invention.

[0027] Figure 7 illustrates an embodiment where the main battery is interfaced with the auxiliary battery carrier, and a CPU controls the flow of charge between the two,

depending on their level of charge, in accordance with one embodiment of the present invention.

[0028] Figure 8 illustrates another embodiment where the main battery of the vehicle is being directly charged, and the auxiliary battery is charged once the CPU detects that the main battery has been fully charged, in accordance with one embodiment of the present invention.

[0029] Figure 9 illustrates an embodiment where the auxiliary battery is triggered to start being accessed by the main battery once the main battery reaches a particular depletion level, in accordance with one embodiment of the present invention.

[0030] Figure 10 illustrates another embodiment where the main battery and the auxiliary battery are each capable of providing power to a motor directly, without transferring charge between either of the batteries, in accordance with one embodiment of the present invention.

[0031] Figure 11 illustrates an embodiment of the volt bar (battery) that is dimensionally sized to fit within a slot of the auxiliary battery carrier, in accordance with one embodiment of the present invention.

[0032] Figure 12 illustrates the auxiliary battery carrier with a plurality of slots capable of receiving one or more volt bars that will be charged once placed in one of the slots, in accordance one embodiment of the present invention.

[0033] Figure 13a illustrates a kiosk system that can receive volt bars in a used condition (depleted), can charge depleted volt bars to a suitable charge level, and can dispense fully charged volt bars from the kiosk (referred to herein as a volt box), in accordance with one embodiment of the present invention.

[0034] Figure 13b illustrates a detailed diagram of the face panel of the kiosk system of figure 13a, which represents one example interface of the kiosk, in accordance with one embodiment of the present invention.

[0035] Figure 13c illustrates one example form factor of a battery service module, that can output or receive volt bars in a service station environment (potentially alongside a conventional fossil fuel pump or nearby location), in accordance with one embodiment of the present invention.

[0036] Figure 13d illustrates an example battery service kiosk that can be expandable in a modular form by adding or subtracting kiosk units to satisfy demand at particular locations, in accordance with one embodiment of the present invention.

[0037] Figure 13e illustrates one example logic diagram for processing battery data associated with batteries received at the kiosk, batteries dispensed at the kiosk, and associated payment transactions, in accordance with one embodiment of the present invention.

[0038] Figure 14a illustrates one embodiment of an interface including a plurality of indicators at a volt box, that can receive and dispense volt bars for use by electric vehicles (in auxiliary battery carriers, or pre-manufactured slots in the vehicle), in accordance with one embodiment of the present invention.

[0039] Figure 14b illustrates another embodiment of a volt box (kiosk location) that additionally includes one or more charging cables that can be directly connected to an electric vehicles plug for efficient recharging at a remote location away from the user's base location (home), in accordance with one embodiment of the present invention.

[0040] Figure 15 illustrates an embodiment where in auxiliary battery carrier can be charged from any number of sources, and the volt bars can be used to charge and power

any number of electric vehicles, or electric equipment, in accordance with one embodiment of the present invention.

[0041] Figure 16a illustrates one embodiment of the present invention that allows for volt box location (kiosk location) tracking of inventory and tracking of movement of volt bars among the various kiosk locations (defining the service network), in accordance with one embodiment of the present invention.

[0042] Figure 16b illustrates another embodiment where volt box locations can be in communication with a central hub, where the central hub collects information regarding the number of empty, ready, charged, and otherwise utilized volt bars that can be purchased/rented by users at the volt box (kiosk) locations, in accordance with one embodiment of the present invention.

[0043] Figure 17 illustrates an example data structure and data communication transferred between a central hub and a volt box, and periodic automatic push-update of volt box memory data, in accordance one embodiment of the present invention.

[0044] Figure 18 illustrates another embodiment of a data structure (providing data) to a hub processing center (that communicates with full box stations) and the exchange of information, such as reservation data, in accordance with one embodiment of the present invention. In one embodiment, the hub is a type of central processing center, and the central processing center can have one or more processing systems and the systems can be localized or distributed and interconnected in any location in the world.

[0045] Figure 19 illustrates another embodiment of a mobile/network reservation transaction and the transfer of data between the mobile application, the hub processing center, and the memory of a volt box (computing system managing the kiosk), in accordance with one embodiment of the present invention.

[0046] Figure 20a illustrates an embodiment of logic that tracks information regarding the status of volt bars in the various kiosk stations, interfacing with mobile smart phone applications, load-balancing algorithms, and service route information, in accordance with one embodiment of the present invention.

[0047] Figure 20b illustrates an example data exchange between a volt box and the central hub for periodic updates, exception alerts and database updating including but not limited to load balancing and heat-map schemas, in accordance with one embodiment of the present invention.

[0048] Figure 20c illustrates an example data structure used in the processing, action, reply and logging of action requests from volt boxes in the field in accordance with one embodiment of the present invention.

[0049] Figure 20d describes one method of incentive driven virtual load balancing and rebalancing of volt bars in a given network of volt boxes in given regions, in accordance with one embodiment of the present invention.

[0050] Figure 21 illustrates a volt box use case in which a user requests to exchange volt bars where the number of return volt bars equal the requested volt bars, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0051] Figure 22 illustrates one method of purchase and volt bar dispensing as requested in figure 21, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0052] Figure 23 illustrates one method of volt box-to-volt box reservation with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0053] Figure 24 illustrates a volt box use case in which a user requests to purchase volt bars without exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0054] Figure 25 illustrates one method of purchase and volt bar dispensing as requested in figure 24, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0055] Figure 26 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 24 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0056] Figure 27 illustrates a volt box use case in which a user requests to purchase volt bars with an un-even volt bar exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0057] Figure 28 illustrates one method of purchase and volt bar dispensing as requested in figure 27, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0058] Figure 29 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 27 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0059] Figure 30 illustrates a volt box use case in which a user requests to return volt bars for deposit refund, as well as logic for confirming validity of the request, exception handling, in accordance with one embodiment of the present invention.

[0060] Figure 31 illustrates one method of volt bar return where the volt box used for return validates the number of volt bars requested to be returned, the condition of each volt bar tendered, validity of volt bar ownership as well as the calculation of refund, deposit of refund and service requests along with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[0061] Figure 32 illustrates a volt box use case in which a user requests to purchase charging time at a volt box location, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention.

[0062] Figure 33 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 32 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[0063] Figure 34 illustrates one method of volt box location charge time purchase, visual user cues and central hub update procedure, in accordance with one embodiment of the present invention.

[0064] Figure 35 illustrates an example instance of a computer or mobile application used for two way communication, administration, metric analysis, commerce gateway, loyalty reward status and administration among other customizable functionality

working in conjunction with the volt box network and central hub as viewed by the user and dependent on details of the user's account, in accordance with one embodiment of the present invention.

[0065] Figures 36A-36C illustrate example locations for placing an auxiliary battery in a vehicle and communication with an existing vehicle or one retrofitted to receive additional batteries of varying sizes or form factors, in accordance with one embodiment of the present invention.

[0066] Figures 37A-C illustrates internet cloud processing for route generation and charge availability, for vehicles (or internet connected devices) that connect to the cloud (e.g., network processing connected to the internet and storage), in accordance with one embodiment of the present invention.

[0067] Figure 38 illustrates an example system that monitors systems and data associated with a vehicle, and methods and systems for processing such information to provide live interactive data for informed decision making, in accordance with one embodiment of the present invention. In one embodiment, the system of Fig. 38 can rich data, including data from systems that collect operational information. Such operational information is sometimes referred to as a vehicles "black box." Thus, the data is not limited to black box data, but also data obtained from the Internet, data input by the user and data collected from car manufacturers and social networks.

[0068] Figures 39 and 40 illustrate examples of a paths taken by electric vehicles and options for receiving charge along that paths, the paths can be sponsored or not sponsored, and metrics concerning the paths are provided to drivers of the EVs, and the charge can be either connections to charge stations (for conventional charging of the

native vehicle battery) or stocking/restocking of volt bars to augment the native battery or both, in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION

[0069] Embodiments are described methods and systems for providing auxiliary charging mechanisms that can be integrated or coupled to a vehicle, to supplement the main battery of a vehicle. The auxiliary charging mechanism can be in the form of an auxiliary battery compartment that can receive a plurality of charged batteries. The auxiliary battery compartment can be charged with or without the vehicle, and can be installed or placed in the vehicle to provide supplemental charge to the vehicles main battery. Thus, if the main battery becomes depleted, the auxiliary battery compartment, having a plurality of charged batteries, can resume providing charge to the vehicle.

[0070] Figure 1 illustrates a broad embodiment of a vehicle having a main battery and an auxiliary battery carrier, in accordance with one embodiment of the present invention. As shown, a vehicle 10 is provided with a main battery 14. Main battery 14 can be installed in any configuration on a vehicle, and as shown, the main battery 14 is preferably installed near a lower section of vehicle 10. Installation of the battery 14 near the lower section (i.e., underneath section) will enable automated handling for replacement of main battery 14. For example, main battery 14 may be removed by automated handling equipment when vehicle 10 reaches a battery replacement location, or shop.

[0071] Alternatively, main battery 14 can be placed in any location suitable for ergonomic placement on, attached, or integrated with body structures of vehicle 10. Although vehicle 10 is illustrated to be a car, vehicle 10 can take on any configuration such as, a sports car, a utility car, a truck, a pickup, an industrial vehicle, a delivery vehicle, a 3 wheeled vehicle, a 2 wheeled vehicle, etc. In one embodiment, vehicle 10 can be a 100% electric vehicle, a partial electric vehicle and fossil fuel powered vehicle (hybrid), or variations thereof.

[0072] Vehicle 10 is illustrated with a charging port 17 that couples to main battery 14. Charging port 17 will enable standardized charging of vehicle 10 at designated charging stations, such as power charger 18. Power charger 18 can be installed at the vehicles home-base, or can be installed at various locations designated for charging for a fee.

[0073] In one embodiment, an auxiliary battery carrier 16 can be inserted into a compartment of the vehicle 10 and is configured for electrical connection to main battery 14. Auxiliary battery carrier 16, in one embodiment, is configured to be placed into the compartment by a human, and is configured with suitable handles for lifting the auxiliary battery carrier 16 into and out of vehicle 10. The handles can be provided on the sides of auxiliary battery carrier 16 to provide for an ergonomic lifting procedure of the auxiliary battery carrier 16 into and out of vehicle 10.

[0074] Still further, the auxiliary battery carrier 16 can be provided with wheels and an handle, so that the unit can be pulled on wheels, similar to travel luggage transport systems. For instance, the handle can be compressed or slid into a side of the auxiliary battery carrier, and when transport is needed, the handle can be extended out to allow pulling, as facilitated by wheels attached to the bottom of the auxiliary battery carrier 16.

[0075] Auxiliary battery carrier 16 may be coupled to a power charger 18 before being placed into vehicle 10. As noted above, power charger 18 can be located at the vehicle user's home or can be located at any distributed charging location throughout the globe.

[0076] In one embodiment, auxiliary battery carrier 16 can be charged by plugging a receptacle into a common wall outlet, and allowing the auxiliary battery carrier 16 to

charge all volt bars 20 contained in the auxiliary battery carrier 16 for a period of time. In one embodiment, the auxiliary battery carrier 16 can also itself include a battery cell that is rechargeable with sufficient voltage charge. In this embodiment, the auxiliary battery carrier 16 can provide charge to the vehicle 10 even when no volt bars 20 are contained within the auxiliary battery carrier 16. In another embodiment, the auxiliary battery carrier 16 will not include a battery cell, and all charge storage will be held in the respective volt bars 20 installed therein.

[0077] Auxiliary battery carrier 16, in one embodiment, can be defined from molded plastic with molded handles for ease of handling and protection of the volt bars contain therein. The molded plastic is configured, in one embodiment, to provide a rugged cushioning to the auxiliary battery carrier 16 in case of accidental dropping, accidental impacts, and overall rigidity. The molded plastic can, in one embodiment include cushioning on the exterior surfaces, and may include a lid for enclosing the volt bars 20 contained therein. As will be shown below, the auxiliary battery carrier 16 can also include plugs, cables, and interfaces for allowing interconnection with charging outlets, and interfaces with vehicle 10.

[0078] As illustrated in figure 1, auxiliary battery carrier 16 is electrically coupled to main battery 14. This illustration is, in one embodiment a logical connection between auxiliary battery 16 and main battery 14. Thus, it will be understood that the electric connection between the auxiliary battery carrier 16 and the main battery 14 can take on any configuration. Interconnections can be by way of receptacles built into vehicle 10 in the vicinity of auxiliary battery carrier 16. Interconnections can be by way of extension wires or cables that coupled to or adjacent to the charging port 17. Interconnections can be by way of circuit panel plugs that interconnect to circuitry.

[0079] Broadly speaking, the circuitry can include, in one embodiment, central processing units, logic, memory, and other electrical and/or computing modules to enable interconnections between auxiliary battery carrier 16 and main battery 14. Additionally, software can control interfaces between auxiliary battery carrier 16 and main battery 14, such as to detect the presence of auxiliary battery carrier 16, control the transfer of voltage between the auxiliary battery carrier 16 and the main battery 14, or the electric motor of vehicle 10, and to interface with electronics, modules, and communication devices that may be integrated within the auxiliary battery carrier 16.

[0080] Accordingly, it should be understood that auxiliary battery carrier 16 can be removed from vehicle 10 for charging, can be charged on vehicle 10, can be interconnected to vehicle 10, can be interconnected to standard charging port 17, and can be refilled with auxiliary batteries (volt bars) with refresh charges to extend the life of charge provided by auxiliary battery carrier 16. Thus, the placement of auxiliary battery carrier 16 on the vehicle 10 can take on any configuration, depending on the definition of the vehicle and its available storage compartments or location suitable for supporting the auxiliary battery carrier 16.

[0081] In one embodiment, the main battery 14 and the batteries that define the volt bars 20 can be constructed using any number of battery technologies, or technologies that can store charge or energy. Additionally, main battery 14 can be configured in any number of formats, and can be integrated in any portion of a vehicle. In one embodiment, any portion of the vehicle can be converted into an electric storage compartment. For example, parts of a vehicle's floorboard can define the electric storage compartment, and thus may act as main battery 14. In another embodiment, the outer shell or frame of the vehicle can be integrated with cavities or structures that are suited for storing electric power.

[0082] Thus, although main battery 14 is shown as a single unit, the placement and distribution on the vehicle can vary. Furthermore, the main battery 14 can work in conjunction with a hybrid system, that enables charging of the main battery 14 during use of the system. Charging in the hybrid vehicle can be by way of collection of energy from braking functions, or the like. Other ways of collecting energy can be by way of collecting energy from the use of the vehicle's shock absorbers. As a vehicle traverses terrain, the vehicle's shocks absorb energy and/or resist movement. These types of energy collection systems can, in one embodiment, be recollected to the main battery 14 or can be transferred to the auxiliary batteries of the vehicle.

[0083] The control of such transfer can be managed by an on-board computer and controlled by a processor. In another embodiment, the control can be carried out dynamically from a remote location. For instance, the vehicle can be connected to the internet. If local conditions change, such as the weather or type of terrain being traversed, the vehicle can be automatically controlled to transfer or collect energy from certain systems, which can be prioritized over others. Still further, solar cells on vehicles can also be configured to collect energy and such solar cells can be controlled to transfer energy to either the main battery 14 or the auxiliary battery carrier 16.

[0084] It should be understood that in addition to standard battery technology, storage of electric energy can also be accomplished using alternate or emerging technologies. One such technology is referred to as ultra-capacitor technology. Broadly speaking, an ultra-capacitor is a device for the efficient storage of power. An ultra-capacitor is also known as a double-layer capacitor, which polarizes an electrolytic solution to store energy electrostatically. Even though it is an electrochemical device, no chemical reactions are involved in its energy storage mechanism. This mechanism is highly reversible, and allows the ultra-capacitor to be charged and discharged hundreds of

thousands of times. An ultra-capacitor also has a lifetime that is greater than conventional batteries, and is resistant to changes in temperature, shock, overcharging, and provides for rapid charging. These types of batteries also require less maintenance than conventional batteries and are more environmentally friendly because they lack common toxic chemicals utilized in standard batteries.

[0085] It is anticipated that charge storage technology will continue to improve over time to provide additional charge capacity, lighter weight, and smaller form factors. As such improvements continue to evolve, the embodiments described herein which refer to “batteries,” should be broadly construed to include any type of electric fuel storage.

[0086] Figure 2 illustrates a more detailed picture of the auxiliary battery carrier, designed to receive one or more batteries (volt bars), in accordance with one embodiment of the present invention. As shown, auxiliary battery carrier 16 can include a number of slots that are defined for receiving volt bars 20. Will include charge receptacles (not shown) that will mate with complementary receptacles defined within the auxiliary battery carrier 16. Thus, charge can be transferred from volt bar 20 and auxiliary battery carrier 16 once inserted within the slots of auxiliary battery carrier 16.

[0087] It should be understood that any number of volt bar's 20 can be installed in an auxiliary battery carrier 16. The larger the auxiliary battery carrier 16 becomes, the heavier the carrier will be for human listing and installation. If the auxiliary battery carrier 16 is designed for commercial purposes, auxiliary battery carrier 16 can be defined to have a larger footprint, and can be installed using suitable machinery. For example, auxiliary battery carrier 16 can be defined for use in construction vehicles, and the number of volt bars 20 capable of being installed in a larger auxiliary battery carrier 16 can be numerous. To handle the increase in weight, specialized vehicles, or

standard construction vehicles (e.g. forklifts) can be used to lift auxiliary battery carrier 16 into and out of vehicle 10. Thus, the size of auxiliary battery carrier 16 is modular, and can be made to receive more or less volt bars 20. In still another embodiment, the size of volt bars 20 can be varied, such that larger sized volt bars 20 can be inserted into a suitably sized auxiliary battery carrier 16 having associated slots.

[0088] In still another embodiment, the volt bars 20 can be designed in ultra large-size capacity. The ultra large-size can be configured for installation into a large container. The large container can be, for example, a typical shipping container converted into a power source. The shipping container can then be delivered to specific sites for use at special events, construction sites, or the power special equipment at office space locations. The modular construction of a large container having volt bars 20 can then be managed by a separate distribution system that allows users to request and have delivered specific large containers with suitable battery capacity for the desired tasks.

[0089] In one embodiment, auxiliary battery carrier 16 can include an antenna 15. Antenna 15 can be configured to communicate with electronics and software/firmware of auxiliary battery carrier 16. Antenna 15 can be used to allow auxiliary battery carrier 16 to communicate with a remote server over the Internet, and report the status of auxiliary battery carrier 16. For example, if a user driving vehicle 10 experiences a decrease charged in main battery 14, and an associated decrease charge in auxiliary battery carrier 16, auxiliary battery carrier 16 can include firmware/hardware/software that will enable communication to a central hub.

[0090] The central hub can then generate a message that will be communicated to the driver of vehicle 10. The message can include an identification of the closest kiosk that has suitable volt bars 20 that can be purchased to replenish depleted contained in

auxiliary battery carrier 16. The user can also be provided with messages that identify special deals for obtaining volt bars, and deals for exchanging depleted volt bars. In one embodiment, the message can be communicated to the user's smart phone, a display panel on vehicle 10, or other personal electronics of the user. Communication between auxiliary battery carrier 16 and the devices utilized by the user to receive messages can be managed using any number of protocols, such as Wi-Media, near field communication (NFC), Wi-Fi, Bluetooth, radio communication, wired communication, etc.

[0091] Figure 3 illustrates a detailed block diagram of a vehicle interfaced with an auxiliary battery carrier, and interfaced directly with a main battery of the vehicle while being interfaced with a CPU, in accordance with one embodiment of the present invention.

[0092] Vehicle 12 can include a number of standard components, as well as components for interfacing with the auxiliary battery carrier 16. As shown, the vehicle can be provided with charge via a power charger 18 by connection to charging port 17. Main battery 14 is connected to auxiliary battery carrier 16 by way of a power interface 29. In one embodiment, data interface 22 is associated with each Main battery 14 and auxiliary battery 16. Data interface 22 provides the link by which a central processing unit (CPU) 31 can communicate with main battery 14 and the auxiliary battery carrier 16. For purposes of general description, it should be understood that CPU 31 can be defined in any number of form factors and configurations.

[0093] For instance, CPU 31 can be part of a digital signal processor, a printed circuit board with circuitry, general logic, logic and memory, firmware, or circuitry that can sense the status of the main battery 14 and auxiliary battery carrier 16, and can communicate data to other modules or circuitry. Broadly speaking, some link or

interconnection is provided between main battery 22 and auxiliary battery carrier 16, so that appropriate interfaces can be made between the batteries, in one embodiment of the present invention. Power interface 29 can provide the interface for exchanging charge between the charge contained in ancillary battery carrier 16 and the main battery 14, as will be described in more detail below. Auxiliary battery carrier 16 is shown capable of receiving a plurality of volt bars 20, and can be equipped with an antenna 15 for communicating with a remote server or with circuitry/software of vehicle 12.

[0094] Continuing with the description of components that may be part of an electric vehicle 12, a motor controller 30 is shown interfacing with main battery 14. Motor controller 30 be shown interfacing with electric motor 30, and electric motor 30 is shown interfacing with transmission 34. Transmission 34 is shown interfacing with differential 36, which interfaces with the wheels 38.

[0095] The general description of components/parts of vehicle 12 are provided as exemplary components only, and shall not limit other configurations of electric vehicles that may include additional components/parts or omit certain components/parts. In general, vehicle 12 should be configured with sufficient components and infrastructure to enable main battery 14 and/or auxiliary battery carrier 16 (and volt bars 20) to provide power to vehicle 12 to enable propulsion in the desired direction.

[0096] Figure 4 illustrates a detailed diagram of a vehicle having a main battery that is replaceable or rechargeable, and interfaced with an auxiliary battery carrier, in accordance with one embodiment of the present invention.

[0097] As shown, figure 4 illustrates an embodiment where the main battery of a vehicle can be replaced from a location defined under the vehicle. The main battery 14 can be coupled to the auxiliary battery carrier 16 by way of power interface 29. Power interface 29 is also coupled to the motor controller 30 that interfaces with the electric

motor 32 of the vehicle. As shown, the volt bars 20 are independently chargeable and can be hand insertable and removed from the auxiliary battery carrier 16, depending on the needs of the vehicle.

[0098] Also illustrated is antenna 15 that can be integrated with the auxiliary battery carrier 16 for communication of status associated with auxiliary battery carrier 16. It is noted herein that antenna 15, being coupled to the auxiliary battery carrier 16 allows for independent communication by the auxiliary battery carrier 16, separate from any communication being performed by the vehicles electronics or communication systems.

[0099] By separating these two communications systems, it is possible for communication between the auxiliary battery carrier and distributed hubs that managed the availability of volt bars throughout the network, without interference by communications systems of the vehicle. Additionally, by separating the communications systems of auxiliary battery carrier 16 from the vehicle, it is possible for the auxiliary battery carrier 16 to independently communicate with the central hub when the auxiliary battery carrier is in or out of the vehicle.

[00100] Figure 5 illustrates another detailed diagram of a main battery of the vehicle, partitioned into a plurality of segments, in accordance with one embodiment of the present invention. In this embodiment, the main battery 14 of the vehicle 12 is partitioned into a plurality of insertable and removable battery segments 14a-14d. Although only four segments are shown, it is possible for the partitioning to be performed in any number of segments. By segmenting the main battery, it is possible for a battery charge detector and selector to replace only those segments that need replacing.

[00101] For example, if the vehicle 12 drives into a battery changing station, the battery changing station can have a system of replacement actuators 52a-52d, that can connect to the various main battery segments 14, and facilitate removal and replacement with a fresh battery. In the example shown, the replacement actuators 52 each include sensors 54a-54d that coupled to each of the main battery segments 14. The sensors are configured to communicate with a control interface defined at a surface of the main battery segments. The control interface will communicate with a computer 56 through a port 50 which will identify the charging level of the various battery segments. If a particular battery segments is substantially full, that battery segment will be allowed to remain in the vehicle.

[00102] Alternatively, if a particular battery segment is only partially depleted, the driver will be given the option to replace the battery segment with a fresh fully charged battery segment. In one embodiment, the vehicle owner will be given a credit for the remaining battery charge left in the battery segment, so that the vehicle owner will be charged only for that charge that is purchased. For example, if main battery segment 14b is only 12% charged, if that battery segment is replaced, the driver will be charged for the charge value of 88%. In still another embodiment, when the user of the vehicle drives into the battery replenishment station, a control system dashboard can be presented to the user of the vehicle to allow the user to enter into a display screen how much battery replacement is desired.

[00103] For instance, if the driver the vehicle only wants to spend to replace one battery segment at that particular time due to budgetary issues, only one segment can be replaced. By segmenting the main battery, and providing options to the user of the vehicle, the user is provided with more flexibility of only charging the main battery with the amount of charge they desire to pay for at any particular time. In still another

embodiment, while the main battery is being replaced in a segmented manner, it is possible for vehicle 12 also be coupled to a receptacle that charges the auxiliary battery carrier 16, and its volt bars 20 contained therein. In still another embodiment, the volt bars can be manually replaced at the station during the charging of the main battery 14.

[00104] Alternatively, the battery changing station can also automatically remove volt bars from a compartment of the vehicle and reinsert charged volt bars into the vehicle at the same time or during the same session of replacing or charging of the main battery. Accordingly, the flexibility of charging, and partitioning batteries out of vehicle will provide users with more options for charging, depending on their driving necessities, and targeted budgets.

[00105] Additionally, by providing display screens to the users to allow selection of their desired charging parameters at a charging station, the user will have control over which battery sections, segments, volt bars, or systems will be recharged (whether completely recharged or partially recharged), and may credit users for any charge remaining on a particular battery segment when a new battery segment is reinserted into the vehicle.

[00106] Figure 6 illustrates a main battery of a vehicle capable of being interfaced with an auxiliary battery carrier that can receive volt bars, and can be interfaced to a power source, in accordance with one embodiment of the present invention.

[00107] In this embodiment, the main battery 14 is shown having a power interface 29b, that couples to a power interface 29a of the auxiliary battery carrier 16. Coupling of the power interfaces 29 will occur when the auxiliary battery carrier 16 is coupled to the vehicle. As illustrated, the main battery 14 is coupled to a charging port

17. The charging port 17 will typically be the charging outlet on the vehicle that will receive a connector that couples to power. For example, in a home configuration, the receptacle can be provided with a connection to the power grid of the home. The receptacle is then connected to the charging port 17 of the vehicle when charging of the vehicles main battery 14 is desired.

[00108] As shown, a plurality of volt bars 20 can be inserted or removed from the auxiliary battery carrier 16. The volt bars 20, when inserted in the auxiliary battery carrier 16, can be charged when the auxiliary battery carrier 16 is connected to a power source by way of a connector 22. Over time, the volt bars can be replaced with new volt bars, or volt bars purchased at kiosk locations throughout a charging network of volt bars and dispensing units. As noted before, an antenna 15 can be provided with auxiliary battery carrier 16 to enable independent communication by the auxiliary battery carrier 16 to a central hub over the Internet. The central hub, although identified as "central," can be defined by a plurality of distributed hubs located in a cloud network topology that may include private, public or hybrid cloud technologies that are installed throughout a particular territory.

[00109] For example, one network of central hubs can be distributed throughout a particular continent of the globe, a particular country, a particular county, a particular state, or particular city. A larger scale interconnected network can then manage the distributed central hubs to allow interchange of information and transfer of volt bars to the desired kiosk locations depending on need and depending on the flow patterns of the volt bars 20. As described herein, flow patterns mean that volt bars when picked up at certain kiosk locations will then be dropped off at other kiosk locations. If more people pickup volt bars at particular locations and travel in the same direction, more volt bars will gather at that direction where volt bars travel the most.

Thus, because volt bars can be tracked, it is possible to define and track the flow patterns of the volt bars throughout the network.

[00110] Figure 7 illustrates an embodiment where the main battery is interfaced with the auxiliary battery carrier, and a CPU controls the flow of charge between the two, depending on their level of charge, in accordance with one embodiment of the present invention. In this embodiment, the main battery 14 is shown having a low charging level, and the auxiliary battery carrier 16 is shown having a higher charging level. In one embodiment, is possible for the auxiliary battery carrier 16 to transfer charged to the main battery 14 during operation. Control of the charging flow between the auxiliary battery carrier 16 and the main battery 14 can be by way of a central processing unit 31. The central processing unit 31 is generally shown as a block diagram.

[00111] However, it should be understood that central processing unit 31 can include any number of electronics, control systems, and software for coupling the auxiliary battery carrier 16 to the main battery 14. The coupling can be by way of connectors between the auxiliary battery carrier 16 and connectors on the vehicle, which then interface to main battery 14.

[00112] Figure 8 illustrates another embodiment where the main battery of the vehicle is being directly charged, and the auxiliary battery is charged once the CPU detects that the main battery has been fully charged, in accordance with one embodiment of the present invention. As shown, the charge level in the main battery 14 is completely full, as power charger has been delivered to the charging port 17 of main battery 14. In this embodiment, charge flow can be directed from the main battery 14 to the auxiliary battery carrier 16.

[00113] Again, CPU 31 can be used to control the charge flow between the main battery 14 and auxiliary battery carrier 16. In some embodiments, CPU 31 will direct that no charge between the two systems will occur, and the auxiliary battery carrier will directly supply charge to the electric motor for power. As such, it is not necessary that the auxiliary battery carrier be directly or indirectly connected to main battery 14, as vehicles can provide their own separate connection between the auxiliary battery carrier 16 and the electric motor. It is again noted that the auxiliary battery carrier 16 can be integrated as part of the car, by way of a plurality of slots defined in some compartment on the vehicle. Those particular slots can then be coupled to the electric motor, or coupled to the main battery, or both.

[00114] Figure 9 illustrates an embodiment where the auxiliary battery is triggered to start being accessed by the main battery once the main battery reaches a particular depletion level, in accordance with one embodiment of the present invention. In this embodiment, the control systems can trigger that the auxiliary battery carrier 16 is accessed by the main battery 14 for additional charged only when the main battery 14 reaches a threshold. In this example, $\frac{1}{4}$ charge or less will trigger the transfer of charge. Of course, it should be understood that any threshold value can be set, and $\frac{1}{4}$ is only an example for illustrating the monitoring of charge contained in each of main battery 14 an auxiliary battery 16. In still another embodiment, additional charge bars 20 can be inserted into auxiliary battery carrier 16 at any particular point in time.

[00115] Figure 10 illustrates another embodiment where the main battery and the auxiliary battery are each capable of providing power to a motor directly, without transferring charge between either of the batteries, in accordance with one embodiment of the present invention.

[00116] Figure 11 illustrates an embodiment of the volt bar (battery) that is dimensionally sized to fit within a slot of the auxiliary battery carrier, in accordance with one embodiment of the present invention. In this example, a particular volt bar 20 can include various dimensional sides. A particular volt bar 20 can be provided with advertisements from various sponsors in physical, static or electronically and dynamically delivered form, and can include charge indicators 21, LED buttons, RF ID for transmission and receiving, and can include a slider protector 25. The slider protector 25 is configured to protect the electrodes 21a and 21b. The slider is configured to be slid up to expose the electrodes when the volt bar is inserted into the auxiliary battery carrier 16 or into a slot of the vehicle. The advertisement can also change dynamically by way of an LED screen, and can change based on codes provided by transmissions received from the antenna of the auxiliary battery carrier 16. The dimensional sizes of a volt bar 20 can change depending on the form factor of the carrier, or the form factor of the slots in the vehicle.

[00117] Additionally, various slider technology, or connector technology can be used to allow exposure of the electrodes when necessary for connection with the auxiliary battery carrier or the receiving slot such as direct contact or wireless charge and discharge technologies. Accordingly, the form factor illustrated here in is only provided as one example. Other examples can include form factor such as tubular form factors, elongated form factors, cylinder form factors, etc. the charge indicator 21 can be provided in the form of a digital display, a plurality of LEDs, or a mechanical indicator.

[00118] The LED buttons can also provide information regarding the health of the volt bar, the life of the volt bar, serial numbers of the volt bar and other information. The RFID can be used to track the when volt bar 20 is inserted into and out of auxiliary

battery carriers, or received from or inserted into kiosk locations, and can be tracked globally for their movement around the network. When a volt bar reaches its lifespan, a kiosk will confiscate the volt bar so that further introduction into the network can be prevented. Confiscated volt bars can then be replaced by service technicians.

[00119] Figure 12 illustrates the auxiliary battery carrier with a plurality of slots capable of receiving one or more volt bars that will be charged once placed in one of the slots, in accordance one embodiment of the present invention. In this example, the auxiliary battery carrier is shown receiving a particular volt bar 20. A universal plug can be provided on the auxiliary battery carrier 16 that will allow connection to a charging station. Alternatively, a cable 27 can be used to connect to a power outlet, or connect directly to the vehicle. The power outlet can be a basic outlet plug 27 to allow connection to any standardized plug for receiving electrical power. When the auxiliary battery carrier 16 is full of volt bars 20, the volt bars contained within auxiliary battery carrier 16 can be charged.

[00120] Figure 13a illustrates a kiosk system that can receive volt bars in a used condition (depleted), can charge depleted volt bars to a suitable charge level, and can dispense fully charged volt bars from the kiosk (referred to herein as a volt box), in accordance with one embodiment of the present invention. As illustrated, a kiosk location is shown, and is referred to herein as a volt box. The volt box is an expandable charging station 60. The charging station 60 can also include direct charging ports 60b and can include a plurality of slots for dispensing volt bars 20 in section 60a. The volt box can include a screen 64 for allowing a user to interface with the kiosk location and allow the user to purchase any number of volt bars. A payment interface 66 is also provided to allow user to purchase the volt bars.

[00121] Charging stations 60 can also be deployed as a mobile unit the can be dropped off at any particular location, such as a storefront, or outside of a big box chain store. Once dropped off they can be deployed, connected to the Internet, and can be powering the volt bars inserted therein. Charge can be received by the electrical grid, a gas generator, a fuel-cell generator, solar panels, or can be charged from a service charging vehicle. The kiosk will include a service ports 61 that will allow service technicians to empty volt bars that have been confiscated as they may have reached their lifespan, or insert new volt bars when the kiosk location is less than full or is in need of additional volt bars due to flow patterns that drive volt bars to other kiosk locations.

[00122] As shown, direct charging ports 60b include a retractable charging cord 73 with a charging plug so that vehicles can drive up and receive charge from the kiosk location, those charging their main battery. At the same time, the user can purchase any number of volt bars for use in their auxiliary battery carrier 16 or in preformed slots defined on the vehicle itself. An antenna 62 is also shown providing the volt box access to communicate with the network of other volt boxes, and/or the central hub. By providing this communication, it is possible the track how full or empty the volt box charging station is, and service vehicles can be deployed to replenish, and/or service the particular charging stations 60.

[00123] As illustrated, charging is performed through a plurality of interfaces 74, or a single interface 74, depending on the configuration and location of the volt box station in the deployed network.

[00124] Figure 13b illustrates a detailed diagram of the face panel of the kiosk system of figure 13a, which represents one example interface of the kiosk, in accordance with one embodiment of the present invention. The indicator lights or

insignias can be provided on the face of the kiosk location to indicate the charging level of the particular volt bars inserted therein. In some cases, volt bars inserted into slots will only be partially charged, and thus will not be available for purchase. Light indicators can be provided to illustrate which volt bars can be removed from the kiosk location. In another embodiment, the volt bars are mechanically pulled into the kiosk location and served to the user in a dispensing manner.

[00125] The dispensing system can then be handled internally to the volt box so that a single slot is provided for receiving used volt bars and dispensing new volt bars. As such, users approaching a kiosk location may empty the used volt bars from their auxiliary battery carrier and insert them into the kiosk location to receive a credit for the volt bar unit. If the credit is received by returning a user volt bar, the user is only charged a nominal fee for the charge when a new or recharged volt bar is dispensed.

[00126] Figure 13c illustrates one example form factor of a battery service module, that can output or receive volt bars in a service station environment (potentially alongside a conventional fossil fuel pump or nearby location), in accordance with one embodiment of the present invention.

[00127] Figure 13d illustrates an example battery service kiosk, that can be expandable in a modular form by adding or subtracting kiosk units to satisfy demand at particular locations, in accordance with one embodiment of the present invention. In this example, kiosk locations can be added in a connected manner to existing kiosk locations to expand the capacity of the modular system. By doing this, one kiosk can include the display interface 105, the battery in slot 109, the battery out slot 111, and the card swipe/ pin pad 107 information.

[00128] Figure 13e illustrates one example logic diagram for processing battery data associated with batteries received at the kiosk, batteries dispensed at the kiosk, and associated payment transactions, in accordance with one embodiment of the present invention. This example shows a battery management system 60c, that includes several subsystems. A battery processing system 200 is shown including a control system 213. The control system 213 is coupled to a plurality of modules that control the receiving and dispensing of volt bars at a particular kiosk location, in one example. As shown, the battery processing system 200 includes a battery hold module 205, a battery charge module 207, a battery diagnostic module 203, a battery in queuing module 201, a battery auxiliary service module 209, and a battery out queuing module 211.

[00129] These systems are then connected to the battery service module or battery service kiosk 60. As shown, the battery in slot 109 is coupled to the battery in queuing module 201. When the battery is received, the battery is then put through a battery diagnostic module 203 where the battery diagnostic module will determine if the battery should be held or confiscated by battery hold module 205. If the battery is in good condition, the battery charge module 207 will charge the battery and allow the battery to be dispensed to a battery out queuing module 211, which in turn allows the battery to be output by the battery out slot 111. Again, the control systems described herein are only representative of one example and the control systems for receiving used or uncharged volt bars and dispensing new volt bars at particular kiosk locations can be modified to account for the volume of volt bars being dispensed, the form factor of the kiosk location, and other factors.

[00130] Figure 14a illustrates one embodiment of an interface including a plurality of indicators at a volt box, that can receive and dispense volt bars for use by electric vehicles (in auxiliary battery carriers, or pre-manufactured slots in the vehicle),

in accordance with one embodiment of the present invention. As shown, an example of a volt box 60a having a plurality of volt bars is shown. Depleted volt bars 20 can be inserted into open slots, while users can purchase and remove charged volt bars from ready slots. The volt bars can then be inserted into an auxiliary battery carrier 16 that are external to the car or integrated within the car, or can be placed into the car.

[00131] Figure 14b illustrates another embodiment of a volt box (kiosk location) that additionally includes one or more charging cables that can be directly connected to an electric vehicles plug for efficient recharging at a remote location away from the user's base location (home), in accordance with one embodiment of the present invention.

[00132] Figure 15 illustrates an embodiment where in auxiliary battery carrier can be charged from any number of sources, and the volt bars can be used to charge and power any number of electric vehicles, or electric equipment, in accordance with one embodiment of the present invention. This example shows that the power source can be delivered to any number of vehicles or appliances that consume electric power. A volt box 16 can be charged from various power sources, and can be inserted into various transportation vehicles, or appliances. The examples shown are various cars, motorcycles, home appliances, mobile appliances, recreational appliances, general lighting equipment, emergency lighting equipment, or charging power sources.

[00133] Figure 16a illustrates one embodiment of the present invention that allows for volt box location (kiosk location) tracking of inventory and tracking of movement of volt bars among the various kiosk locations (defining the service network), in accordance with one embodiment of the present invention.

[00134] Figure 16b illustrates another embodiment where volt box locations can be in communication with a central hub, where the central hub collects information regarding the number of empty, ready, charged, and otherwise utilized volt bars they can be purchased/rented by users at the volt box (kiosk) locations, in accordance with one embodiment of the present invention. This example illustrates how a hub processing center 302 couples to a service network 300. The hub processing center at 302 will include a number of operational units. The units can include payment servers 306, reservation servers 310, volt box unit interface servers 304, load balancing and heat mapping engines 308, mobile application interface servers 312, service and service route optimization engines 314, interfaces through wide area networks and local area networks and private/public/hybrid cloud infrastructures 316, and databases 318. The payment servers receive payments from the users and redeem payments from payment interface businesses.

[00135] The reservation servers 310 will allow users to reserve volt bars at particular volt box kiosk locations ahead of time. This ensures that users are able to obtain their volt bars at the destination they are approaching or have discovered that volt bars are available. By allowing users to advance reserve volt bars, users arriving at the kiosk location will not be discouraged if they find out that the volt bars that were indicated to be available are no longer available.

[00136] The load balancing and heat map engine 308 is configured to track the flow patterns of the volt bars around a particular network. If volt bars are accumulating at particular kiosk locations, the load-balancing engine can institute discounts at particular kiosk locations to influence the automatic distribution of the volt bars to other locations where volt bars are in short supply, or move volt bars away from locations where volt bars are accumulating. The heat map can identified in real time

the movement of volt bars by tracking the RFID's on the various volt bars as they traverse the locations in the network.

[00137] For instance, as volt bars are removed from vehicles and inserted into kiosk locations, the volt bars can be analyzed to see where the volt bar originated, and where the volt bars have been from a historical mapping perspective. If volt bars appear to accumulate more in a particular location, the heat map will indicate a higher heat level, or indicator of where volt bars may be accumulating. The mobile application interface can then relay this information to users who are attempting to locate volt bars in the network. The mobile application interface server is configured to provide information to users on smart phones, or similar devices, or computer interfaces connected to the Internet.

[00138] An application can then track the user's current location and can inform the user of the closest kiosk location for obtaining a volt bar. The user can be provided with options to purchase an advance reserve the volt bars from those locations. The user can also be provided with discounts if the heat map desires to move certain volt box inventory away from certain kiosk locations to other kiosk locations. The discounts can influence users to obtain volt bars from certain volt boxes as opposed to others, thus automatically load-balancing the distribution of volt bars throughout the network.

[00139] Having information of the locations with volt bars, the status of volt bars, and the flow patterns, the service and service route optimization engine 314 can direct service agents to the most efficient locations to provide service. The service can include replacing volt bars that are identified to be past their useful life, replenish volt bars, and/or service the kiosk infrastructure. As shown in figure 16a, the various volt box locations 60 can be tracked using GPS information, address information, or

previously defined location information. IP address locations and cell tower accessing can also be used.

[00140] Accordingly, the hub processing unit 302 is intelligently interfaced with the network to allow management of the various kiosk locations and ensure efficient distribution of volt bars to the various vehicles, and to provide information to users through mobile devices, computer interfaces, and allow for efficient and ease of purchase and reservation when volt bars are desired. By providing this information to users in a dynamic manner, users of electric vehicles will not be challenged with range anxiety when operating their electric vehicles from location to location throughout the globe.

[00141] Knowing that kiosk locations are available, and their ability to reserve, purchase, or identify availability of volt bars, and associated discounts, users are empowered with information that will enable efficient purchasing and utilization of energy for their electric vehicles. Social networks can also be accessed to determine if any comments or referrals are being made about specific locations, or if problems are being experienced at certain locations. Social networks can also be tapped to identify if certain locations are liked over other locations, and if certain features are particularly good or fall below some accepted standard.

[00142] Figure 17 illustrates an example data structure and data communication transferred between a central hub and a volt box, and periodic automatic push-update of volt box memory data, in accordance one embodiment of the present invention. This embodiment shows that each location can be managed and the quantity of volt bars each location can be tracked by the central processing hub, to efficiently utilize the volt bars throughout the network. As shown, the volt box locations (kiosk locations) can be

distributed throughout a city at different street addresses. Service personnel can then be routed to the specific streets of a city to perform the servicing operations.

[00143] The most efficient routes can then be predefined for the service technicians so that service can be made at each volt box location. This embodiment illustrates that each volt box location 60 can collect a plurality of data that can be relayed to the hub processing center 302. Based on the information collected by the hub processing center 302, on-demand information can be provided to the system for setting the price of each volt bar, and other parameters at specific volt box locations.

[00144] For example, the periodic updates can be pushed to the volt box memory data so that the charging stations can provide efficient pricing information, and adjustments based on market conditions. Memory 60-1 illustrates the various information data that can be stored at the volt box 60, and communicated to the hub processing center 302.

[00145] Figure 18 illustrates another embodiment of a data structure (providing data) to a hub processing center (that communicates with full box stations) and the exchange of information, such as reservation data, in accordance with one embodiment of the present invention. This example illustrates a generic reservation push update of the volt box memory data. In this example, reservation data can be pushed to the volt box when obtained by the hub processing center 302. As noted above, when users reserve volt bars at specific volt box locations, the volt box locations need to update their information so that the reservation can be set.

[00146] Figure 19 illustrates another embodiment of a mobile/network reservation transaction and the transfer of data between the mobile application, the hub processing center, and the memory of a volt box (computing system managing the

kiosk), in accordance with one embodiment of the present invention. In this example, the mobile/network reservation push update is made to the volt box memory data. For example, a reservation request data from another volt box can be received or from a computer or mobile application in step 330. The hub processing center 302 will then receive this information from the memory and will be in communication with the memory of the volt box to reserve resources for the given time limit. The reservation data is received from 320, in response to the setting by the hub processing center 302.

[00147] Figure 20a illustrates an embodiment of logic that tracks information regarding the status of volt bars in the various kiosk stations, interfacing with mobile smart phone applications, load-balancing algorithms, and service route information, in accordance with one embodiment of the present invention. This also illustrates an example of the processing of volt bars, such as managing damaged volt bars 402 and generating a route for pickup 404, when service operations are performed. Empty volt bar information 406 can then be communicated to a load balancer 410. The load balancer 410 can also receive information from ready charged volt bars 408. This information can then be communicated to a mobile smart phone application 412. Logic can then be processed in operation 414, to deploy pickup of volt bars or redistribution of volt bars.

[00148] The redistribution or pickup can then be managed by a route generator 416 where replacement of damaged volt bars 420 can occur during a route. In still another embodiment, the price can be adjusted in real time to encourage or discourage use of particular kiosk locations by module 418. Mobile notifications can also be generated to customers of particular sales or discounts based on the desired encouragement to move or flow volt bars to or from specific kiosk location is s by module 422. System 400 is provided as an example of the management systems that

can controlled to achieve specific load-balancing, notifications, and management communications to users of the network.

[00149] Figure 20b illustrates an example data exchange between a volt box and the central hub for periodic updates, exception alerts and database updating including but not limited to load balancing and heat-map schemas, in accordance with one embodiment of the present invention. In this specific process 450, the volt box uses a network including but not limited to cellular, WAN, LAN and or satellite to attempt to establish a connection with a server in the central hub in 452. The connection request sent to the server in 454 enters into a queue for processing.

[00150] When the server acknowledges the requesting volt box's connection attempt, the server will send identification and security information requirements back to the volt box in 456. The requesting volt box then sends the identification and security information requested by the server in 458 to establish the network handshake and commence data exchange described in 460. Once data exchange channels are open between the volt box and the server, the volt box sends an action code to the server, 462, at which point the server in 464 will determine if the code sent by the volt box is a routine check-in code. If the code sent by the volt box to the server is not a routine check-in code, the server will receive the code as exception data in 476 and subsequently tag the volt box that sent the code for service and update all dependant systems in 480.

[00151] If the code sent to the server in 462 and checked in 464 was a routine check-in code then the routine check in status on the sever is updated and the server subsequently sends update data to the requesting volt box's memory with up to date information. Data stores pertaining to the requesting volt box on the central processing hub and servers are updated after either a routine check-in code or an exception code

has been successfully processed by the server, 470. Additional dependant systems and schemas are updated to provide the most up to date aggregate data and reporting after each and every individual volt box is updated in 472. When all updating has completed the connection between the requesting volt box and the server is closed, 474.

[00152] Figure 20c illustrates an example data structure used in the processing, action, reply and logging of action requests from volt boxes in the field in accordance with one embodiment of the present invention. The data structure and communication shown describes how a plurality of volt boxes, 60, communicates to a data structure within the hub processing center that receives action requests in an organized fashion for processing.

[00153] Logic at the hub processing center cycles through data segments in the data structure to individually address action requests using methodologies including but not limited to first-in-last-out, last-in-first-out, priority queuing, and weighted fair queuing. After the hub processing center processes an action request, a sync is performed with the volt box that sent the now processed action request. Additionally, an action request history storage data structure and database is updated with details specific to each processed action request such as identifying information for the requesting volt box, action requested, action performed, when it was performed and any additional notes, data points, tracking and reporting necessary to catalog and warehouse data related to action request handling.

[00154] Figure 20d describes one method of incentive driven virtual load balancing and rebalancing of volt bars in a given network of volt boxes in given regions, in accordance with one embodiment of the present invention. In this example of the embodiment, regions are shown to work in conjunction with one another for load balancing of volt bars. Three regions are shown with varying number of volt bars

located in aggregate total from the entirety of volt boxes designated as residing within the given region.

[00155] Region 1 shows to have 51,375 volt bars while region 3 only holds 15,200 volt bars. In order to maintain a steady inventory of volt bars across all regions, each volt box will advertise an incentive to exchange, purchase or drop off volt bars at a volt box in a region that is running low on volt bar inventory. When the inventory in a certain region is low as compared to other regions, volt boxes in that particular region may de-incentive consumers by raising the price of volt bars at a volt box accordingly.

[00156] Volt bar inventory may run low or high for a variety of reasons such as high demand due to a high traffic event close by or low demand due to a bedroom community in which most commuters are away for most of the day. Pricing will fluctuate to stabilize and load balance the availability of volt bars across all regions. Regions may be comprised of sub regions or be part of a larger regions. Regions also have the ability to become part of other regions dynamically and similarly individual volt boxes may be assigned to any given region based on demand, load balancing and strategy.

[00157] Figure 21 illustrates a volt box use case in which a user requests to exchange volt bars where the number of return volt bars equal the requested volt bars, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention. This example embodiment is described by flow 500 with continuation B on Figure 22 and continuation C on Figure 23. In this example of the embodiment, a user requests to exchange volt bars at a volt box where the amount of fully charged volt bars requested equal the amount of discharged or spent volt bars the user will deposit into the volt box in 502. The user will enter the amount of volt bars

required for their transaction and the system will determine, 504 if there are sufficient fully charged volt bars available to fill the user's request.

[00158] If there are enough fully charged volt bars to fill the users order, a transaction price along with an escrow price will be calculated presented to the user. The transaction price will be based on a successful transaction in which the same amount of fully charged volt bars tendered to the user equals the discharged volt bars deposited. If the user fails to deposit any amount of volt bars required to successfully complete the transaction, a penalty fee will be deducted from the escrow paid by the user in 510. If the user does not accept the quote and pricing offered by the volt box, 514, the user proceeds to 512.

[00159] If the volt box in 514 determines that the user has accepted the pricing presented in 510 (see fig 22), the volt box will ask for payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 522. Alternatively, if the user is reserving/purchasing volt bars via application on a network connected device, payment will be taken over the network as well. The volt box will then determine in 524 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 526. If the user does not opt to try again the use case ends. In one embodiment, the volt box and network servers are updated with transaction results data.

[00160] If the payment is successful initially or after subsequent attempts in 524, then the volt box, volt box kiosk or application on a network connected device will make the number of fully charged volt bars available for removal of the volt box and designate their location in the volt box either visually and or audibly in 528. The user then performs the exchange in 530 where the user's spent volt bars are deposited into

the same bays, available bays, slots or mechanism for depositing volt bars. The volt box then communicates with the volt bars via RFID or other wired or wireless communication method to determine if the correct amounts of depleted volt bars have been deposited in 532. The volt box also gathers information regarding the state of each volt bar at the time of deposit.

[00161] After the deposit has been completed, the volt box calculates if there is a refund due to the user or if the transaction has been completed in 534. If the volt box determines that damaged volt bars have been detected, an exception code is sent to the server at the processing hub that tags the volt box for volt bar replacement service. The volt box communicates data to the server about the transaction including but not limited to where the volt bars were tendered, the charge cycles the volt bar has completed, the user(s) the volt bar has been used by and other identifying information for reporting metrics and data warehousing.

[00162] The volt box then places the bay(s) containing the damaged volt bar(s) out of service as well as the volt bar(s) themselves by deactivating them. If no volt bars in 536 were determined to be damaged the use case ends after the server on the volt box network is updated with pertinent information regarding the transaction. If at 504 the volt box, volt box kiosk or application on a network connected device determines there are not sufficient fully charged volt bars at the volt box to fill the user's order, the volt box interface will suggest the user request the available maximum volt bars from the volt box in 506. If the new quantity is accepted in 508 then the user continues to 510.

[00163] If the user does not accept the new quantity of available fully charged volt bars available for transaction, the volt box will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested volt bar exchange quantity. The volt box will use incentive, load

balancing information from the server at the processing hub to display the user's options sorted by price, distance and or both in 512. The volt box in 516 will suggest the best value or incentives option for the user and allow the user to reserve the volt bars at the location described by the volt box in 516. If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and a server may be updated.

[00164] However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars requested at the volt box location indicated for the user while the user tenders payment in 520. (see fig 23) The volt box will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 540. The volt box will then determine in 542 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 544. If the user does not opt to try again the volt box will notify the server at the processing hub to release the volt bars from reservation at the target volt box to make them available in the general pool of reservable / exchangeable/ purchasable volt bars in 546.

[00165] If the payment is successful initially or after subsequent attempts in 542, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars for at least a pre determined number of minutes or hours in 548. The volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction. In one embodiment, the volt box network will update the user's account with reservation data accessible through any network connected device to view

metrics and data related to all interactions the user has with the volt box network. When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 550.

[00166] If the user does not perform the transaction at the target volt box within the allotted time, the volt bars will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action. In one embodiment, a server may be updated.

[00167] Figure 22 illustrates one method of purchase and volt bar dispensing as requested in figure 21, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00168] Figure 23 illustrates one method of volt box-to-volt box reservation with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[00169] Figure 24 illustrates a volt box use case in which a user requests to purchase volt bars without exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention. In this example, flow 600 can continue to D on Figure 25 and continue to E on Figure 26. In this example of the embodiment, a user requests to purchase volt bars at a volt box without tendering spent volt bars in 602. The user will enter the amount of volt bars the user wishes to purchase and the system will determine, 604 if there are sufficient fully

charged volt bars available to fill the user's request. If there are enough fully charged volt bars to fill the users order, a transaction price along with an escrow price will be calculated presented to the user.

[00170] The transaction price will be based on the number of fully charged volt bars requested by the user using the latest pricing information from the volt box network in 610. If the user does not accept the quote and pricing offered by the volt box, 614, the user proceeds to 612. If the volt box in 614 determines that the user has accepted the pricing presented in 610 (see, fig 25) the volt box will ask for payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 622. Alternatively, if the user is reserving/purchasing volt bars via application on a network connected device, payment will be taken over the network as well.

[00171] The volt box will then determine in 624 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 626. If the user does not opt to try again the use case ends. In one embodiment, the volt box and network servers are updated with transaction results data. If the payment is successful initially or after subsequent attempts in 624, then the volt box, volt box kiosk or application on a network connected device will make the number of fully charged volt bars available for removal of the volt box and designate their location in the volt box either visually and or audibly in 628. The user then removes the volt bars from the volt box in 630. After the removal of volt bars is complete, the volt box calculates if there is a refund due to the user or if the transaction has been completed in 632. After removal at 630 and calculation at 632 is complete, the volt box updates the volt box network

with the results of the transaction to update all dependant data structures, data stores and data warehouses, 634.

[00172] If at 604 the volt box, volt box kiosk or application on a network connected device determines there are not sufficient fully charged volt bars at the volt box to fill the user's order, the volt box interface will suggest the user request the available maximum volt bars from the volt box in 606. If the new quantity is accepted in 608 then the user continues to 610. If the user does not accept the new quantity of available fully charged volt bars available for transaction, the volt box will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested volt bar quantity. The volt box will use incentive, load balancing information from the volt box network to display the user's options sorted by price, distance and or both in 612. The volt box in 616 will suggest the best value or incentives option for the user and allow the user to reserve the volt bars at the location described by the volt box in 616.

[00173] If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and the server may be updated. However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars requested at the volt box location indicated for the user while the user tenders payment in 620. (see fig 26) The volt box will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 636. The volt box will then determine in 638 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 640. If the user does not opt to try again the volt box will notify the server at the processing hub to release the volt bars from reservation at the target volt

box to make them available in the general pool of reservable/ exchangeable/ purchasable volt bars in 642.

[00174] If the payment is successful initially or after subsequent attempts in 638, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars for at least a pre determined number of minutes or hours in 644. The volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction.

[00175] Additionally, the volt box network may update the user's account with reservation data accessible through any network connected device to view metrics and data related to all interactions the user has with the volt box network. When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 646.

[00176] If the user does not perform the transaction at the target volt box within the allotted time, the volt bars will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action, and the servers may be updated.

[00177] Figure 25 illustrates one method of purchase and volt bar dispensing as requested in figure 24, communication of volt bar with volt box and damage detection with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00178] Figure 26 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 24 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[00179] Figure 27 illustrates a volt box use case in which a user requests to purchase volt bars with an un-even volt bar exchange, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention by flow 700 with continuation to F on Figure 28 and continuation to G on Figure 29. In this example of the embodiment, a user requests to exchange volt bars at a volt box where the amount of fully charged volt bars requested does not equal the amount of discharged or spent volt bars the user will deposit into the volt box in 702.

[00180] The user will enter the amount of volt bars he or she would like to purchase along with the amount of spent volt bars he or she will be depositing into the volt box and the system will determine, 704 if there are sufficient fully charged volt bars available to fill the user's request and if the volt box has the capability to capture the amount of spent volt bars the user wishes to deposit. If the volt box can fill the order for the user, a transaction price along with an escrow price will be calculated presented to the user.

[00181] The transaction price will be based on a successful transaction in which the user receives the amount of volt bars they require and deposit the amount of spent volt bars they indicated they wished to turn into the volt box. The volt box will determine if a penalty fee will be deducted from the escrow paid by the user in 710 or if a refund is required after the actual transaction takes place using the information gathered at this point. If the user does not accept the quote and pricing offered by the volt box, 714, the user proceeds to 712. If the volt box in 714 determines that the user

has accepted the pricing presented in 710 (see, fig 28), the volt box will ask for payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 722. Alternatively, if the user is reserving/purchasing volt bars via application on a network connected device, payment will be taken over the network as well. The volt box will then determine in 724 if the payment was successful.

[00182] If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 726. If the user does not opt to try again the use case ends, and the volt box and network servers may be updated with transaction results data. If the payment is successful initially or after subsequent attempts in 724, then the volt box, volt box kiosk or application on a network connected device will make the number of fully charged volt bars available for removal of the volt box and designate their location in the volt box either visually and or audibly in 728. The user then performs the exchange in 730 where the user's spent volt bars are deposited into the same bays, available bays, slots or mechanism for depositing volt bars.

[00183] The volt box then communicates with the volt bars via RFID or other wired or wireless communication method to determine if the correct amounts of depleted volt bars have been deposited in 732. The volt box also gathers information regarding the state of each volt bar at the time of deposit. After the deposit has been completed, the volt box calculates if there is a refund or penalty is due to the user or if the transaction has been completed in 734. If the volt box determines that damaged volt bars have been detected, an exception code is sent to the server at the processing hub that tags the volt box for volt bar replacement service. The volt box communicates data to the server about the transaction including but not limited to where the volt bars were

tendered, the charge cycles the volt bar has completed, the user(s) the volt bar has been used by and other identifying information for reporting metrics and data warehousing. The volt box then places the bay(s) containing the damaged volt bar(s) out of service as well as the volt bar(s) themselves by deactivating them. If no volt bars in 736 were determined to be damaged the use case ends after the server on the volt box network is updated with the transaction results.

[00184] If at 704 the volt box, volt box kiosk or application on a network connected device determines the requested volt bar/ return volt bar combination is not available to fill the user's order, the volt box interface will suggest the user request the best available combination currently available at the volt box. 706. If the new quantity is accepted in 708 then the user continues to 710. If the user does not accept the new quantity combination for the transaction, the volt box will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested volt bar exchange combination quantity. The volt box will use incentive, load balancing information from the server at the processing hub to display the user's options sorted by price, distance and or both in 712. The volt box in 716 will suggest the best value or incentives option for the user and allow the user to reserve the volt bars at the location described by the volt box in 716.

[00185] If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and the server may be updated. However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars requested at the volt box location indicated for the user while the user tenders payment in 720. (see fig 29) The volt box will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 740. The volt box will

then determine in 742 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 744. If the user does not opt to try again the volt box will notify the server at the processing hub to release the volt bars from reservation at the target volt box to make them available in the general pool of reservable/ exchangeable/ purchasable volt bars in 746. If the payment is successful initially or after subsequent attempts in 742, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars for at least a pre determined number of minutes or hours in 748. The volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction.

[00186] In one embodiment, the volt box network may update the user's account with reservation data accessible through any network connected device to view metrics and data related to all interactions the user has with the volt box network. When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 750. If the user does not perform the transaction at the target volt box within the allotted time, the volt bars will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action, and the servers may be updated.

[00187] Figure 28 illustrates one method of purchase and volt bar dispensing as requested in figure 27, communication of volt bar with volt box and damage detection

with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00188] Figure 29 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 27 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention

[00189] Figure 30 illustrates a volt box use case in which a user requests to return volt bars for deposit refund, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention by flow 800 with continuation to H on Figure 31. In this example, a user requests to return volt bars to a volt box in varying stages of charge for a refund. The return of the volt bar to a volt box may be triggered by a variety of reasons in 802 including but not limited to, exchange for a fully charge volt bar, return for a refund, defective volt bar return, transaction where the user wishes to purchase a certain amount of volt bars and return an certain amount of volt bars where the amounts do not necessarily require to match.

[00190] The user deposits volt bars they have previously purchased at a volt box in 806 at which point the volt box communicates with the volt bars that were tendered in 808. The volt bar deposit aggregate information is collected in 810 including the amount of volt bars deposited among other metrics. The volt box system then cycles through 1-n volt bars deposited processing each one individually in 836 while the number of volt bars left to process is greater than 0. For each volt bar in 838 the volt box will determine if the volt bar tendered is operational or if it is malfunctioning form. If the volt bar is malfunctioning, the volt box uses additional data collected from the volt bar and the volt box network in 840 to determine if the volt bar is within a reasonable charge/discharge life span. If the volt bar is determined to be

reasonably malfunctioning, the user is refunded their escrow previously paid to remove the at one point fully charged volt bar from a volt box.

[00191] If the volt bar is malfunctioning and is not reasonably at the end of its life, the user is alerted and to volt box network server is updated with the issue data and logging information in 844 for the user to follow up to determine why the volt box did not provide a refund in 848. The volt box then tags itself using the volt box network for service and alerts the hub processing center to add the volt box to the service routing system in 850. If the volt bar in 838 was not malfunctioning at the time of deposit, the system will determine if the volt bar has been reported stolen in 842. If the volt bar is determined to be stolen using information gathered from the volt bar in conjunction with information gathered from the server at the hub processing center using the volt box network, then the user proceeds to 844.

[00192] However, if at 842 the volt bar is determined to not be stolen, the volt box in 846 will confirm that the volt bar meets the criteria for escrow refund. If the volt bar does not meet the refund criteria, the user proceeds to 844. However, if the volt bar passes all tests and is determined in 846 to qualify for a refund in 846, a refund is provided for the user by adding it to his or her volt box credit account, credit card or voucher in 852.

[00193] Figure 31 illustrates one method of volt bar return where the volt box used for return validates the number of volt bars requested to be returned, the condition of each volt bar tendered, validity of volt bar ownership as well as the calculation of refund, deposit of refund and service requests along with transaction results transmitted to the central hub, in accordance with one embodiment of the present invention.

[00194] Figure 32 illustrates a volt box use case in which a user requests to purchase charging time at a volt box location, as well as logic for confirming validity of the request, exception handling, re-routing of the request and remote reservation for the request, in accordance with one embodiment of the present invention by flow 900 with continuation to J on Figure 34 and continuation to K on Figure 33. In this example of the embodiment, a user requests to purchase charging time at a volt box charging station where one or more charging stations are present at a given location in 902 through a central kiosk transaction and payment system.

[00195] If the kiosk determines that at least one of the charging stations at the particular site is available in 904, a transaction price determined and displayed in a form including but not limited to price per time unit, price per volt, price per watt or price per amp of charging will be calculated and displayed to the user based on a floating pricing system using an incentive based load balancing algorithm on the volt box network server in 908. If the user does not accept the quote and pricing offered by the volt box, 908, the user proceeds to 912. If the volt box in 914 determines that the user has accepted the pricing presented in 908, (see fig. 34) the volt box will ask for payment for either a specific amount of time or units the user has requested or pre-qualifies the user using a credit card for a maximum transaction and waits to determine final time or units actually consumed to charge the users account. Alternatively, the user may simply pay cash and the charge purchased with the amount of cash will dispense until the units or time has elapsed.

[00196] The volt box charging station kiosk will allow payment in one of the available forms including but not limited to cash, NFC, credit, pre-paid volt box code or a volt box credit account number in 934. Alternatively, if the user is reserving/purchasing charging units via application on a network connected device,

payment will be taken over the network as well. The volt box will then determine in 936 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try to tender payment again in 938. If the user does not opt to try again the use case ends, and the volt box and network servers may be updated with transaction results data. If the payment is successful initially or after subsequent attempts in 936, then the volt box, volt box kiosk or application on a network connected device will make the charging station available for use and designate their location in the volt box charging station either visually and or audibly in 940.

[00197] The user then performs the connection 942 between the charging station via charging cord to a volt bar auxiliary battery unit or directly to the vehicle's main battery. While charging is progressing in 944, the volt box charging station communicates the current status of the charging station to the server on the volt box network to communicate metrics including but not limited to busy status, free status, estimated wait time and efficiency among other identifying and measurable data and again at the conclusion of the transaction. If at 904 the volt box, volt box kiosk or application on a network connected device determines there are no charging stations available, the volt box interface will suggest the user enter a queue and display an estimated wait time in 906. If the user accepts entering a queue in 910, the user proceeds to 908. If the user does not accept to enter a queue and agree to the estimated wait time, the volt box interface will calculate and display using information from the volt box network which of the nearest volt box locations can fill the users requested charging requirements and provide the option to rent a volt bar to reach the location, the volt bar rental quantity determined by the distance to the target charging station in 912.

[00198] The volt box interface will also use incentive, load balancing information from the server at the processing hub to display the user's options sorted by price, distance and or both in 912. The volt box interface in 916 will suggest the best value or incentives option for the user and allow the user to reserve the charging time/units and or volt bars at the location described by the volt box interface in 916. If the user does not reserve the volt bars suggested by the volt box the use case ends without further action, and the server may be updated. However, if the user does accept one of the qualifying volt box transaction sites, the volt box sends a request to the volt box reservation system to hold the volt bars and or charging station requested at the volt box location indicated for the user while the user tenders payment in 920 (see fig. 33).

[00199] The volt box interface will ask for payment in one of the available forms including but not limited to cash, pre-paid volt box code or a volt box account number in 920. The volt box interface will then determine in 924 if the payment was successful. If the payment was not successful, the volt box or application on a network connected device will give the user the option to try again in 926. If the user does not opt to try again the volt box, volt box kiosk or application on a network connected device will notify the server at the processing hub to release the charging station and or volt bars from reservation at the target volt box to make them available in the general pool of reservable/ exchangeable/ purchasable volt bars in 928.

[00200] If the payment is successful initially or after subsequent attempts in 924, then the volt box, volt box kiosk or application on a network connected device where the payment transaction in was completed will send a confirmation to the target volt box through the volt box network to retain the requested amount of volt bars and or charging station for at least a pre determined number of minutes or hours in 930. The

volt box will also produce a code for the user to take to the target volt box to redeem the pre purchased volt bar transaction. In one embodiment, the volt box network may update the user's account with reservation data accessible through any network connected device to view metrics and data related to all interactions the user has with the volt box network.

[00201] When the user arrives at the target volt box holding reservation data for the user's transaction, the user will enter the code to redeem his or her transaction. The volt box will compare the code to code data on the server through the network to determine the validity and dispense as needed in 932. If the user does not perform the transaction at the target volt box within the allotted time, the volt bars and or charging station will be released into the available pool and the user will be credited. After the user performs his or her transaction the use case ends without further action.

[00202] Figure 33 illustrates one method of volt box-to-volt box reservation for the requested transaction in figure 32 with pre-payment and reservation completion through the central hub, in accordance with one embodiment of the present invention.

[00203] Figure 34 illustrates one method of volt box location charge time purchase, visual user cues and central hub update procedure, in accordance with one embodiment of the present invention.

[00204] Figure 35 illustrates and example instance of a computer, mobile application or network connected device used for two way communication, administration, metric analysis, commerce gateway, loyalty reward status and administration among other customizable functionality working in conjunction with the volt box network and central hub as viewed by the user and dependent on details of the user's account, in accordance with one embodiment of the present invention.

[00205] This example illustrates a smart phone or network connected device operating system 1000 having a plurality of applications. One application could be a volt box application 1002. When the user selects to run the volt box, the volt box application can produce a number of screens. For example my volt box screen can include general information 1004 regarding the status of a user's current volt bars, the range provided by my volt bars, the closest volt box to my current location, the deals of the day a particular ZIP code or region, any reservations I wish to make, the gifts they can be made to friends, referrals to and for friends to purchase volt bars, upgrades to volt bar infrastructure, hardware configuration upgrades or replacements, loyalty points, history information of my purchases, and the carbon footprint produced by the utilization of my volt bars.

[00206] Other information screens can also provide the total battery capability of each particular volt bar in a user's auxiliary battery carrier or slots on my vehicle 1006. Additional information can also include a carbon footprint graph 1010 showing the utilization of the user's volt bars, and the efficient utilization and purchasing of volt bars without requiring inefficient retrieval of volt bars. For example, if users obtain volt bars from locations that are near their current location or need, users reduce the amount of travel time to simply secure volt bars.

[00207] This reduction in travel time will cut down the carbon footprint produced by the simple act of obtaining the volt bars. Mapping functions can also be used. Maps 1014 can also be overlaid with social networking data, to provide additional real-time information about charge locations, deals, coupons, pricing, and liked kiosk locations. Newsfeed data can also be accessed from various networks to provide rich data back to the user's application. The application can be run on any smart device, and the device can have access to cloud processing for immediate data

interfacing and/or local storage. Data can also be gathered from other internet sources, such as Wikipedias, Internet search sites etc., and data can be processed, compiled and presented back to the user's mobile device, vehicle display, etc. The application would also allow the user to remotely find, reserve and make purchases for a target volt box, any number of volt bars or charging time/units based on distance, price, zip code etc. in 1012.

[00208] Further information can also include loyalty points 1016 for purchases at various kiosk locations, and show bonuses provided to users that frequently utilize the volt bars. Additional dynamic information 1008 can be provided through the applications such as suggested travel speeds to conserve energy, maps for routing, better dynamic traffic information based on real-time information, and other settings. The user can also access heat map sourced deals 1018 to show where the network has decided that volt bars are accumulating and special discounts are being provided, coupon sharing, pricing, upgrade deals, and access to social networks to communicate deals to friends.

[00209] The deals to friends can be provided by way of a map that identifies the location of your friends and the possibility of giving your friend special points or the receipt of loyalty points for referring friends to specific kiosk locations. Additionally, ride sharing programs can also identify locations where people can be picked up if users desire to travel to the same location or same general area. All of these features can be integrated into the mobile app and internet website portals.

[00210] By providing this dynamic status information to users, users are better able to identify kiosk locations to obtain volt bars, and charge, as users traverse distances utilizing their electric vehicles. Range anxiety will thus be all but eliminated. Informed users and the ability to access charge when needed, solves these problems.

[00211] Figures 36-38 illustrate examples of an auxiliary battery being inserted into a compartment of a vehicle, in accordance with one embodiment of the present invention. In this illustration, the auxiliary battery can be installed into a trunk space of a vehicle, and the trunk space can have a compartment in the floor of the trunk. The top surface of the auxiliary battery can provide the surface of the trunk, instead of the previously defined surface. In one embodiment, auxiliary battery is a single unit that is installed into a compartment.

[00212] In other embodiments, the auxiliary battery can be one compartment that has multiple smaller compartments for receiving volt bars (charging units), or other battery type charging devices. Further, the auxiliary battery is shown interconnected to the main battery of the vehicle, or to a battery distribution or charge distribution handling unit. In other embodiments, the auxiliary battery can be inserted into side panels of the vehicle, in the front compartment of the vehicle, the floorboard of the vehicle, the site support structure of the vehicle, etc.

[00213] Figure 37A illustrates an example of cloud processing technology, which provides processing resources to connected vehicles through a distributed network. In one embodiment, the cloud processing can communicate with various charging stations using Internet connections, where charge Station metrics can be uploaded to the cloud processing system. The charge Station metrics can include availability of charge pumps, charge handles, charge plugs, charge mats (for wireless charging), volt bars, or other charge providing facilities.

[00214] Examples of such metrics can include the number of charge pumps available at particular period of time, historical availability times of the charge pumps, typical charge time estimates at particular charging stations, prices associated with the charge at the particular charging stations, feedback from customers through social

networks, concerning the charging stations, and the like. The cloud processing can then process the charge Station status, traffic information associated with locations around or between charging stations and a user's current location, and provide specific suggested routes. The route generator can provide guided routes to the various charging stations (e.g., charge locations), based on the users immediate needs, desire for discounts, sponsored rewards, or the amount of time it will take to obtain access to a charge pump at a particular point in time. Broadly speaking, a discount is a reward and a reward is a discount, and a sponsored reward is a discount that is at least partially paid by another party for a the benefit of the recipient of the reward.

[00215] The driver location processor can communicate the information concerning drivers to the cloud processing logic, so as to provide the most effective information concerning charge availability to the various drivers. As illustrated in figure 37A, various drivers that communicate with the cloud processing unit can (e.g., over the internet wirelessly) be provided with specific routes or route options. For example, users in their particular vehicles may have a connected display or a portable device having access to the Internet. Based on the users location and charging needs, (and optionally the destination) the user can be provided with route options (e.g., one or more optional paths). The route options can be, for example, the fastest and most available charge Station (or charge providing devices) to the users current location, the cheapest charge available at a particular point in time, or information regarding charge prices for a particular future point in time.

[00216] Once the user selects a route option, the route generator can provide information concerning the charging station, and can also prepay or book a charging station slot. A charging station slot can include, for example a parking spot in front of a charging station. The charging station slot can be reserved if the user decides the

prepay for the charging station, as a convenience. For example, if charging slots at a particular charge Station appear to be heavily used, a user can pre-reserve a charging slots ahead of time, so that when the user arrives at the charging station, the charging slot will be immediately available. This could be considered a convenience fee associated with pre-reserving of a charging slot, along a particular route. In another embodiment, the charging station can provide incentives to users to come to the particular charging station.

[00217] For example, if the user prepays for charge at a particular charging station, the charging station can provide a discount on the charge provided. For example, if the charging station wishes to fill a plurality a charging slots during a particular slow time, the charging station can communicate with the cloud processing and publish availability of its charging stations per particular period of time. A database associated with cloud processing will hold this information so it can be dynamically updated and accessed in real-time by users to fill their charging needs of their electric vehicles. During that particular period of time, the charging station can offer discounts or rewards to users so that drivers can decide to visit the charging station instead of another charging station. Still further, charging stations can offer discounts for users to use the particular charging station, and the discounts can be offered by more than one party or entity. For instance, if the charging stations are located near a particular business, that particular business can sponsor discounts or rewards at the charging station to drive traffic to or near that particular business. When users are charging their vehicles at the particular station near the particular business, users can spend their time at the particular business while there vehicle is being charged.

[00218] Potentially, the owners of the particular business that sponsored the discounts can increase traffic to their business and increase sales. In another embodiment, the owners of the particular business can offer discounts to their business products or services, if the business products or services are located near or beside the charging station. As will be described below, other embodiments can include having charging station pumps or handles or plugs, located in nontraditional charging station configurations. For example, charging plugs can be installed at various nontraditional locations, such as parking lots of retail stores. Other examples locations can include, without limitation, parks, city streets, parking garages, post offices, government areas, schools, offices complexes or campuses, coffee shops, malls, strip malls, box store parking lots, beach parking, homes, public roads, etc. If a large retail store has a large parking lot, a portion of that parking lot can be dedicated for charging plugs, which can be used by customers while the customers shop at the retail location. In such a situation, the owners of the retail store that have charging plugs assigned to particular parking spots, can publish availability of those charging plugs through the cloud processing network.

[00219] The cloud processing network can then publish availability and prices for users that may be driving around, or may be passing by the retail store along a particular path or route. In some embodiments, the retail store can offer significant discounts for charge, if users charge their vehicles at the charging plugs of the retail store. While the users charge their vehicles, the users may visit the retail store and purchase goods or services, which is a reward for the retailer that is offering the discount for the charge. In still another embodiment, retail stores having charge plugs can advertise availability of the charge plugs (and parking spots) in real time, and

provide discounts or deals to users that may wish to charge at the particular retail location.

[00220] The discounts can be for the goods and services of the retail store, or simple discounts on the charge provided by the charge plugs of the retail store. As noted above, one embodiment would allow the parking spots having the charge plugs to be reserved in advance, to provide additional convenience to users. In such a configuration, the parking spots can include mechanical barriers that lift and close to allow vehicles to come into and leave the particular parking spots. Thus if a parking spot is reserved, the mechanical barrier can remain closed until the vehicle having the code can communicate access to lift the mechanical barrier so that charging can commence immediately upon arriving at the reserved parking spot. In another embodiment, the charging station or plug can include a monitor or display that indicates whether or not the charging plug is reserved.

[00221] If the charging plug is reserved, no other user can park in front of the parking spot, or else received a ticket or fine for parking in a parking spot that's been reserved. The parking spot reservation for charge can be made in advance, such as while user is driving around looking for charge and the reservation is made by smart phone, or an integrated device of the vehicle that has access to the Internet. The transaction can also allow a user that is searching for charge to prepay for the charge using a graphical user interface or other exchange mechanism, associated with the route and reservation of a particular charge station or slot. In some embodiments, the charge stations or plugs can be placed in shared parking lots or locations where multiple retail outlets reside.

[00222] In such a case, multiple retailers can provide discounts to users to come and use the charging stations located at the retailers locations. These discounts

can then be published to the cloud processing logic. These discounts can also be published dynamically at the request of the provider of the charge, using an Internet portal, that allows the user to participate in a network of charge stations that provide discounts. In such embodiments, the discounts can be provided by multiple retailers for their goods and services, and the plug can be located in the shared parking lot. Having this information, the cloud processing can communicate with a route generator to generate various routes (e.g., paths) that are optimized to the user's desired outcome.

[00223] The optimization can be to route a user for charge along a plurality of charge stations or plugs that provide discounts. If this is the goal of the user, the route may be longer than other routes, but the discounts may be greater. Such routes may be viewed as a sponsored path, that requires a user to traverse a particular route in order to obtain charge for their vehicle. The sponsored routes can change dynamically over time, as sponsors decide to add or remove discounts. Thus, a user that finds a good path may wish to buy now, to avoid losing the discount. If a particular charge station or chart plug has a lot of customers during a particular period to time, the discounts may drop dynamically. If the charge plug for station experiences low activity, the discounts may be increased dynamically. The dynamic adjustment of discounts can occur based on a preset number of rules (e.g., what discount, where offered, when offered, how long it lasts, incentives for fast buy, logic for combining discounts, logic for sharing costs of discounts with others, logic for reducing the cost of the charge, etc.), as set by the provider the charge and/or the sponsor.

[00224] Figure 37B illustrates an example of a charge station and its metrics, in accordance with one embodiment of the present invention. In this example, the charge station has 10 plugs and 6 plugs are in use at a particular period of time. The charge station can also have historical data that can provide estimates of when charge plugs

would be available. Additionally, the charge station metrics can also provide charge cost estimates, which can be adjusted dynamically over time.

[00225] The cost for the charge can also be provided with a green rating, which signifies how efficient the charge station is in supplying charge, and the location and source of the charge provided by the charging station. If the charging station obtains charge from wind power, the green rating would be high. If the charge station receives its charge from fossil fuels, the green rating may be lower. If the charging station receives is charge from a variety of different sources, whether solar, wind, or fossil fuel, the green rating can be adjusted. This metric information can then be provided to the cloud processing to allow users of electric vehicles to decide whether or not to visit a particular charge station or charge plug.

[00226] In some embodiments, the price of the charge may be more expensive if the green rating is very high, but the charge value to the user may be high, if the user wishes to obtain a very high green rating, and a lower carbon footprint.

[00227] Figure 37C illustrates an example of route options for driver A, as shown in figure 30A, in accordance with one embodiment of the present invention. In this example, a display screen can be provided in the vehicle which would allow the user to be informed of where charge is available now for a certain price. The user can select to get a map route, get information regarding distance, get information regarding discounts, reserved charge plugs are stations, cancel request, or show lower rate charge options and distances associated with obtaining the lower cost charge.

[00228] This is only one example of the various options provided to the user through a graphical user interface. As noted above, the graphical user interface can be integrated with the vehicle, or can be part of a smart device that communicates with the

vehicle. The smart device that communicates with the vehicle can communicate using wireless technology so that metrics associate with the vehicle and location of the vehicle can be obtained and then communicated to the cloud processing to exchange information.

[00229] Figure 38 illustrates one example of metrics data that can be obtained by a transportation vehicle (TV), and communication to and from other networked TVs, in accordance with one embodiment of the present invention. In this example, information can be obtained from a particular vehicle, such as service and repair history, whether user is willing to sell or exchange the vehicle, the replacement cost of the vehicle versus repairing the vehicle, the replacement part cost of a vehicle, parts to replace for vehicle (as known from historical data of the same vehicle, or based on a current malfunction), the fuel rates, fuel locations for charge, route generators, modification suggestions for driving to increase performance, accident avoidance data, comparable vehicle current market price, recall information for the current vehicle, etc.

[00230] This information can be obtained from the vehicle or from the users of the vehicle. This information can also be obtained by the cloud processing which communicate with other systems connected to the Internet. Other systems can be data stores for information concerning the same vehicle, historical data concerning potential breakdown of the vehicle, price estimates of the vehicle, marketplace data concerning exchange the vehicle, etc. This information can be provided at the vehicle to the user through a computer user interface. On demand, the user can determine whether it's worthwhile to exchange the vehicle for another vehicle, and the potential of the current vehicle to break down.

[00231] Furthermore, the user may decide that it's time to exchange the vehicle for new vehicle, and market rates for the current vehicle based on actual vehicle data of the

user's vehicle, can be used to identify its current market price. The current market price for replacement vehicle can also be obtained dynamically, and comparable data can be presented to the user in the user interface. Accordingly, the user would not have to input information concerning its vehicle into the user interface simply to figure out what the market price is. The data concerning the vehicle is inherently collected and stored in the vehicle memory based on vehicle use, age, accidents, condition, etc. Additionally, information concerning available vehicles near the user which may be for sale can also be attained dynamically and in real time.

[00232] For example if the user wishes to replace the vehicle, the user can simply click a button, select an icon, touch a screen, speak a command, gesture an input, etc., to figure out what his vehicle value is, the cost of a replacement vehicle, and the total cost after exchange. This information can be useful to the user in deciding whether or not to trade in the vehicle or remain with the current vehicle and make investments in repairs. As shown, the data exchange between vehicles and the vehicles and the cloud processing can be extensive, but such information can be made available to drivers of those vehicles to make informed decisions.

[00233] Figure 39 illustrates an example of various paths that a driver can make between point A and point B. For example, point A can be the current location of a vehicle, and point B can be the destination that the vehicle user wishes to traverse. If the user needs to travel to point B from point A, the system in the vehicle, as connected to the cloud processing, can determine various paths to take between A and B. In one embodiment, the user wishes to traversed directly to point B, and does not wish to receive any sponsor discount along the path.

[00234] This path would then generate a recommendation to the user to charge the vehicle at charging stations C1. In another embodiment, the user may wish to traverse

the path between A and B, but receive some sponsored assistance in the charge or discount on a good or service. In this example, the system can generate a path between A and B, where the user may stop and charge at charging station C2 (or plug location). In this embodiment, the system will calculate that the user can traverse from point A to C2 with the current charge availability in the vehicle, and then arrive at point B. In another embodiment, the user may wish to select a different path 2, which is also a sponsored path that takes the user to charging stations or plugs C3 and C4, before reaching point B.

[00235] In this example, the user may have received additional discounts from the providers of the charge at C3 and C4, or from a sponsor that sponsored a discount at the charging stations or plugs C3 and C4. In this example, a retail outlet that sits proximate to the charging station or charging plugs can provide a discount to the users to charge their vehicles at C3 and C4, or they can provide a discount at the retail outlet, which would be proximate to the location of C3 and C4. The discount provided by the various retailers that sponsored the charging stations can be dynamically posted, so that drivers can obtain current and real-time discounts as they drive around and look for charge.

[00236] The drivers can also be provided with information of the duration of the discount, so that drivers can obtain the discount if they have the time to traversed the path, or avoid the path if the discount will not be present when the driver arrives at that application. In another embodiment, the logic in the vehicle or the processing system in the cloud processing can determine whether or not the user would be able to arrive at each of the charging stations or plugs to receive the sponsor discounts. This analysis can include, for example, reviewing traffic patterns, travel speeds and estimates to traversed the different distances, time of day, etc.

[00237] In another embodiment, the user may select to traversed path 3, which takes the user to charge provider C5 and C6 before progressing on path B. In this illustration, it is shown that the user must go off path to travel to charge C6. However, it may be more beneficial for the user to travel to charge C6, as that location is offering a larger discount. In some embodiments, even though the user travels off path, the discounts offset the cost of going off path. In some embodiments, going off path can actually be faster if the particular charge stations or pumps or plugs are more available and there is less wait. In still another embodiment, the user may not actually have a path in mind, and the user may select to simply obtain charge and would be provided with path 4.

[00238] In this example, the users looking to charge the vehicle along a path that is sponsored. A currently sponsored path may be to charge C7. The user can be provided with an option of charge discounts, which can include discounting the cost of the charge itself, or discounts to retail or service providers that are proximate to the charge outlet. In such an embodiment, the data can be provided to the display of the users car or vehicle, or can be provided to the users device. For example, if the user wishes to obtain charge, and the users currently sitting in his or her office, (and the car is in the parking lot) the user can select it obtain a sponsored path to obtain charge. That sponsored path can identify the closest station, or a number of stations or plugs their offering particular discounts.

[00239] In some embodiments, the discounts are provided by a combination of the charge station and retail shops nearby. In other embodiments, the retail shops and plugs/charge providers can provide combined packages of discounts, which could drive users to their location. Accordingly, it should be understood that the dynamic generation of paths can be sponsored, such that the user can be provided with

identification of charging locations along a particular path, and the discounts that may be provided along those particular paths.

[00240] Figure 40 illustrates an example of data that can be provided or associated with the various paths describe in figure 39, in accordance with one embodiment of the present invention. As shown, the path that is displayed by the system of the vehicle, or the processing provided by the cloud processing, can provide information that is displayed to the user.

[00241] Again, the information displayed to the user can be displayed in the vehicle's display screen or can be displayed on the users display device (e.g. smart phone, computer, tablet, etc.). In this example, path 1 can be selected such that the user simply wishes to obtain charge and the path is not a sponsored path. In this example, the user is provided with information, such as the mapping of the path, whether the reward or sponsor is provided, the estimated trip time with charge stopped, and estimated cost. This information is generated dynamically for the particular point in time when the user wishes to obtain charge. In path 1, the number stops is still 1, but the sponsored path is sponsored by big coffee company.

[00242] Big coffee company is going to provide a \$2 off charge discount to the user, which lowers the price from \$10 to \$8 for the charge. The time increase in the charge time is only 2 min., but the discount was \$2. For some people, the discount is not sufficient to overcome the additional amount of time taken to obtain the discount, but for others, the discount is sufficient. Sponsored path 2, illustrates that stops are provided and the sponsors are a quick stop market and a big coffee shop. The discount in this scenario is \$4 off of the charge bill. The estimated time is now 17 min., which is 5 min. longer than an unsponsored path, but the discount is \$4 off a \$10 non-sponsored charge.

[00243] Path 3 illustrates an example where there are 2 stops, and the sponsors are box store and big coffee company. In this example, the discount is \$5 off the charge bill. And the estimated time with charge stopped is also 17 min., while the total cost to the user for the charge would be \$5. Path 4 would be another sponsored path where the number of stops is 0 between the current location and the charge location. In this example, the path is sponsored by big coffee company.

[00244] Big coffee company is providing a \$1 off the charge bill (or a free coffee or discount on coffee), and the estimated time with charge stopped is 5 min. This example would be one where the user simply wishes to obtain charge now, but also wishes to obtain a discount. Map information (e.g., dynamically generated maps (street and satellite) on a display using internet provider data) can also be displayed on the users device or vehicle display, including any other options and discounts provided. This information can be provide using a global positioning map, with turn by turn directions, voice directions, voice activation, etc. Voice input and voice output is also possible for providing information regarding the sponsored paths. As the discounts changed during the day or different times, the different map options can also change. The providers of the discounts can also dynamically change your discounts over time based on the desired need to drive traffic to their locations or charge spots.

[00245] Accordingly, the generated maps/paths for users are incentivized to provide the user with the desired sponsored path for obtaining charge. Broadly speaking and without limitation, obtaining charge will include plugging the vehicle into a charging receptacle so as to charge the native battery of the vehicle. In another embodiment, obtaining charge can also include refilling on volt bars to replenish volt bars that have been used during the vehicle usage. In other embodiments, charge can be transferred

to a vehicle wirelessly (e.g., without plugging in an outlet or receptacle). Examples can include a transfer surface that the vehicle parts over, and the charge can be transferred wirelessly to the vehicle via conductors on the underside of the vehicle. The vehicle can simply part in the slot and once payment is made, the charge can start to flow capacitively or wirelessly to the electric vehicle.

[00246] As can be appreciated, the sponsored path process can provide a quick and efficient manner for allowing the user to identify their desired endpoint, and provide options for traversing a path to that and point. Along that endpoint, the user can be provided with discounts for charge by sponsors, which can influence or drive people to their charging outlets. The discounts can also be provided in a hybrid manner, such as providing discounts for the charge and discounts with in the retail outlets that are located proximate to the charging stations.

[00247] Providing this information to drivers in real time is efficient for both drivers and the retail locations. Drivers in their electric vehicles will need charge, and providers of the charge will benefit from driving users to their location. If the user is still progressing along their desired path, the providers of the discount are simply providing a service and driving customers to their location, where the drivers may purchase other goods and services while the vehicle is being charged.

[00248] Sponsored paths can therefore take on various forms, depending on the user's desire to seek faster charge times, lower charge rates, or even obtain charge for free. If the provider of the charge plug or the sponsor the charge plug wishes to pay for the charge altogether, the sponsored path can identify those particular charge locations and provide the user with options to traversed that path along their desired journey from point A to point B.

[00249] In one embodiment, the sponsored paths may be generated on electronics and circuitry of the vehicle, or by processing in the cloud processing system (e.g. networked Internet systems). In some embodiments, the sponsor paths may be processed partially on the vehicle and partially on the cloud processing system. In some embodiments, the sponsored paths would be dynamically generated on the cloud processing system, and the vehicle or smart phone of the user would simply connect to the cloud processing system.

[00250] The data exchange can therefore be dynamically set to be real time, such that providers of the discounts, providers of the charge, and drivers of the vehicles can exchange information. In this example, the provided to the charge can provide discount information, incentives, etc., and the drivers of the vehicles can provide information concerning their desired paths. The processing system can then generate a plurality of options for the user to traverse from point A to point B. For example, the user can select to traverse a sponsored path, to a particular address. The display the vehicle can then requested the user identify whether or not a sponsored path is desired.

[00251] If the sponsored path is desired, the vehicle to provide one or more options for traversing the path, and the metrics associated with traversing the various types of paths, as shown in figure 40. This information can also be provided to the user via voice input and voice output, to avoid excessive display data inside of a vehicle. In one embodiment, instead of relying on the user to request a sponsored path, the information regarding sponsored paths can be automatically pushed to the electric vehicle as the vehicle is driven around. For instance, if a reward is being offered ahead of the driving path, the navigation system can inform the user “You will need charge in X miles, and a reward X is being offered if you charge at location X in two

miles.” These notifications can be pushed to the electric vehicle dynamically, and presented to the user’s display on demand or can be provided as alert to the user. The alerts can be voice alerts, sound alerts, dashboard icons, gauges, or combinations thereof. Thus, the information regarding availability of charge and any rewards can be obtained dynamically by the user on demand or can be provided to the user dynamically using push notification. The notification method can also be programmed by the user, so that the notification is best received.

[00252] It will be obvious, however, to one skilled in the art, that the present invention may be practiced without some or all of these specific details. In other instances, well known process operations have not been described in detail in order not to unnecessarily obscure the present invention.

[00253] Embodiments of the present invention may be practiced with various computer system configurations including hand-held devices, microprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers and the like. The invention can also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a wire-based or wireless network.

[00254] With the above embodiments in mind, it should be understood that the invention could employ various computer-implemented operations involving data stored in computer systems. These operations are those requiring physical manipulation of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared and otherwise manipulated.

[00255] Any of the operations described herein that form part of the invention are useful machine operations. The invention also relates to a device or an apparatus for performing these operations. The apparatus can be specially constructed for the required purpose, or the apparatus can be a general-purpose computer selectively activated or configured by a computer program stored in the computer. In particular, various general-purpose machines can be used with computer programs written in accordance with the teachings herein, or it may be more convenient to construct a more specialized apparatus to perform the required operations.

[00256] The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data, which can thereafter be read by a computer system. The computer readable medium can also be distributed over a network-coupled computer system so that the computer readable code is stored and executed in a distributed fashion.

[00257] Although the foregoing invention has been described in some detail for purposes of clarity of understanding, it will be apparent that certain changes and modifications can be practiced within the scope of the appended claims. Accordingly, the present embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope and equivalents of the appended claims.

What is claimed is:

Claims

1. A system for providing auxiliary charge to a main battery of an electric vehicle, comprising:
 - (a) an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from within the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery; and
 - (b) a kiosk for storing a plurality of charge units, the kiosk having,
 - (i) slots for storing and recharging the plurality of charge units;
 - (ii) control systems for communicating over a network, the control system includes logic for identifying inventory of charging units in the kiosk and logic for processing payments and fee adjustments for charge units provided or received in the slots of the kiosk; and
 - (b) display for providing an interface for enabling transactions to provide or receive charge units to customers;
 - (c) a central processing center that communicates with,
 - (i) a plurality of said kiosk over a network, the central processing center configured to provide for centralized rate changes to prices to charge for the charge units at each of the plurality of kiosks, wherein changing the price of the charge units is specific to each of the kiosks and is based on a plurality of metrics, including availability at each kiosk and discounts, and
 - (ii) a plurality of vehicles, the plurality of vehicles being provided with access to availability information of charge units at each of said kiosks, the availability information being custom provided to the plurality of vehicles based on their geo-location.

ABSTRACT

Systems and method are provided for providing auxiliary charge to a main battery of an electric vehicle. One system includes an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from within the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery. Kiosks for storing a plurality of charge units. A display in the kiosk for an interface for enabling transactions to provide or receive charge units to customers, and a central processing center that communicates with a plurality of said kiosk over a network and a plurality of vehicles, The plurality of vehicles are provided with access to availability information of charge units at each of said kiosks.

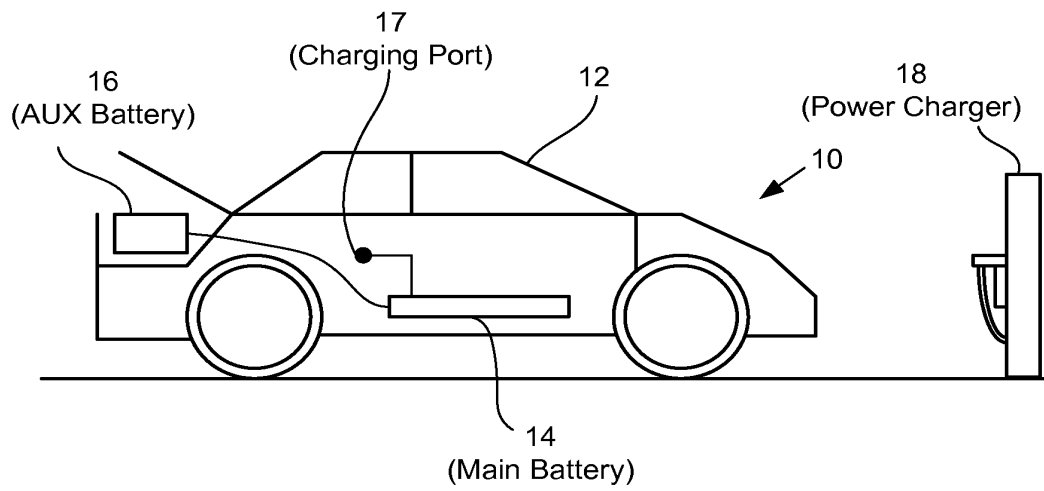


FIG. 1

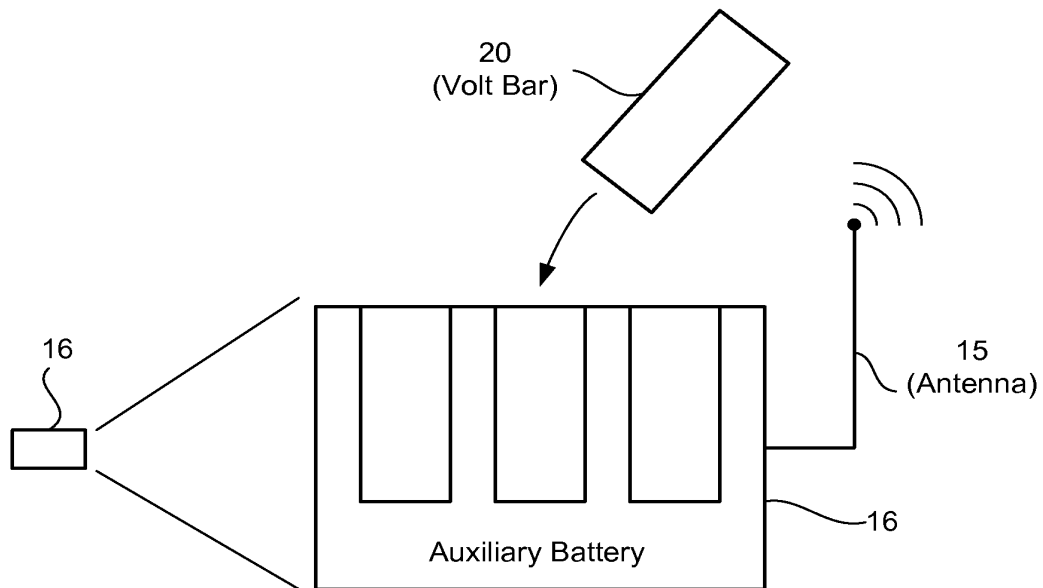


FIG. 2

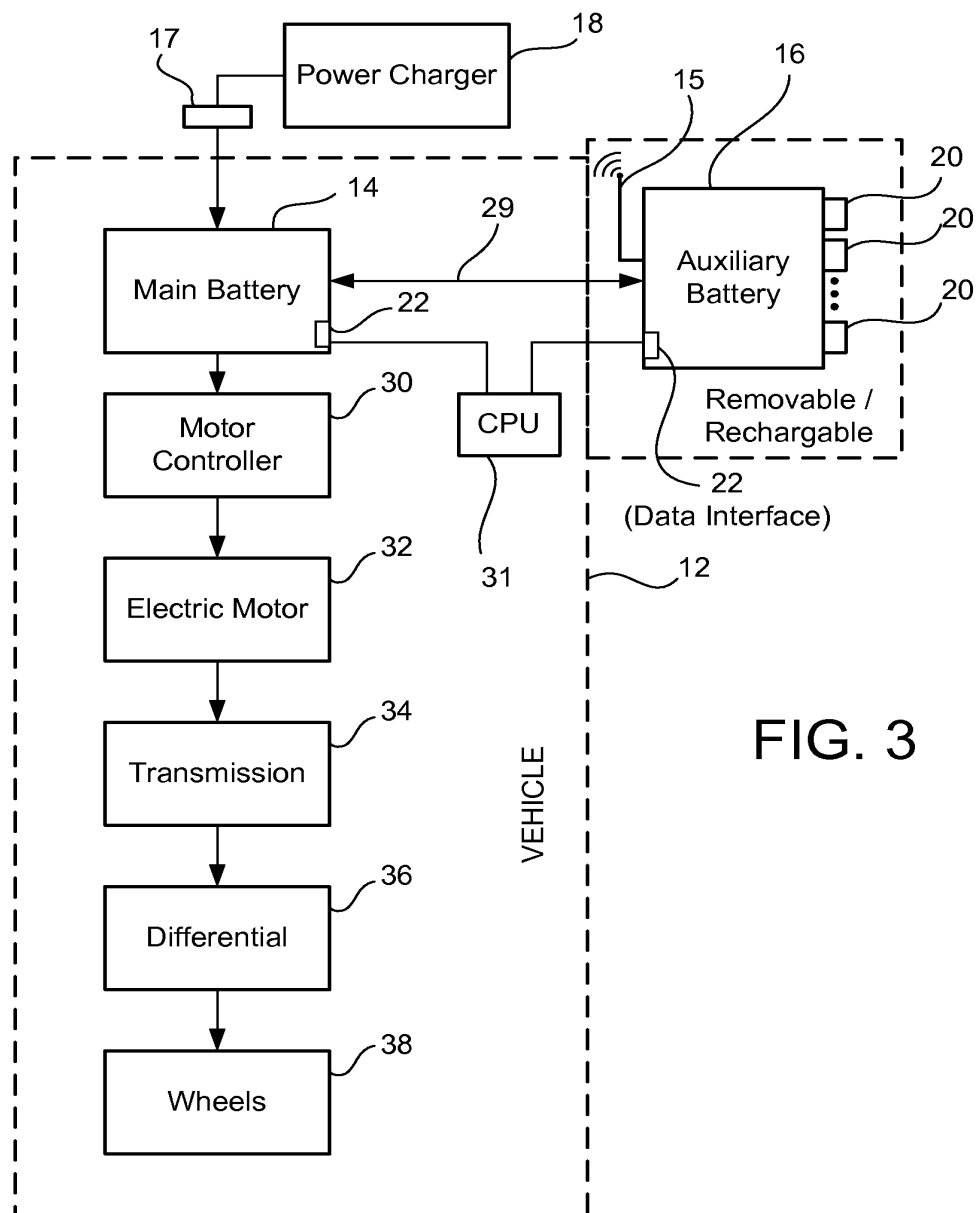


FIG. 3

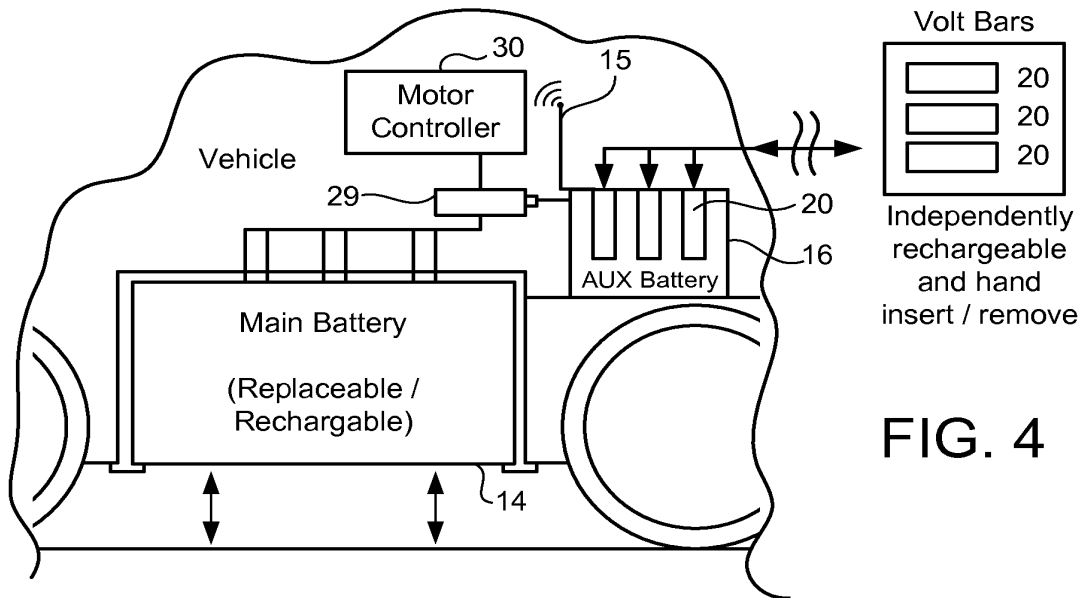


FIG. 4

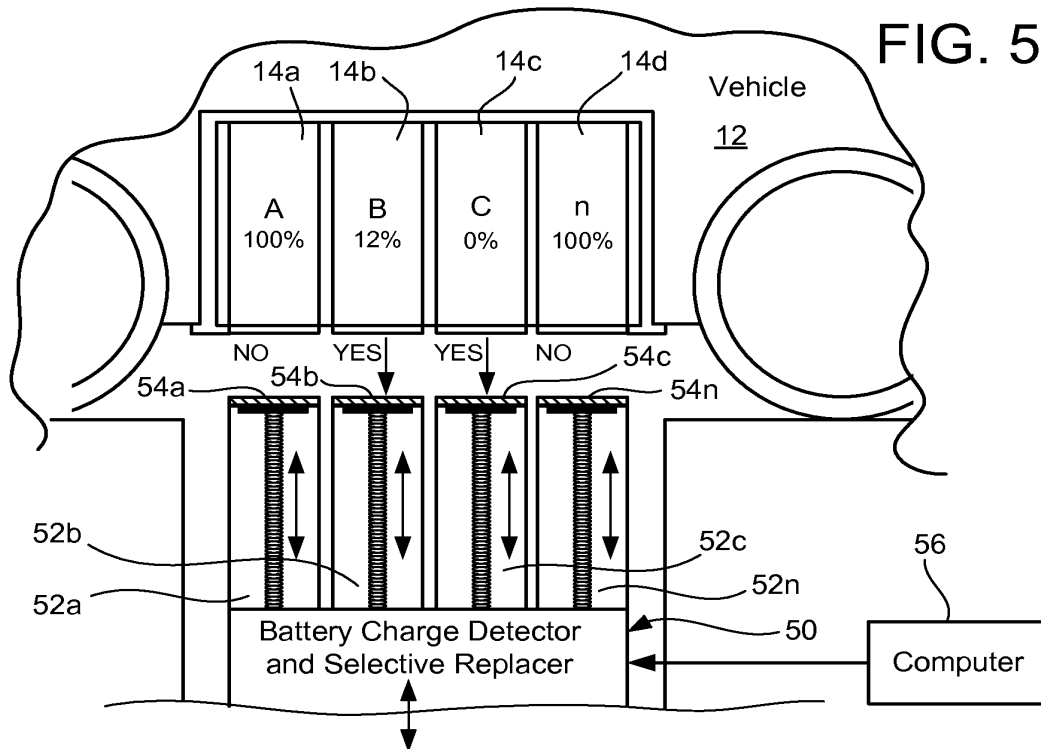
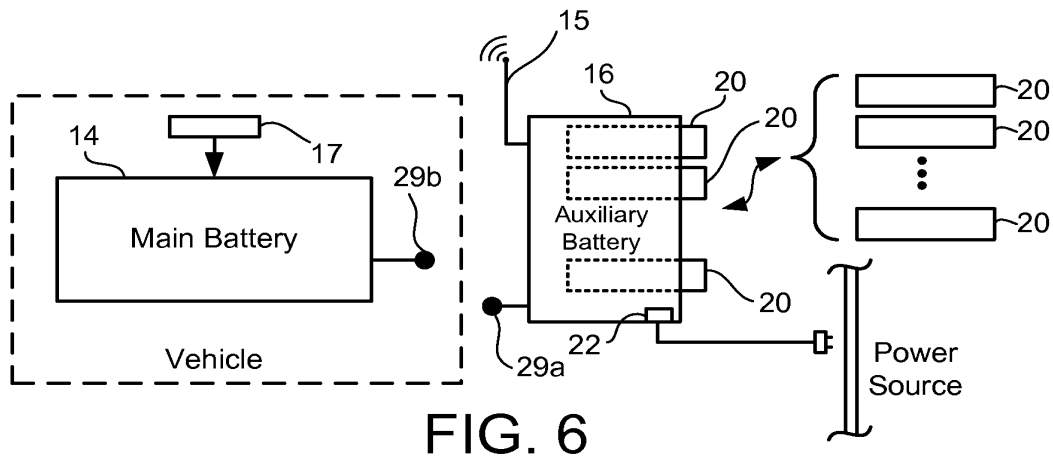
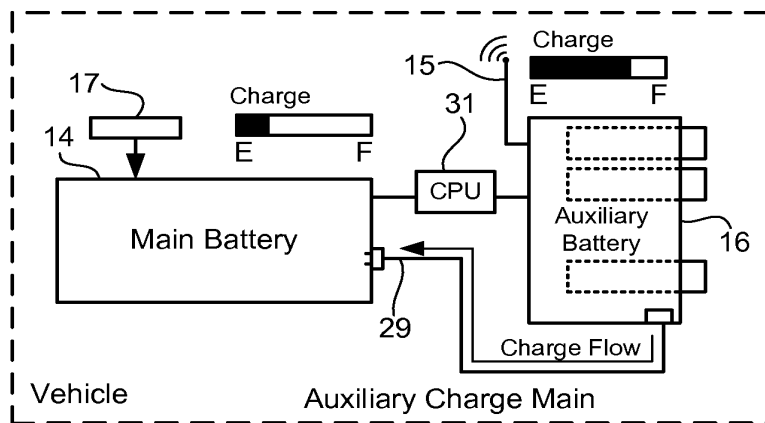
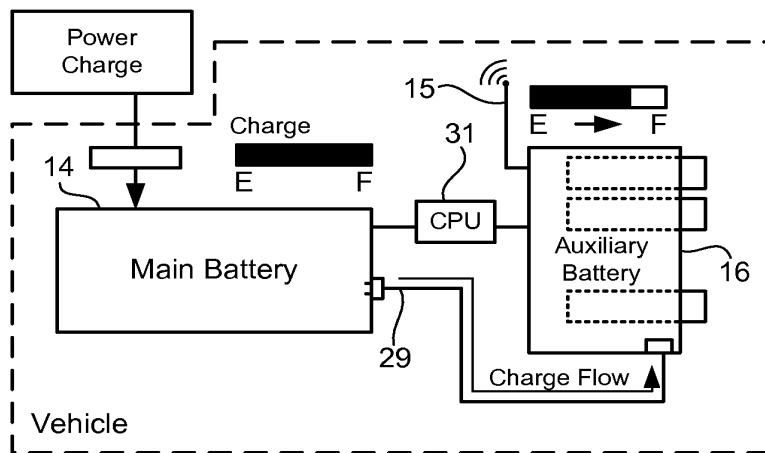


FIG. 5



Main charges auxiliary when main power charge is charging main battery, main battery is full and auxiliary is less than full

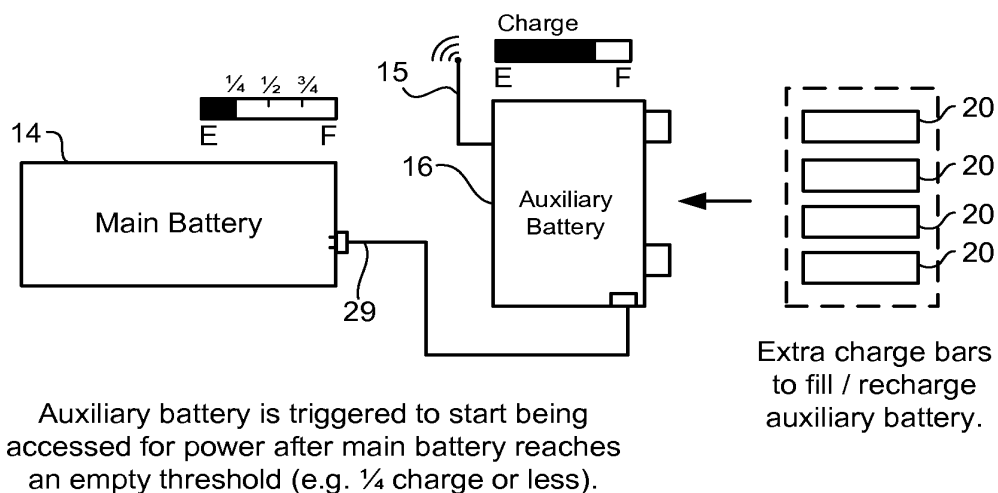


FIG. 9

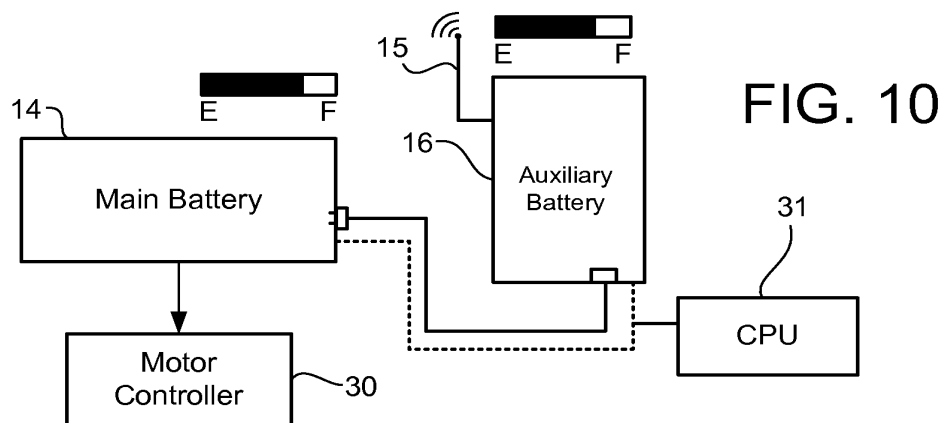


FIG. 10

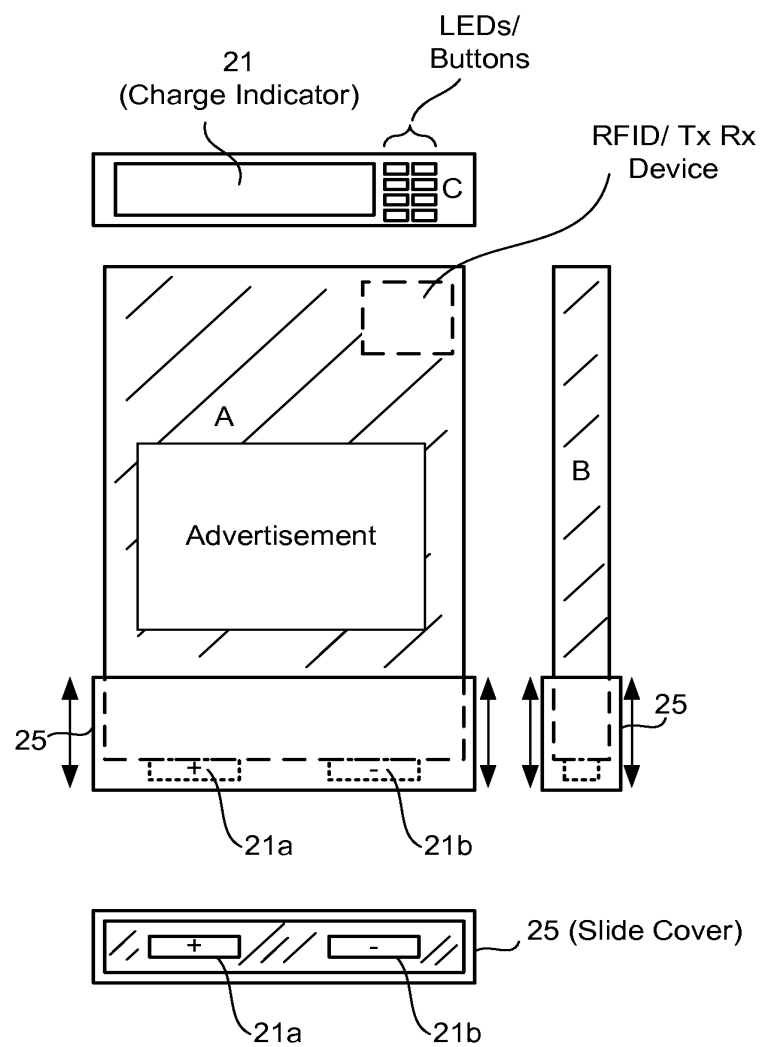


FIG. 11

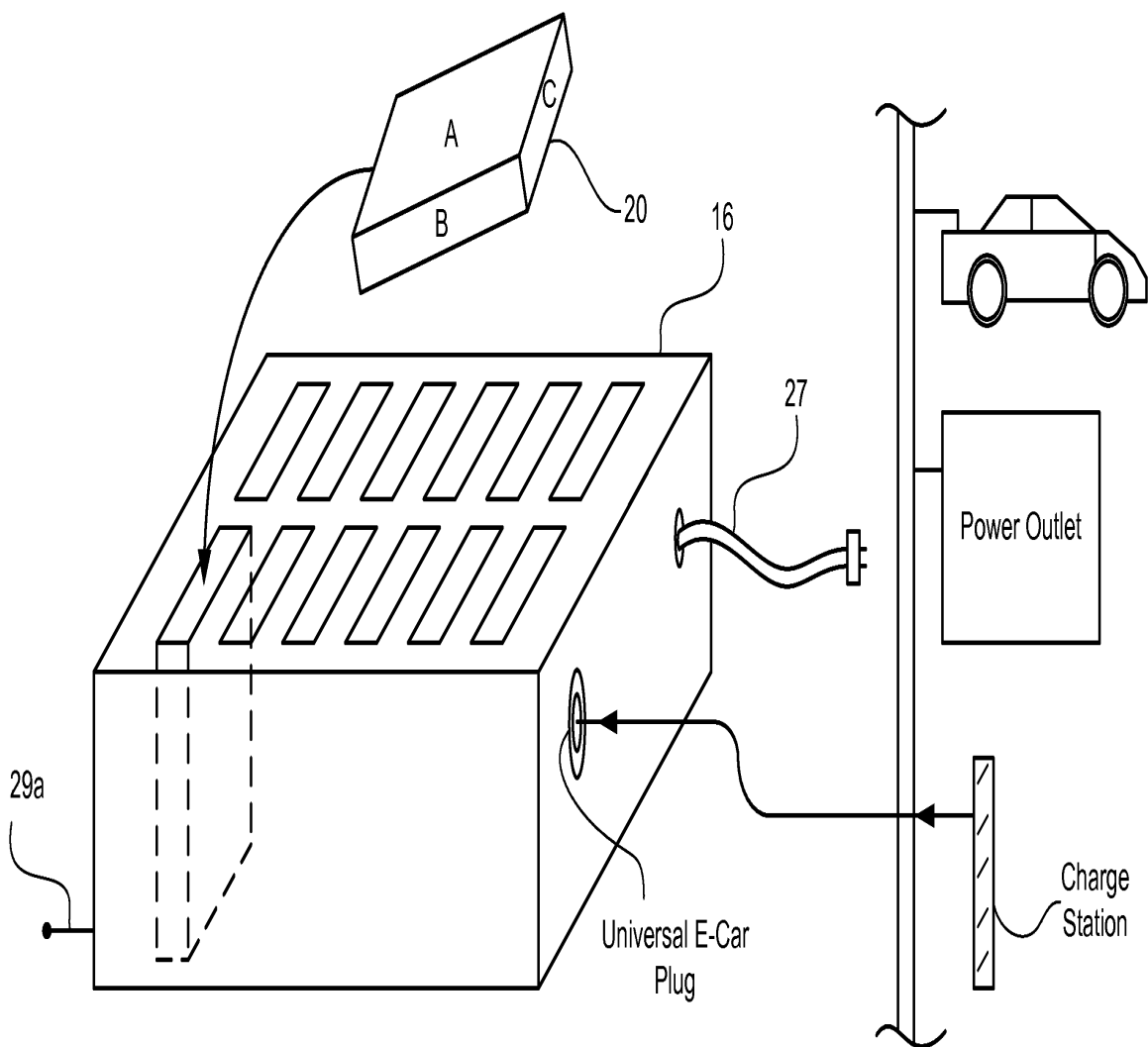
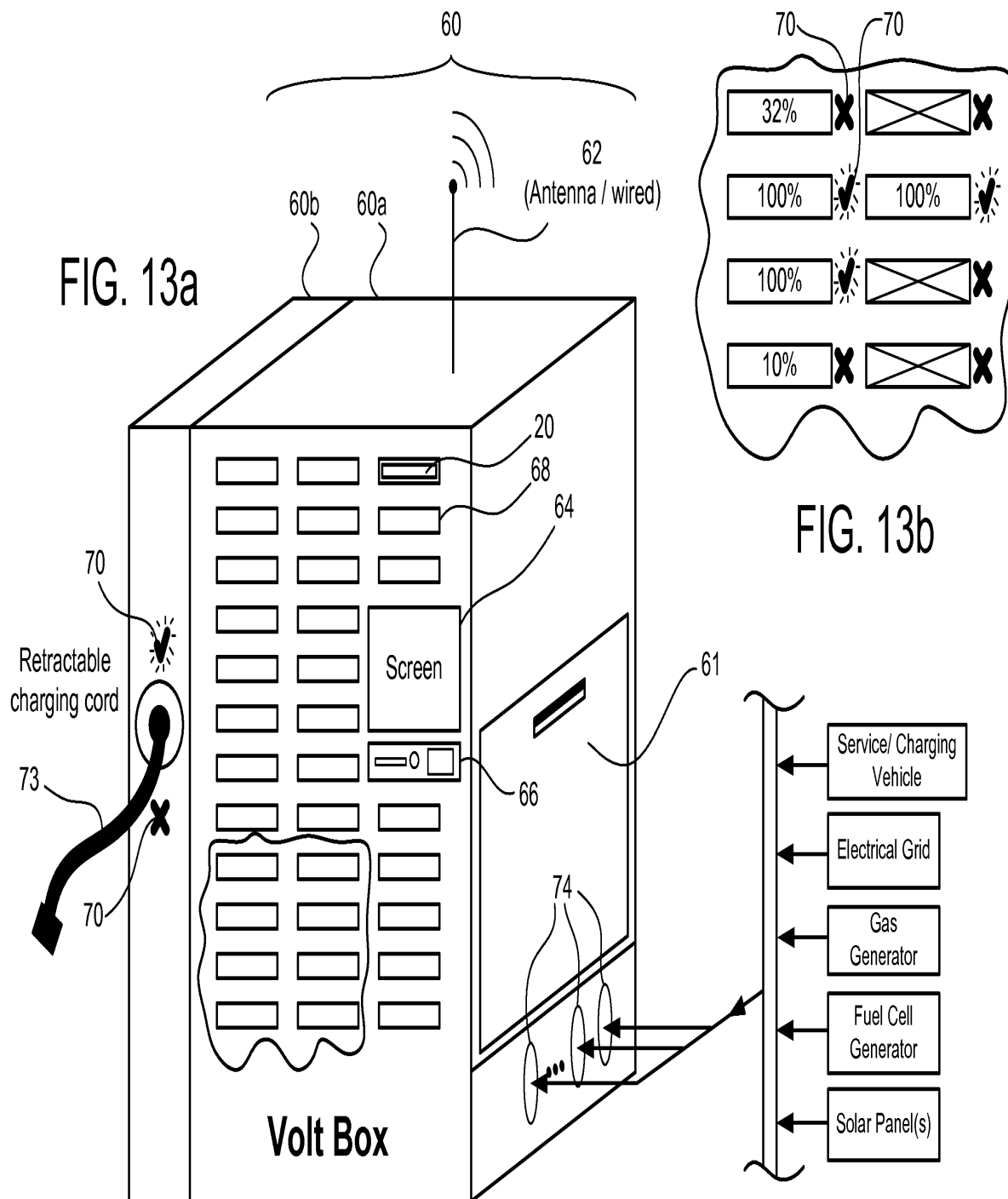


FIG. 12



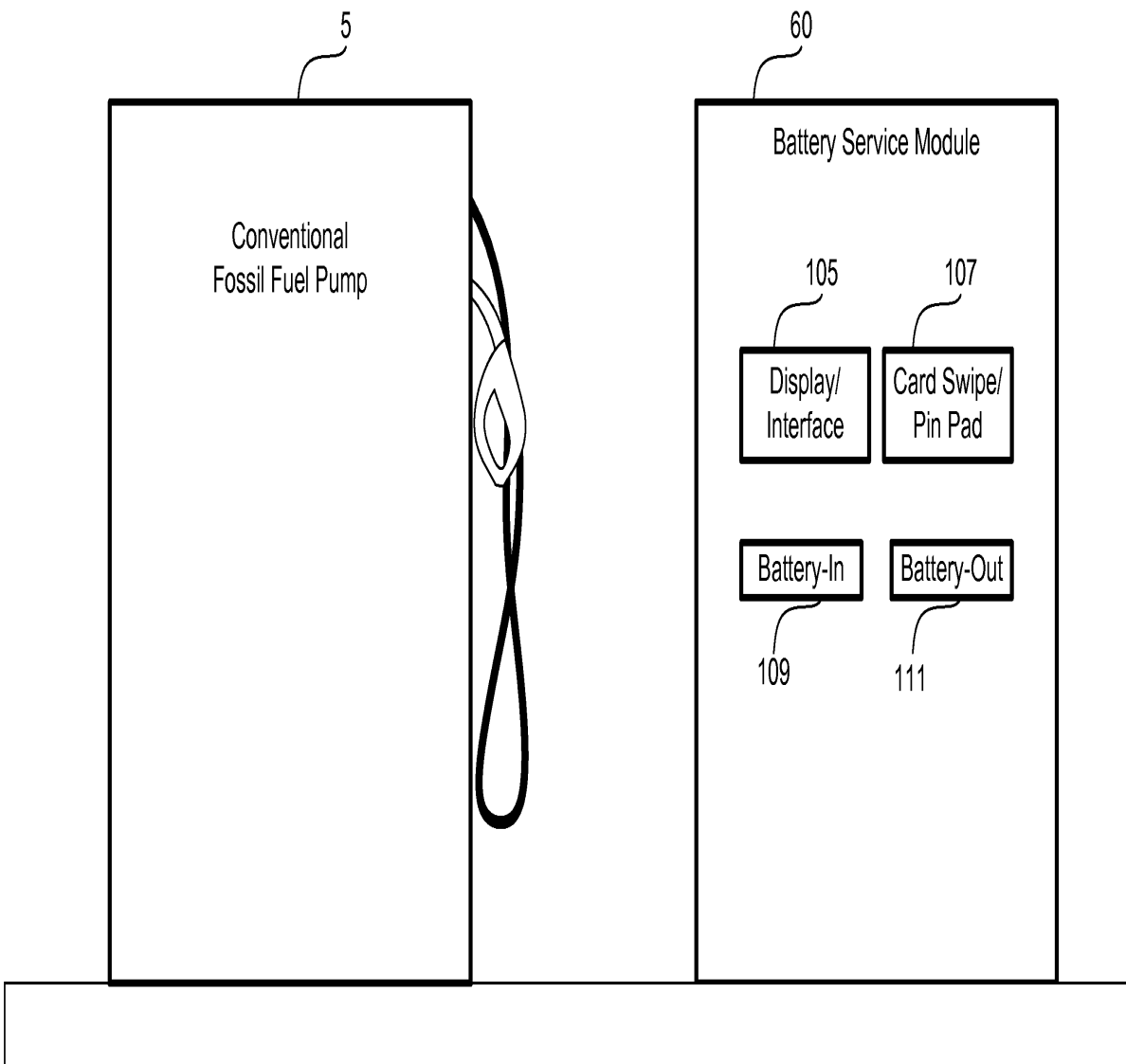


FIG 13C

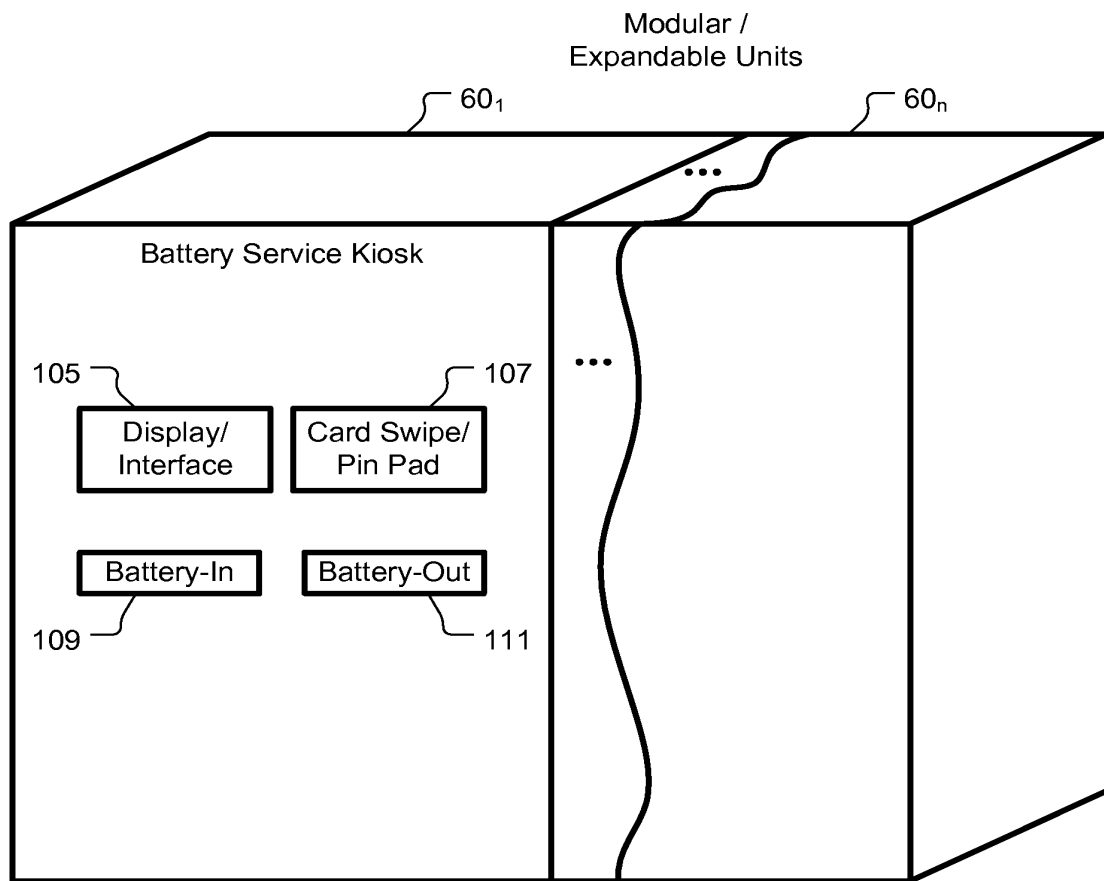


FIG 13D

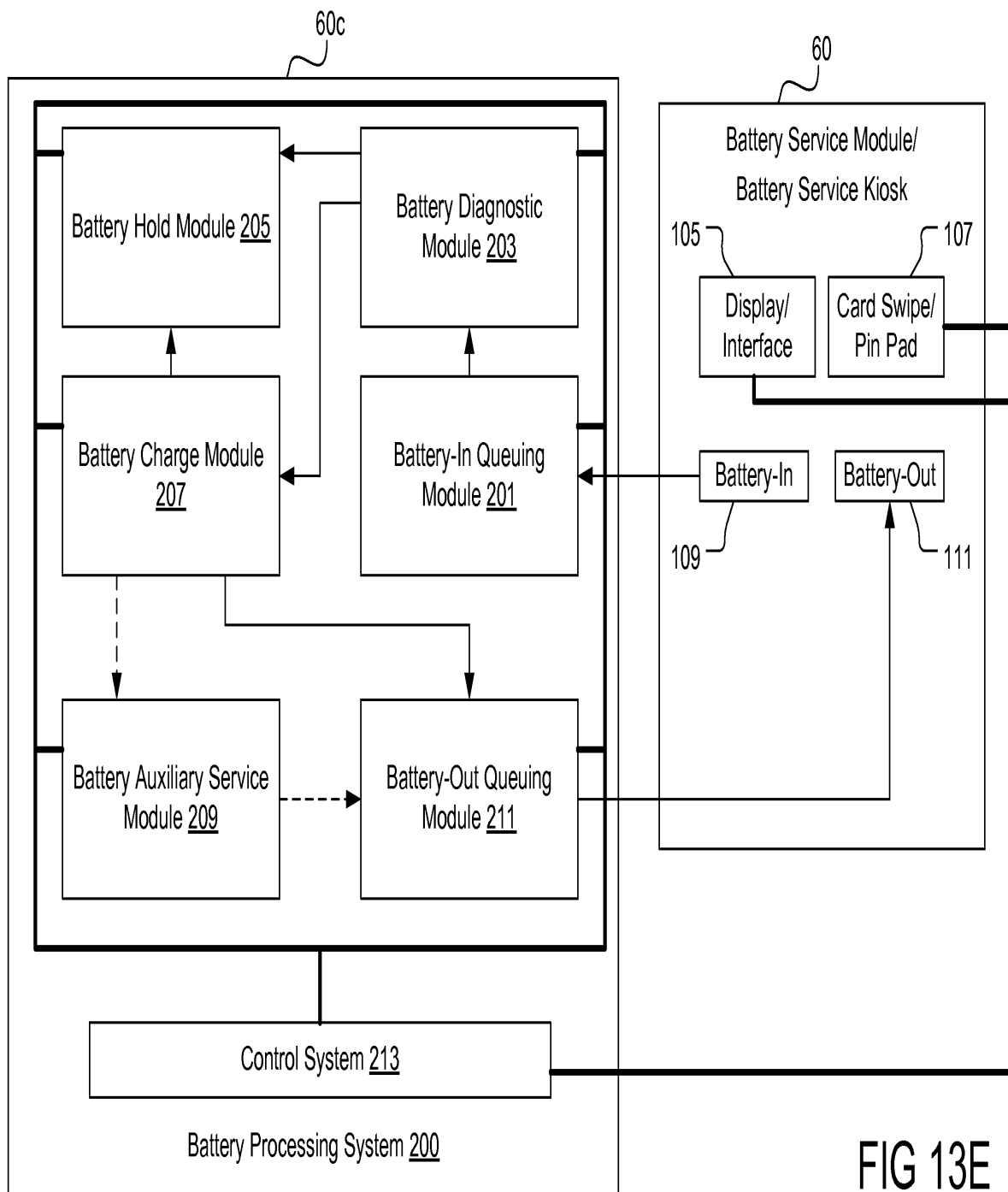


FIG 13E

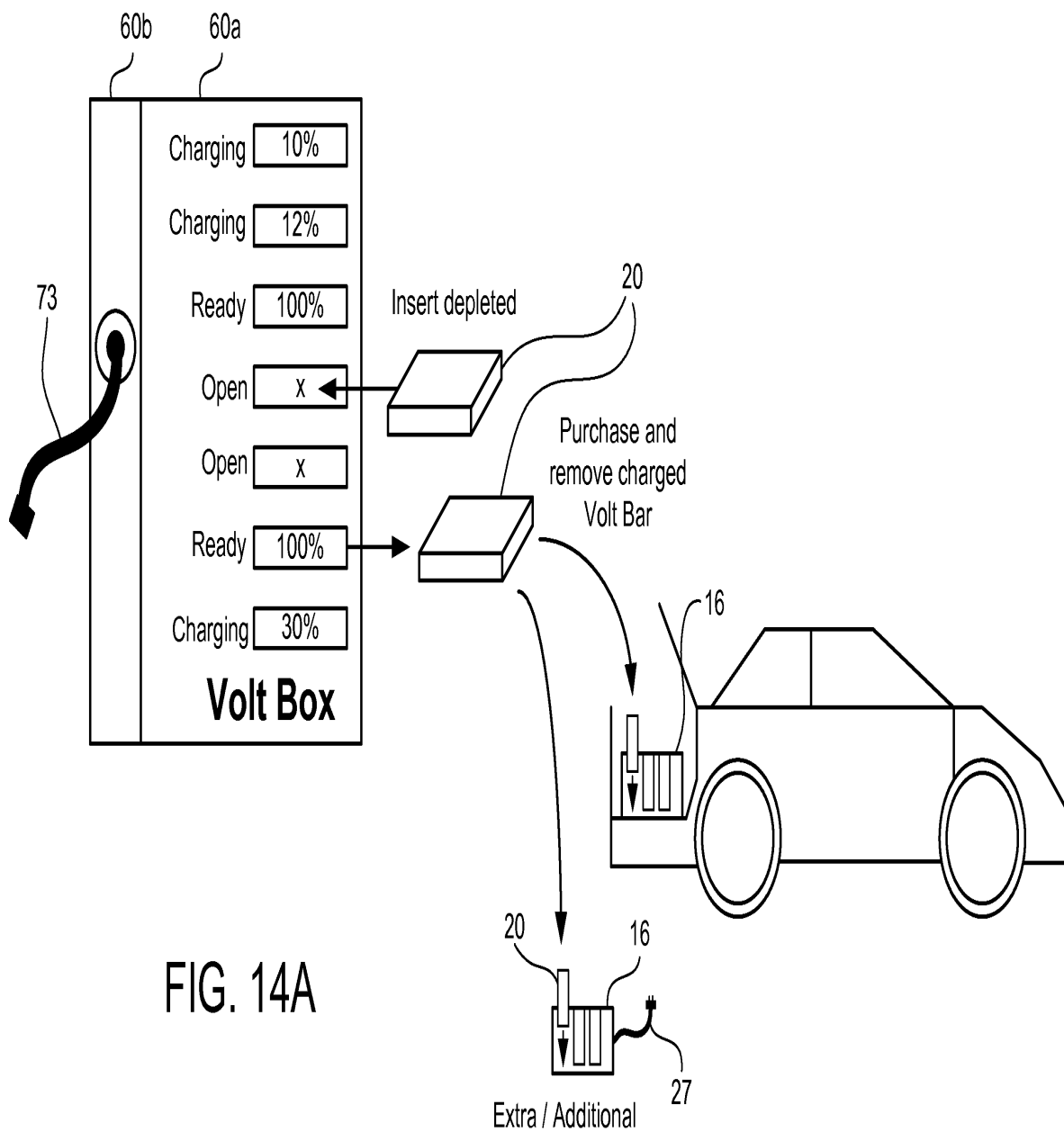


FIG. 14A

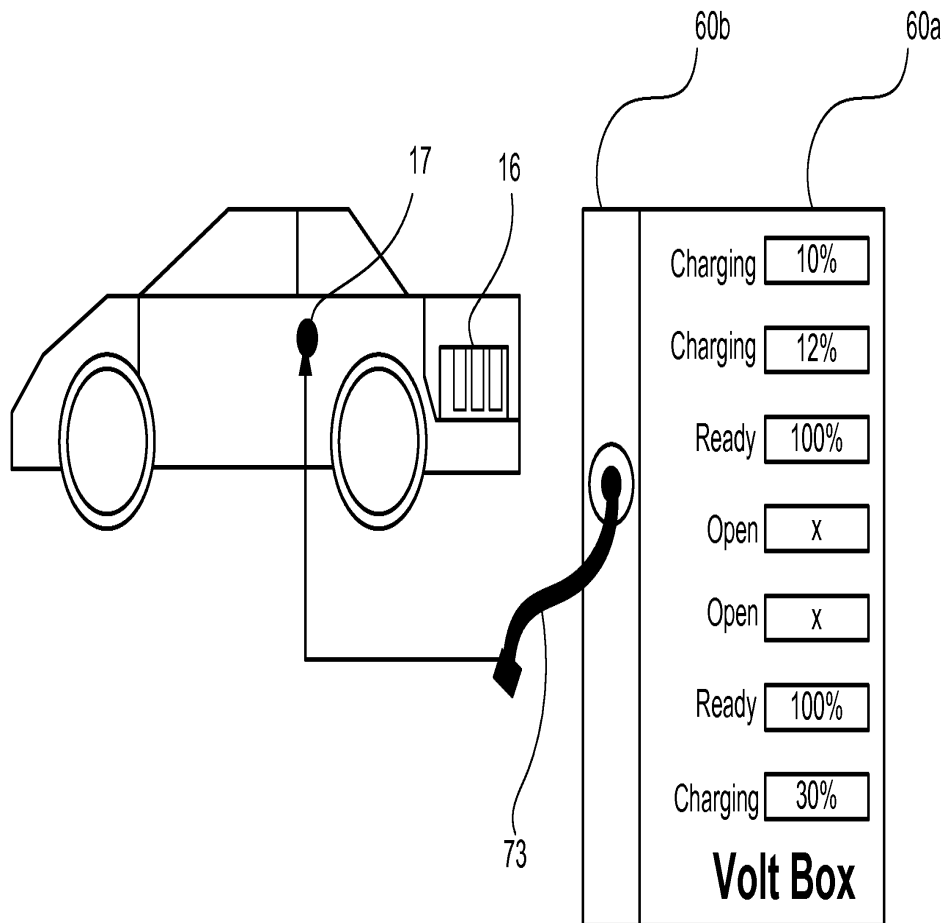


FIG. 14B

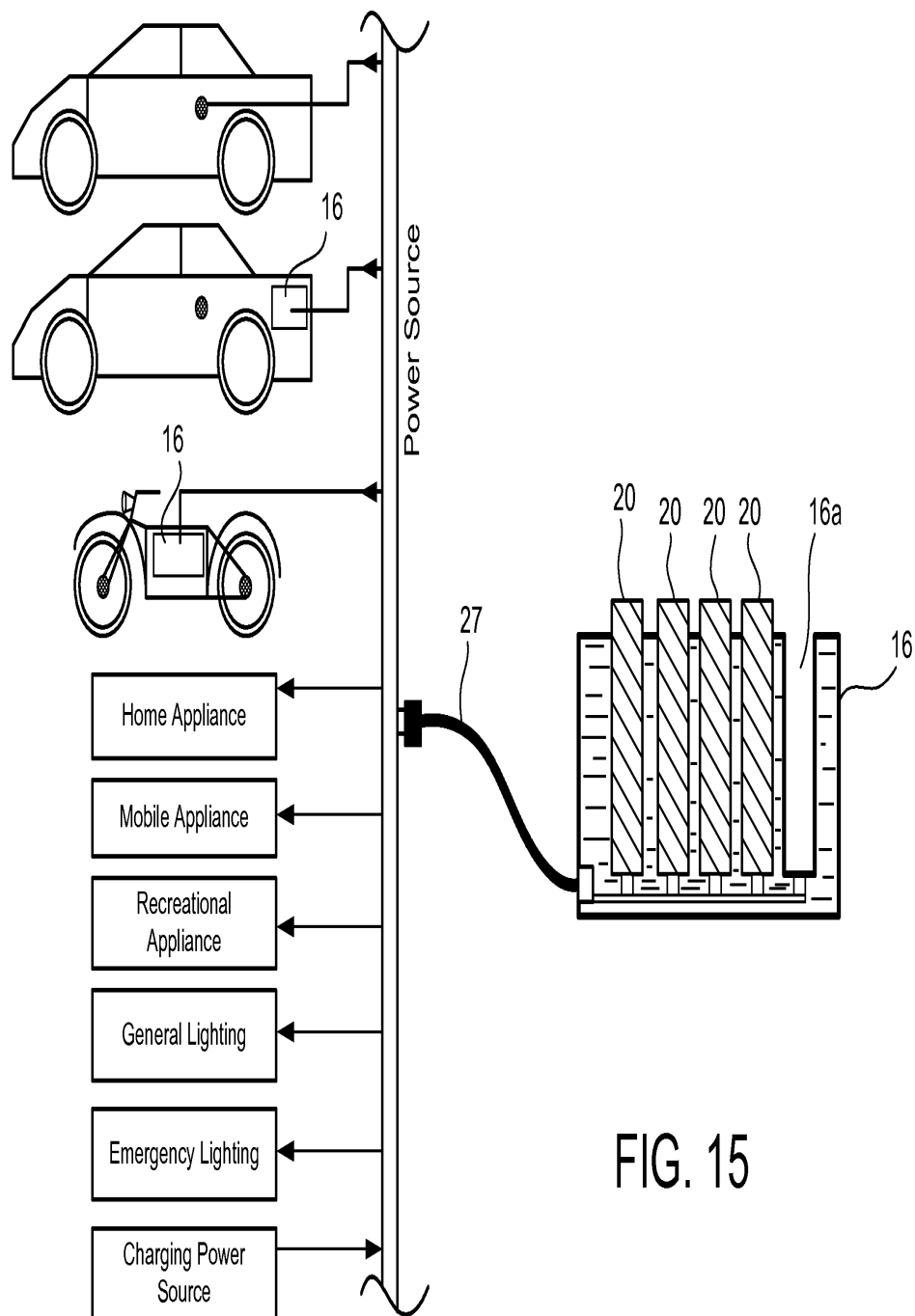


FIG. 15

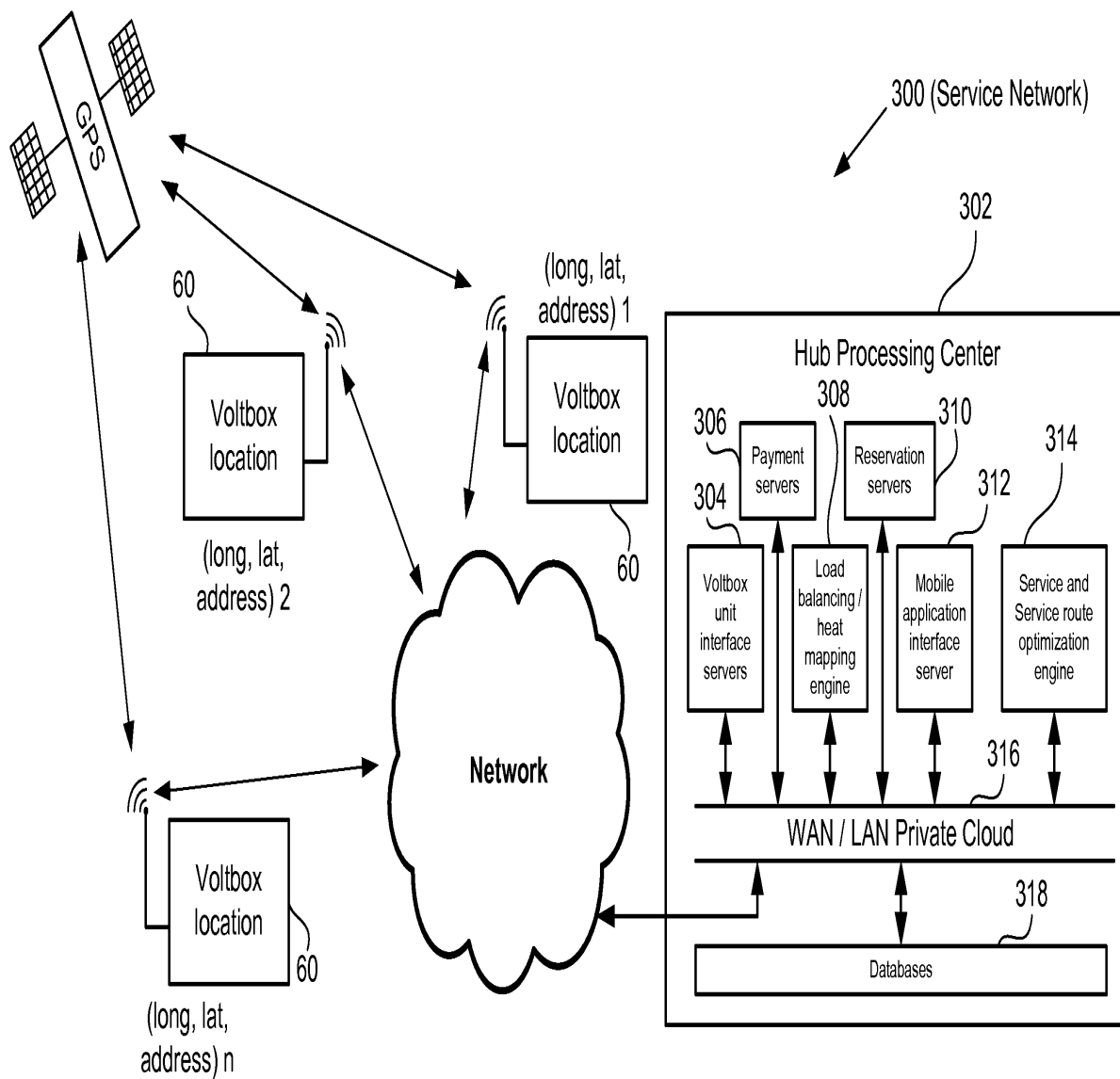
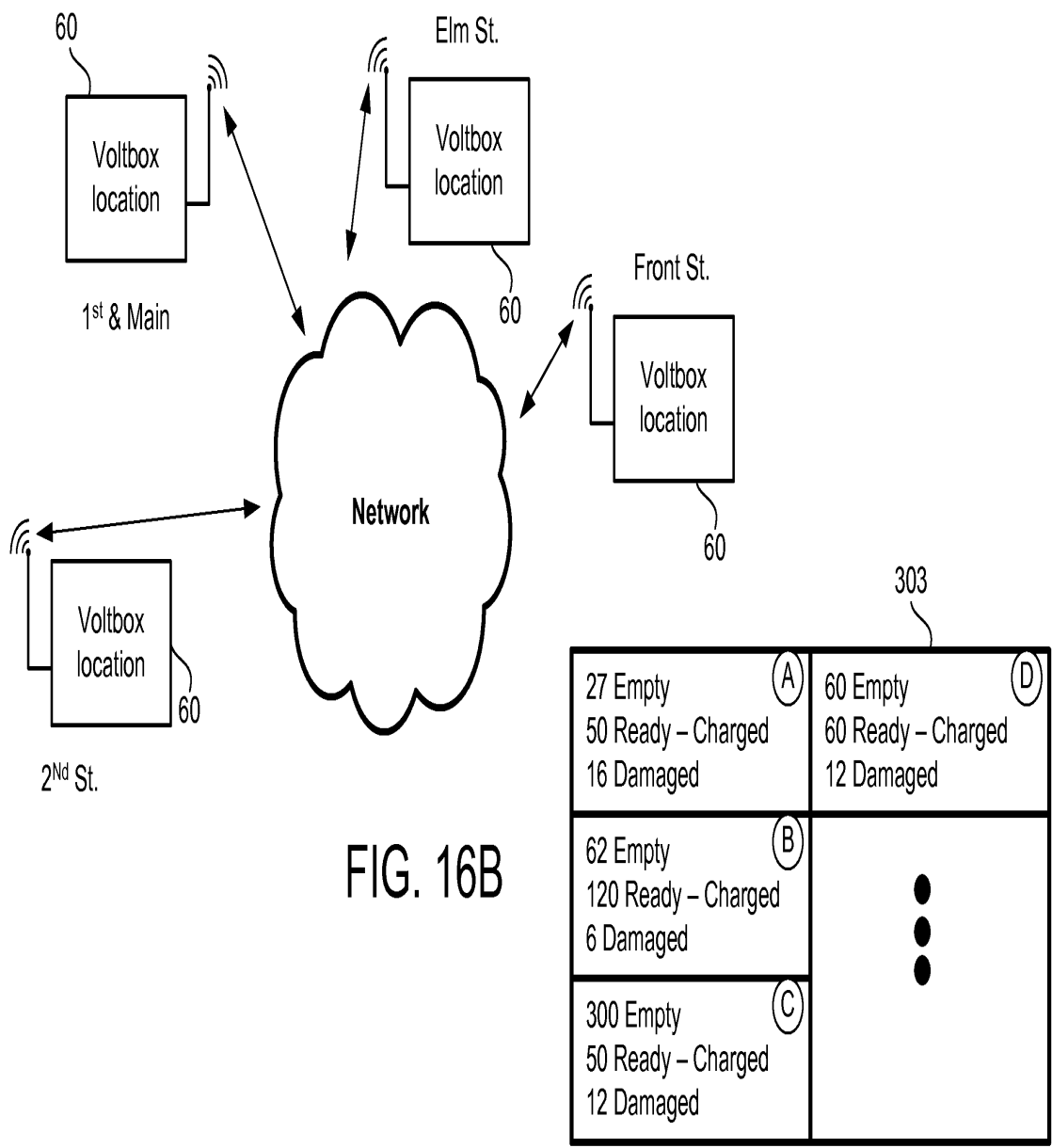
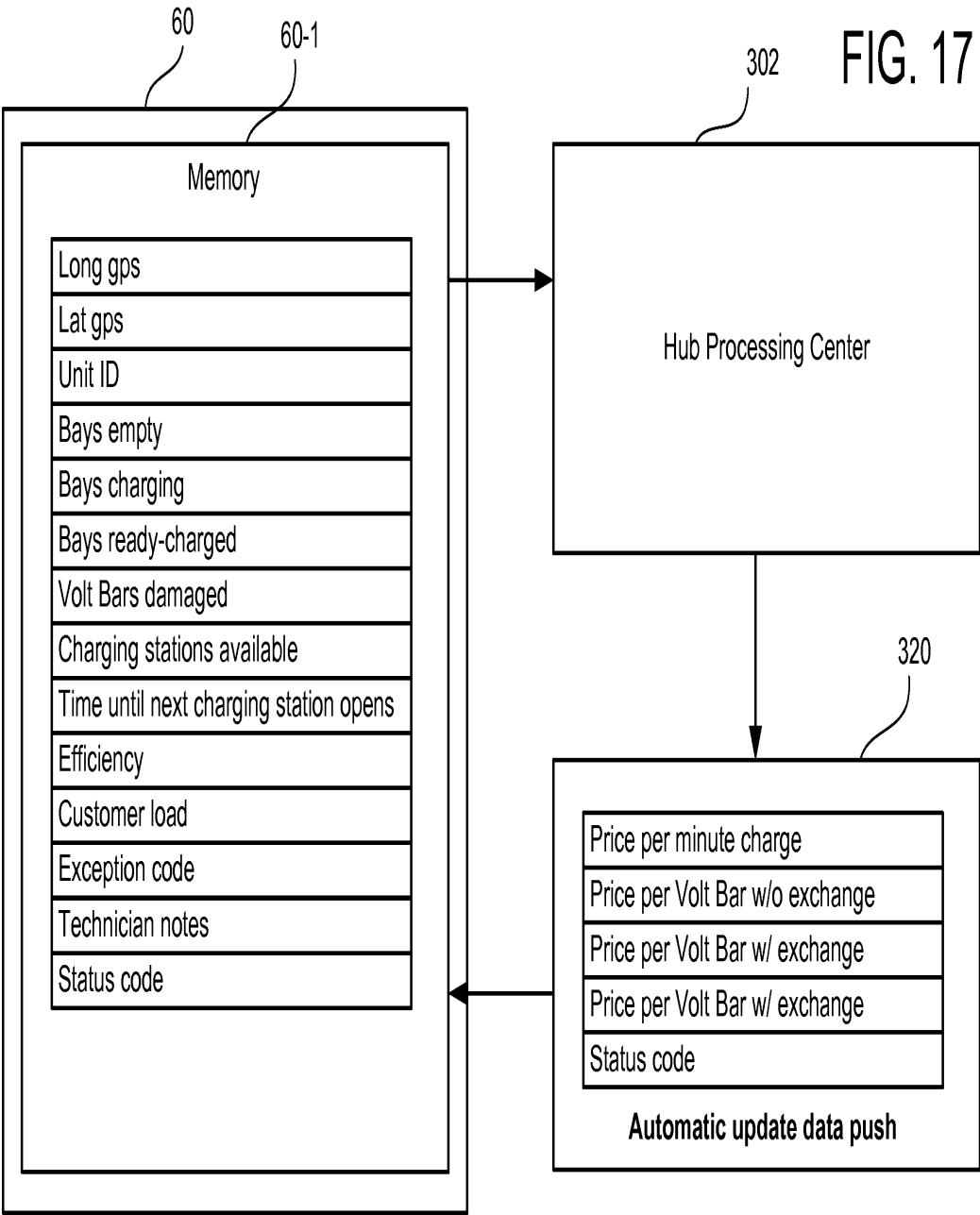


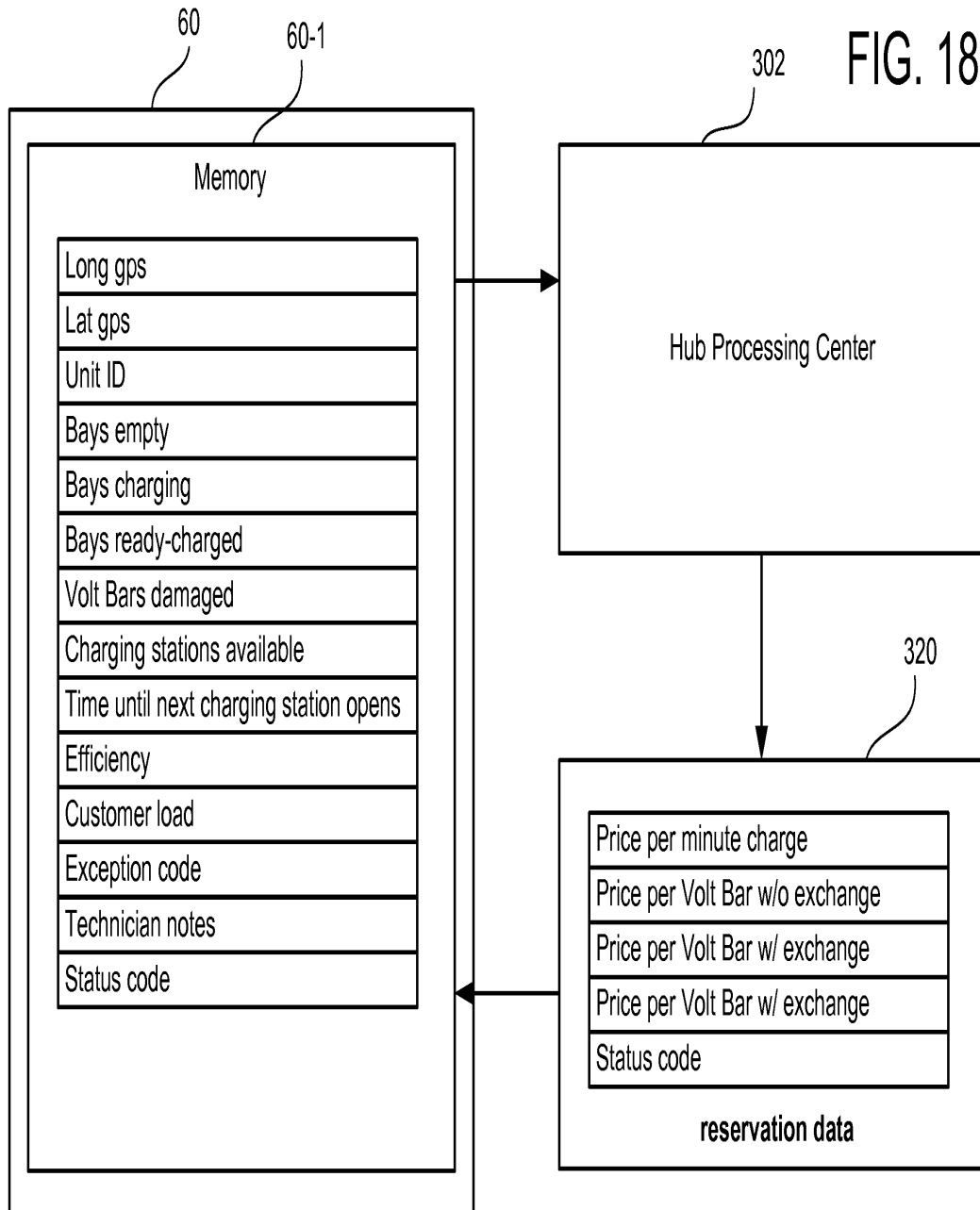
FIG. 16A



Periodic Automatic Push Update of Volt Box Memory Data

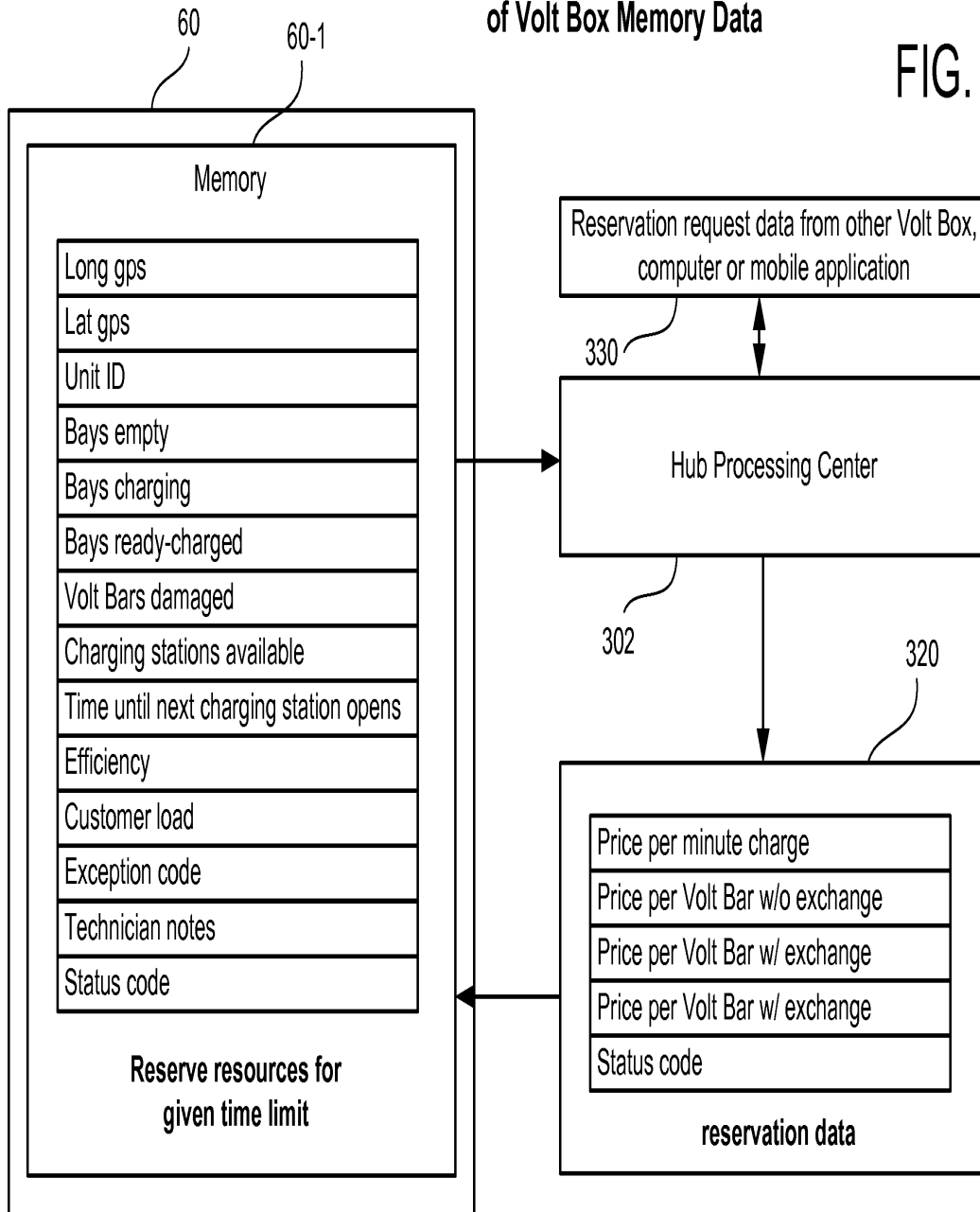


Generic Reservation Push Update of Volt Box Memory Data



Mobile / Network Reservation Push Update of Volt Box Memory Data

FIG. 19



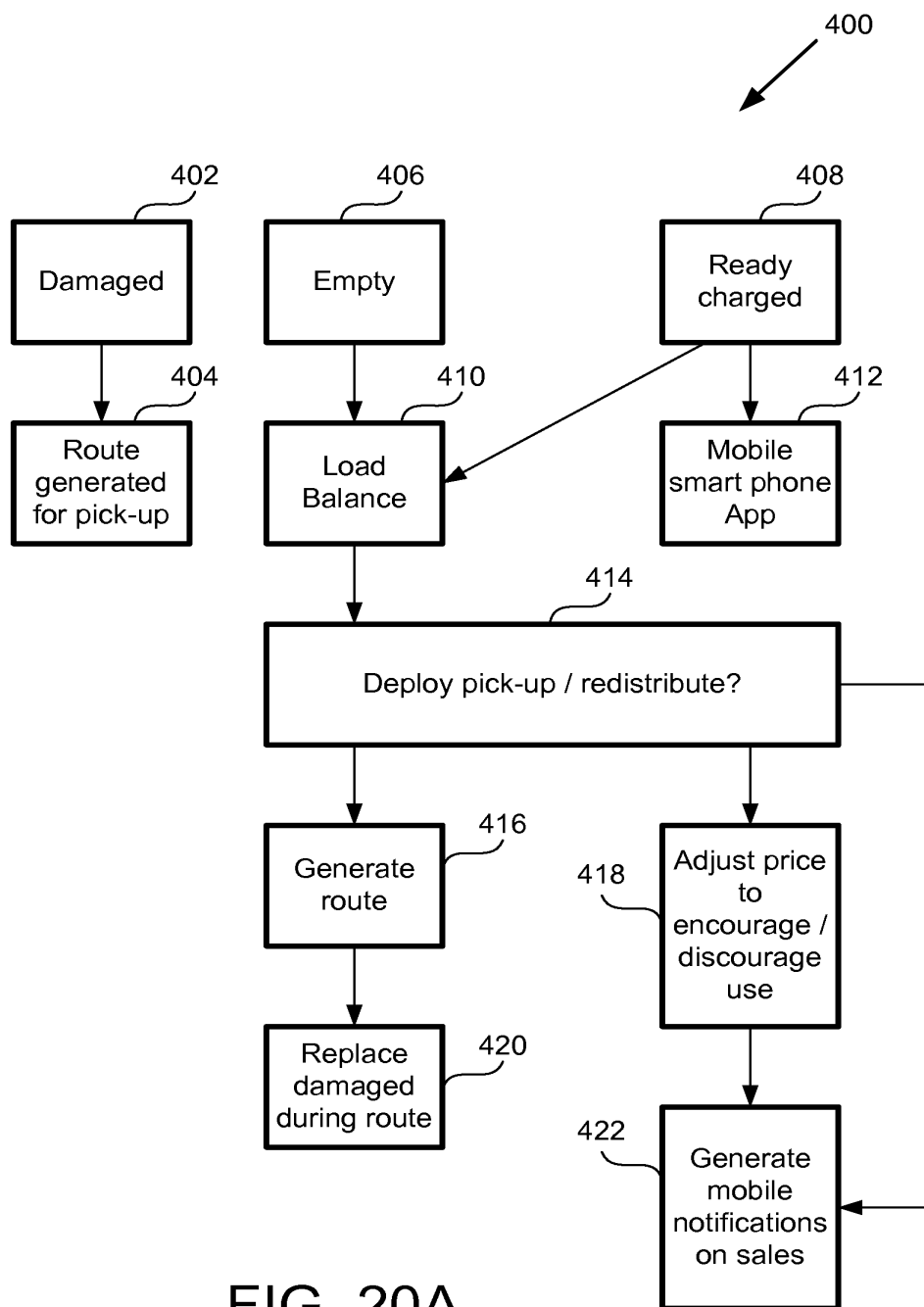


FIG. 20A

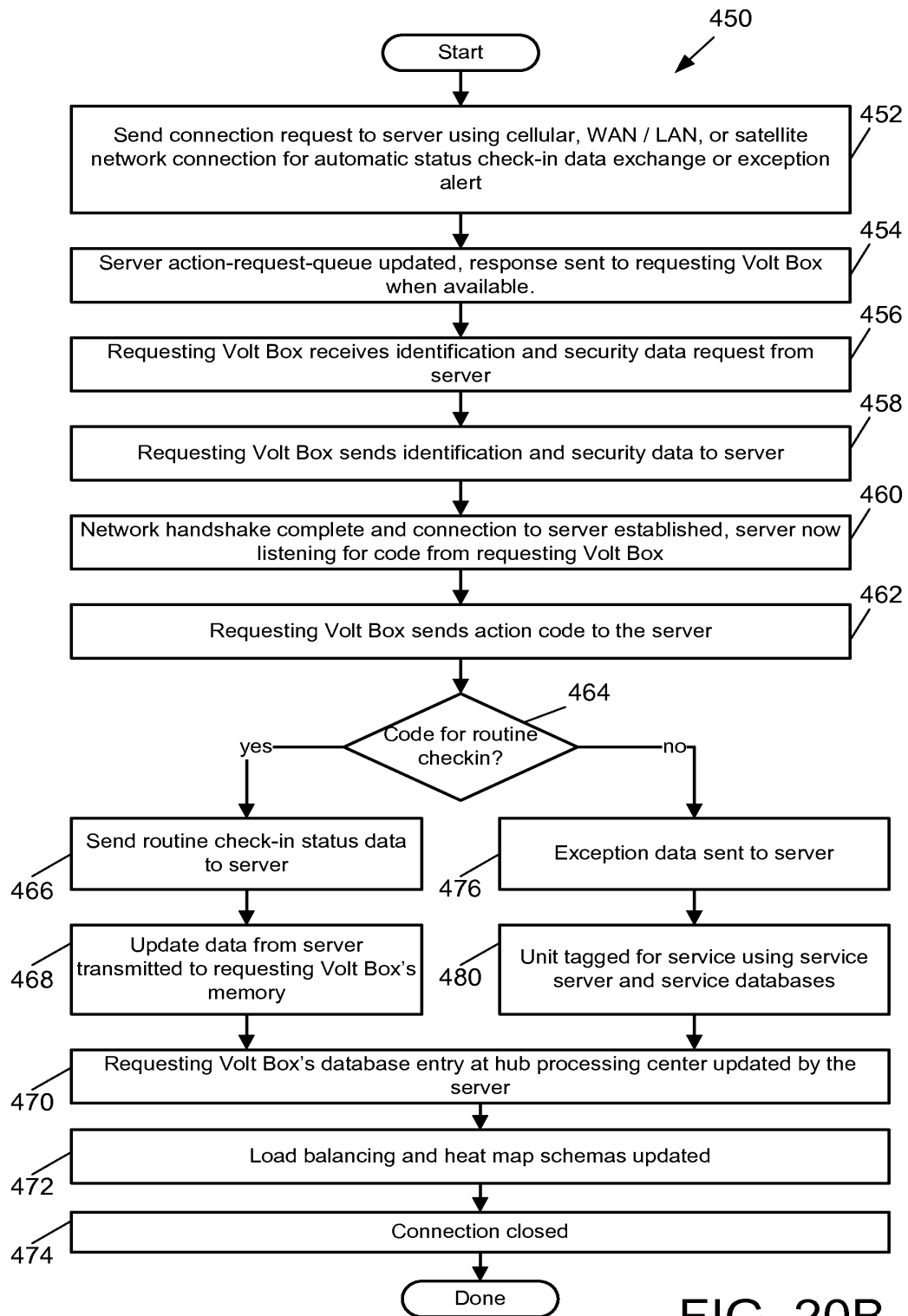


FIG. 20B

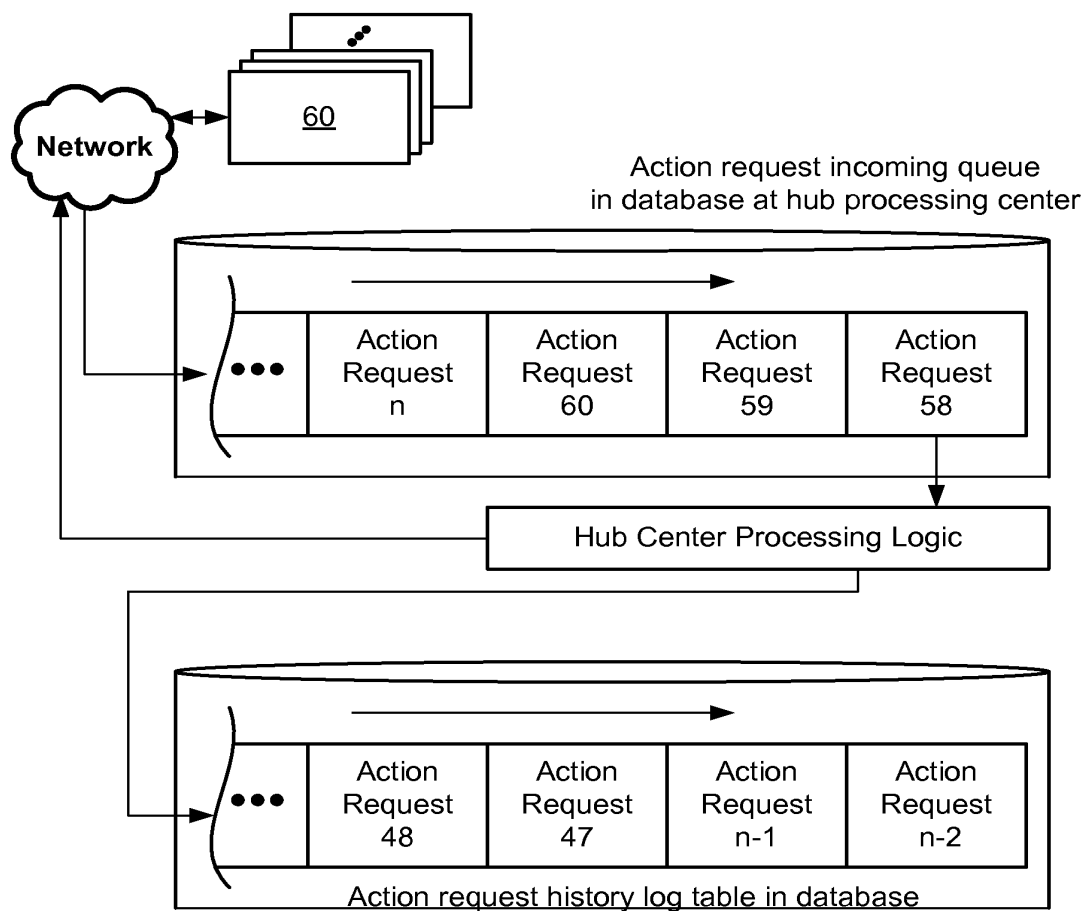


FIG. 20C

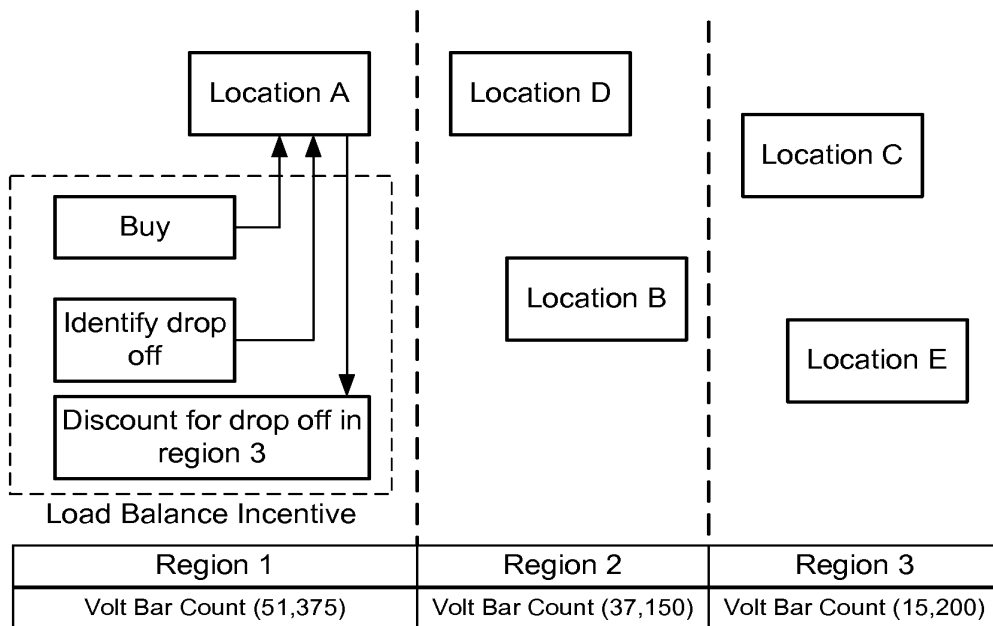
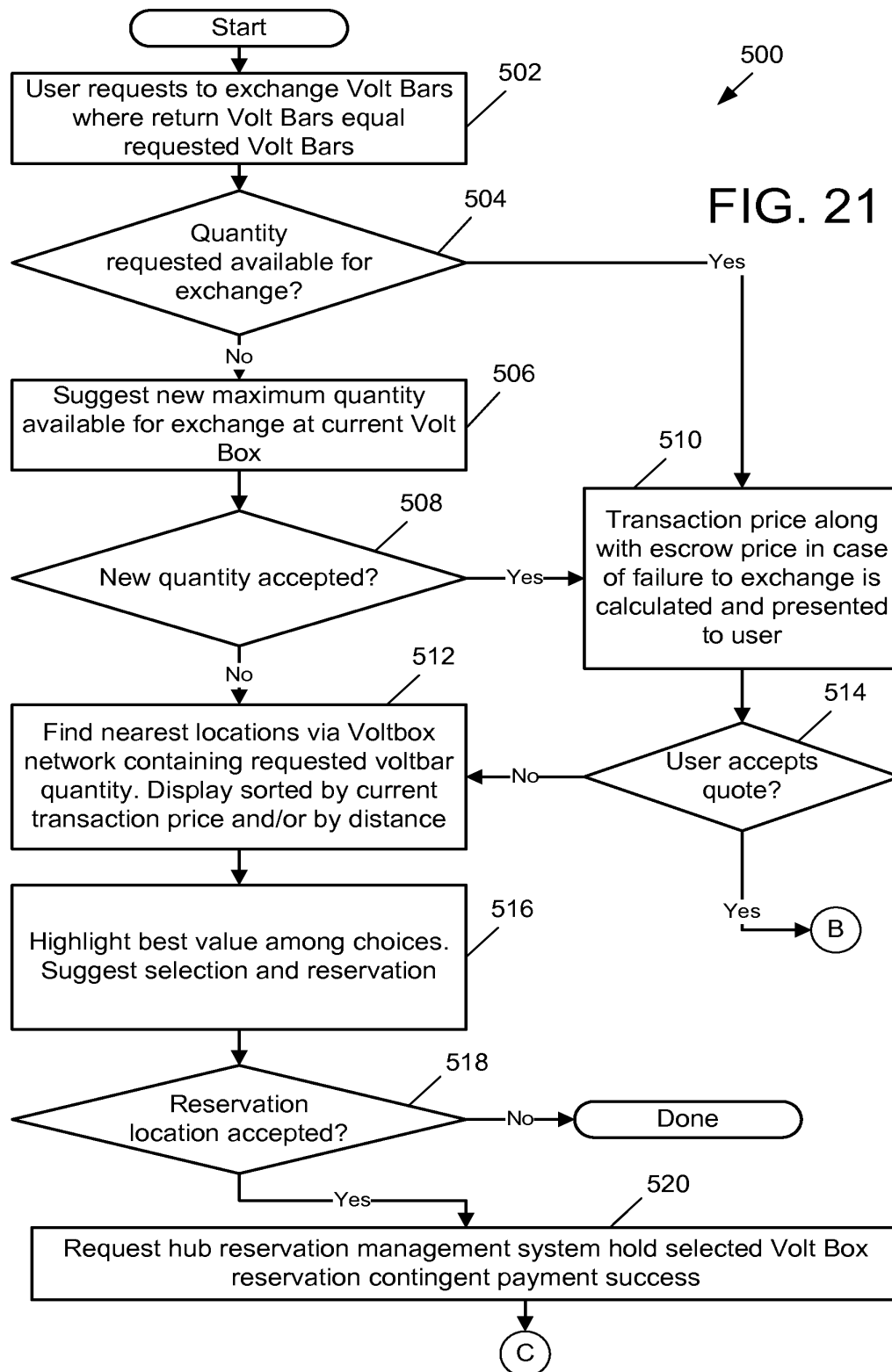


FIG. 20D



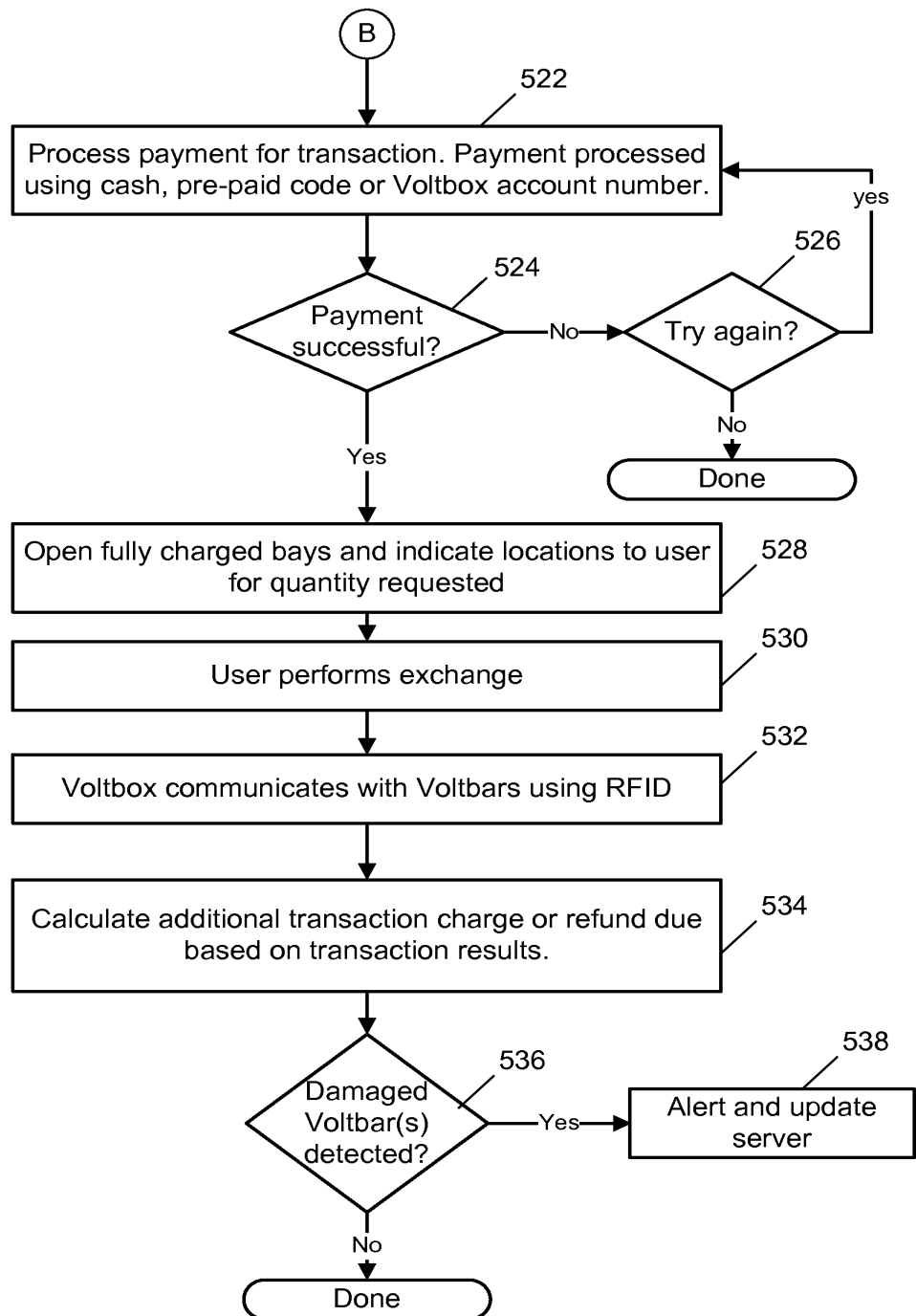


FIG. 22

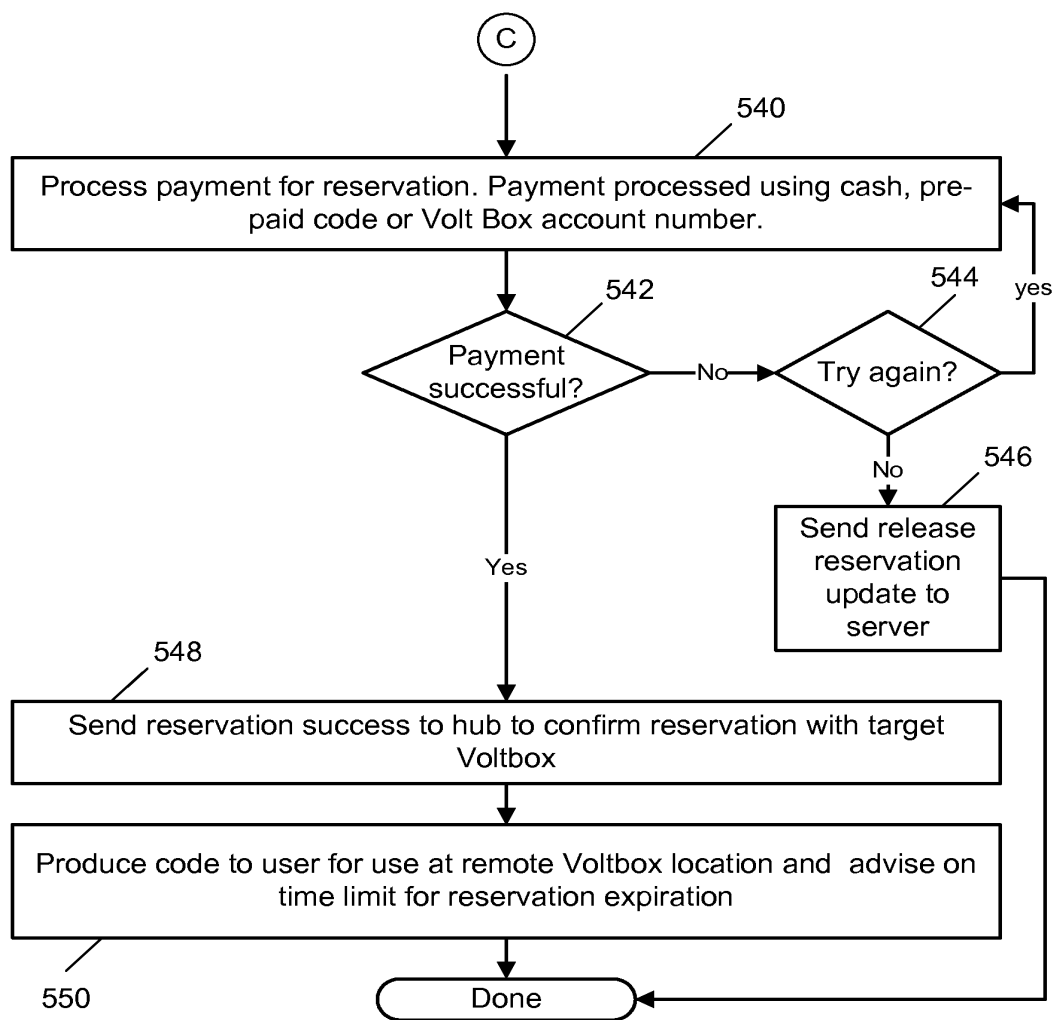
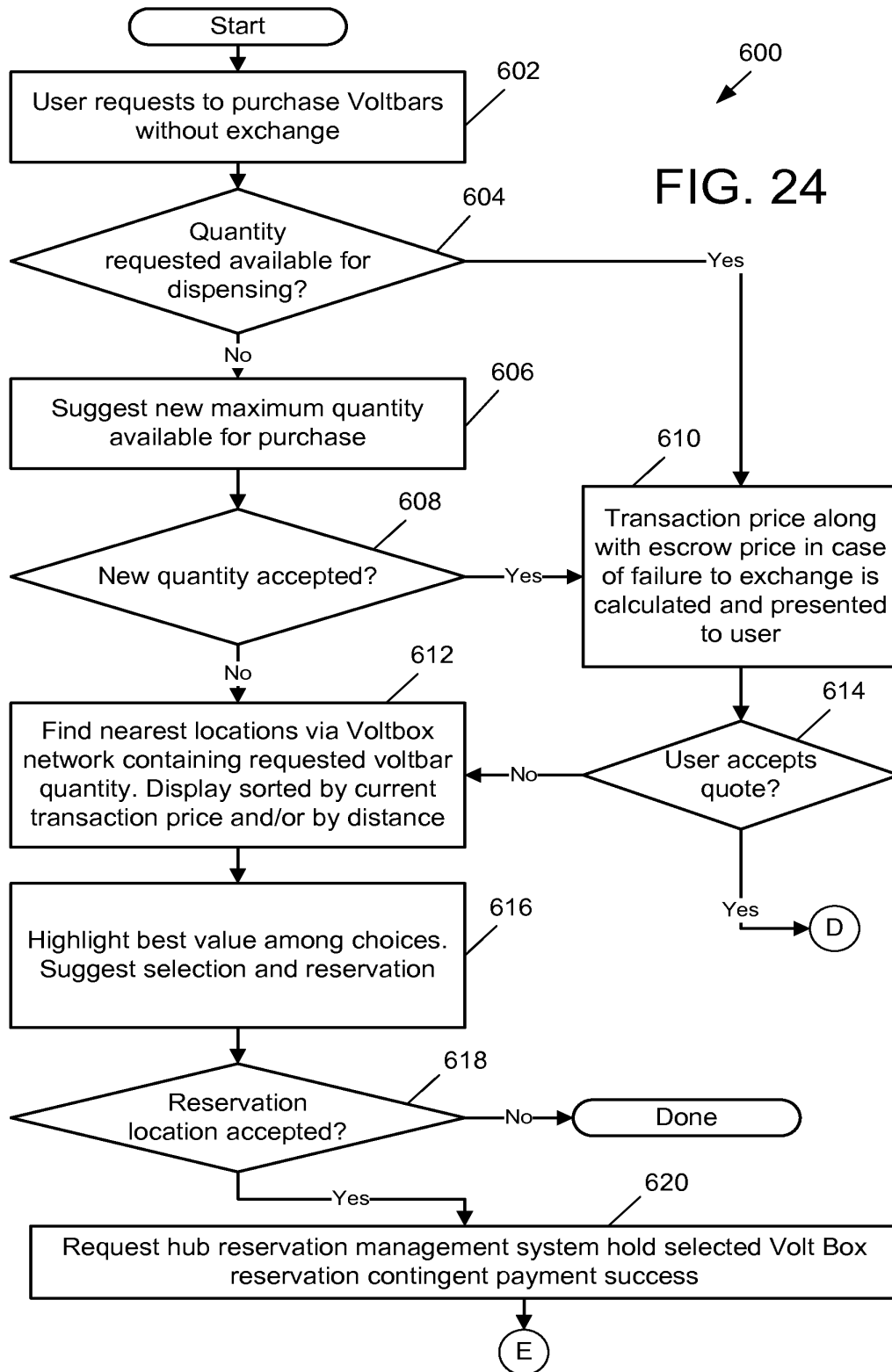


FIG. 23



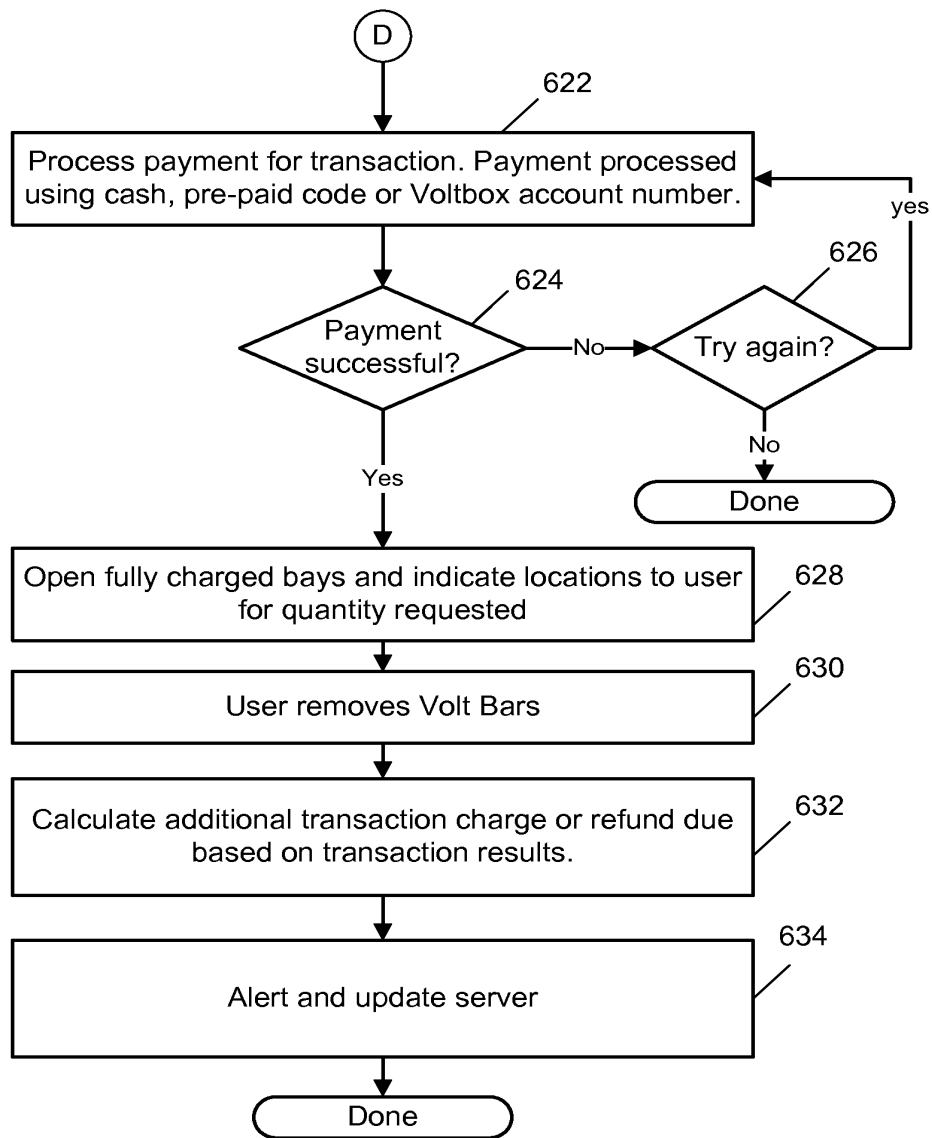


FIG. 25

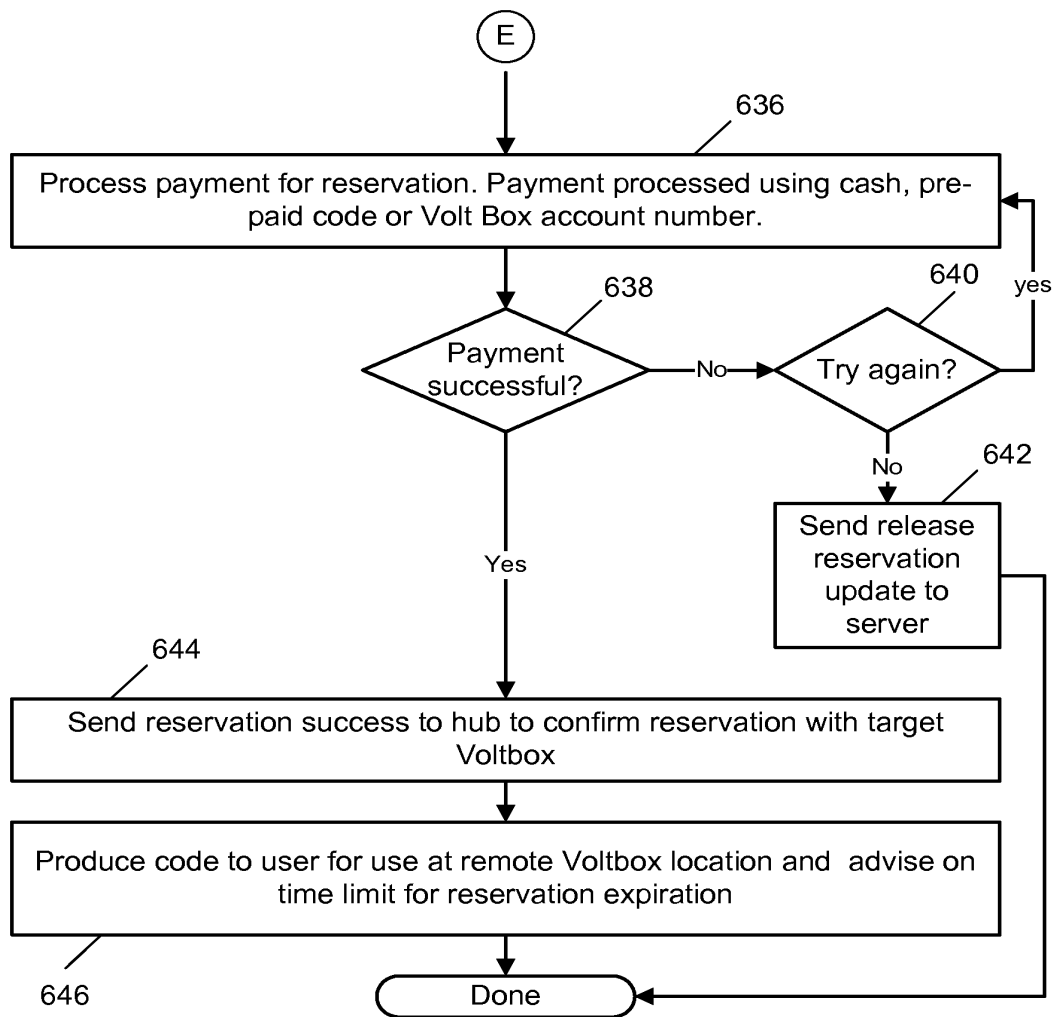
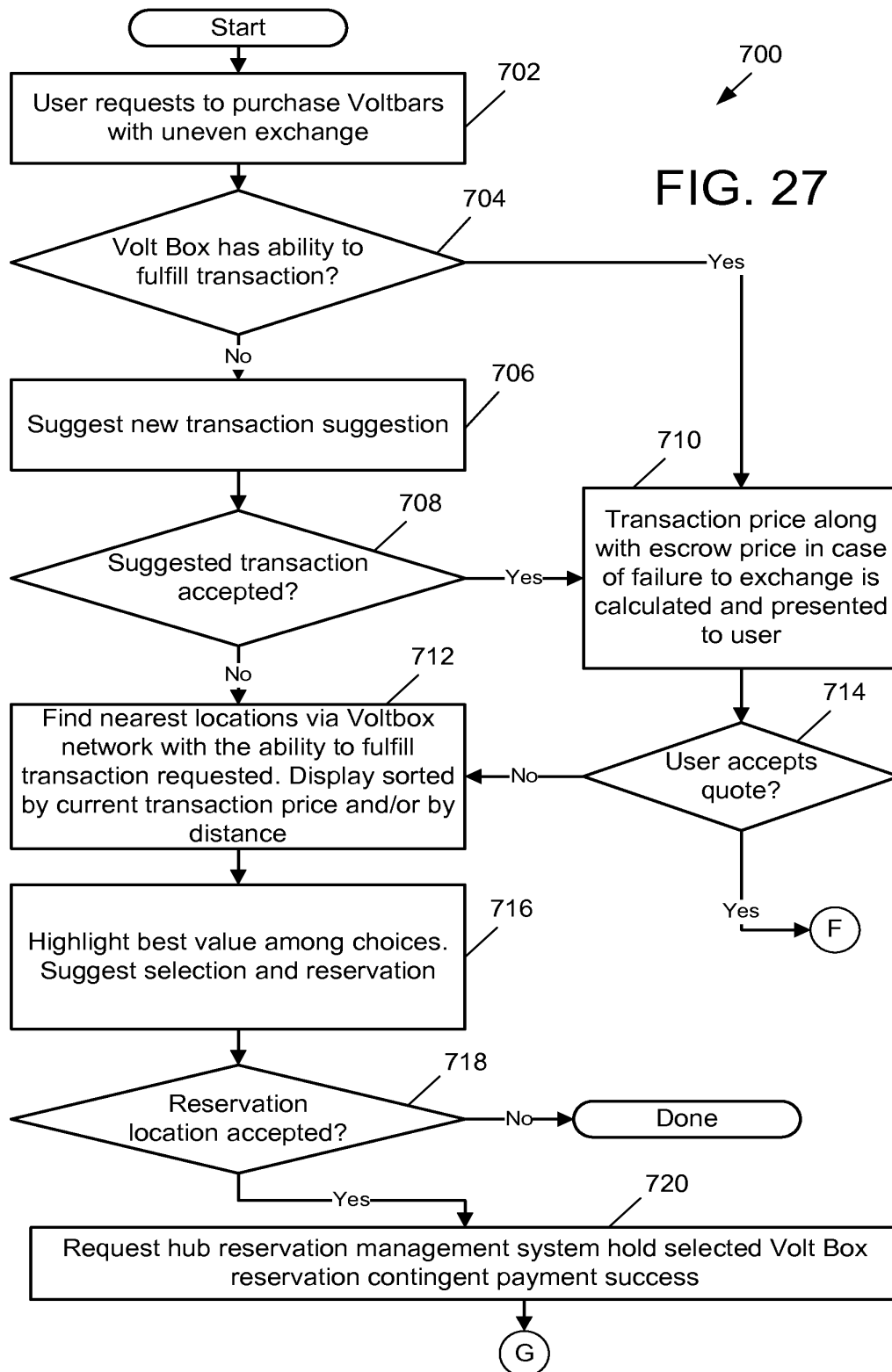


FIG. 26



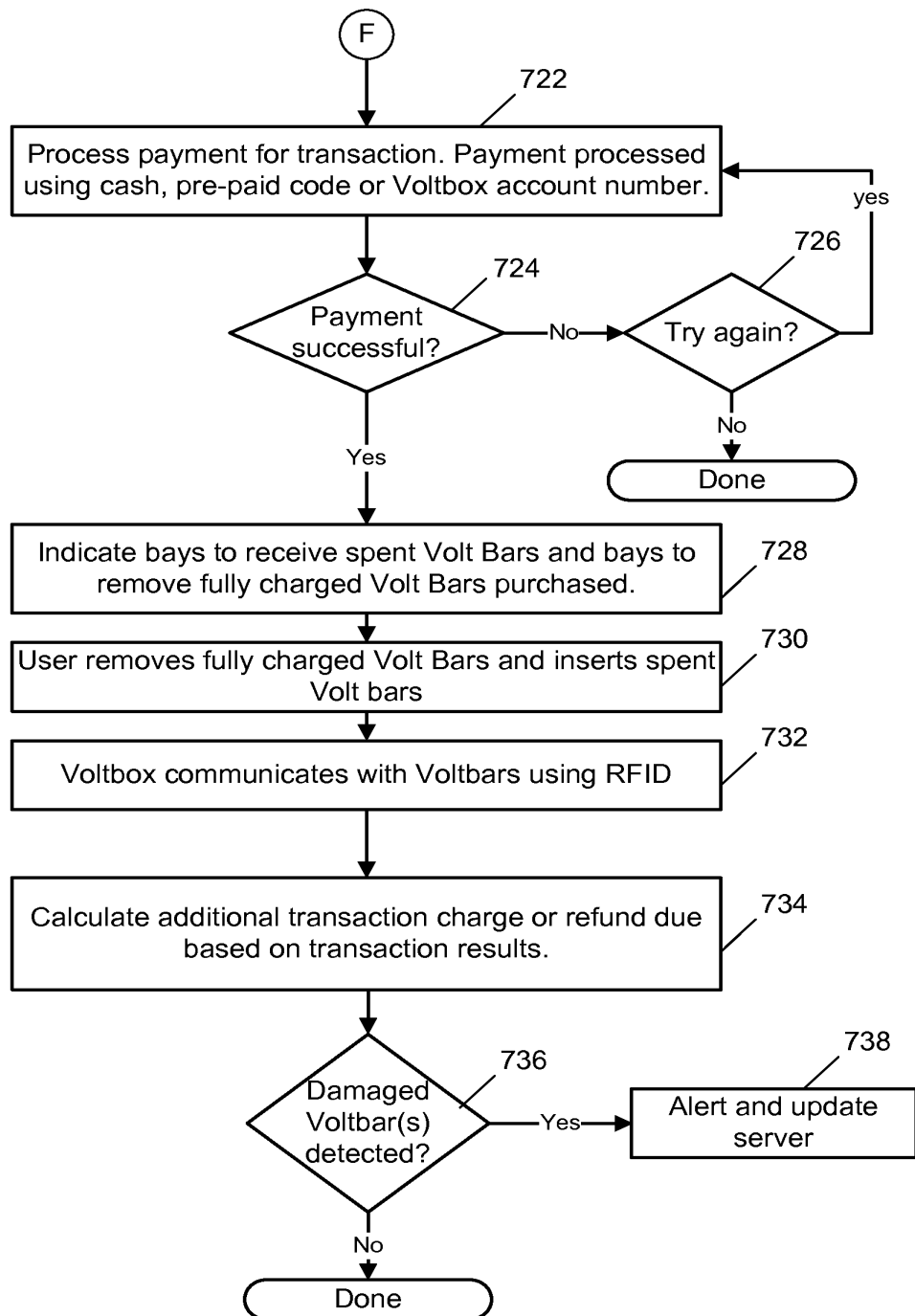


FIG. 28

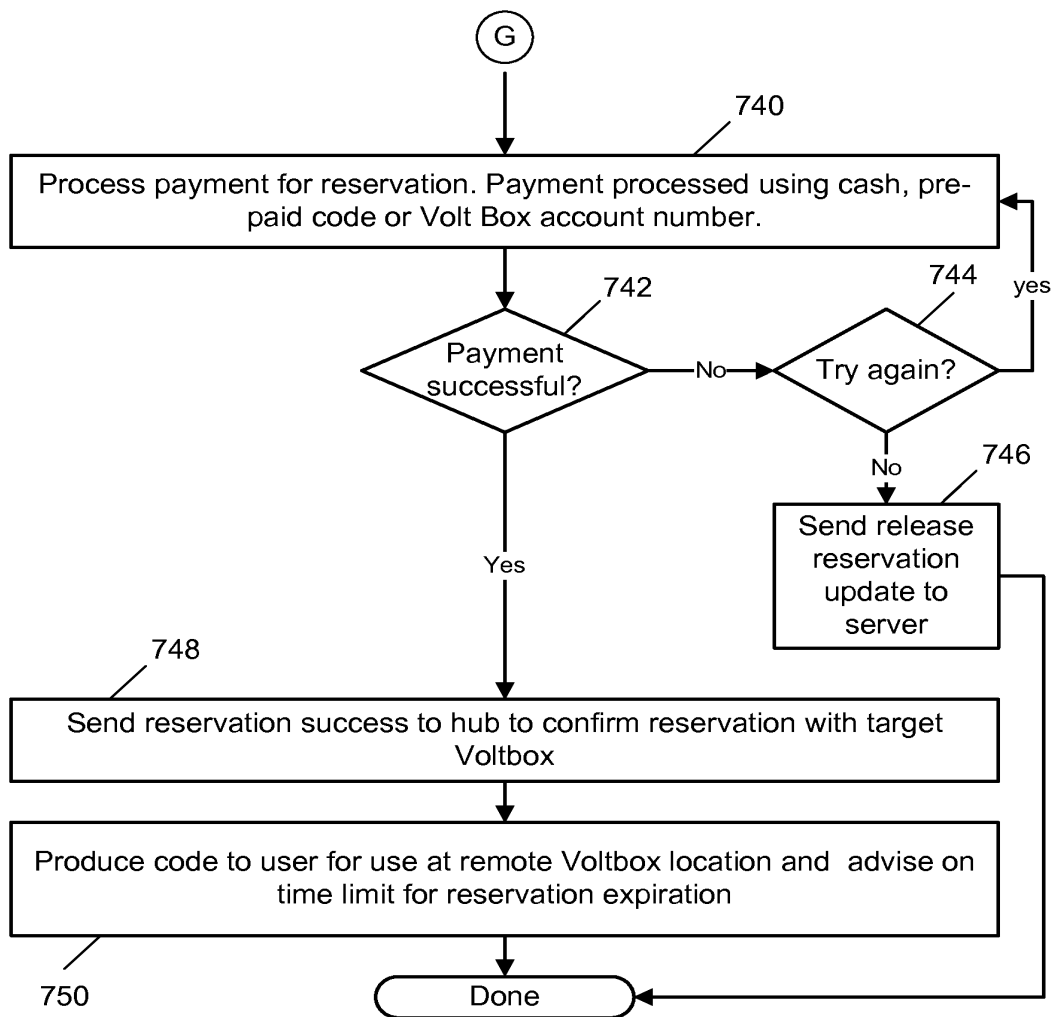


FIG. 29

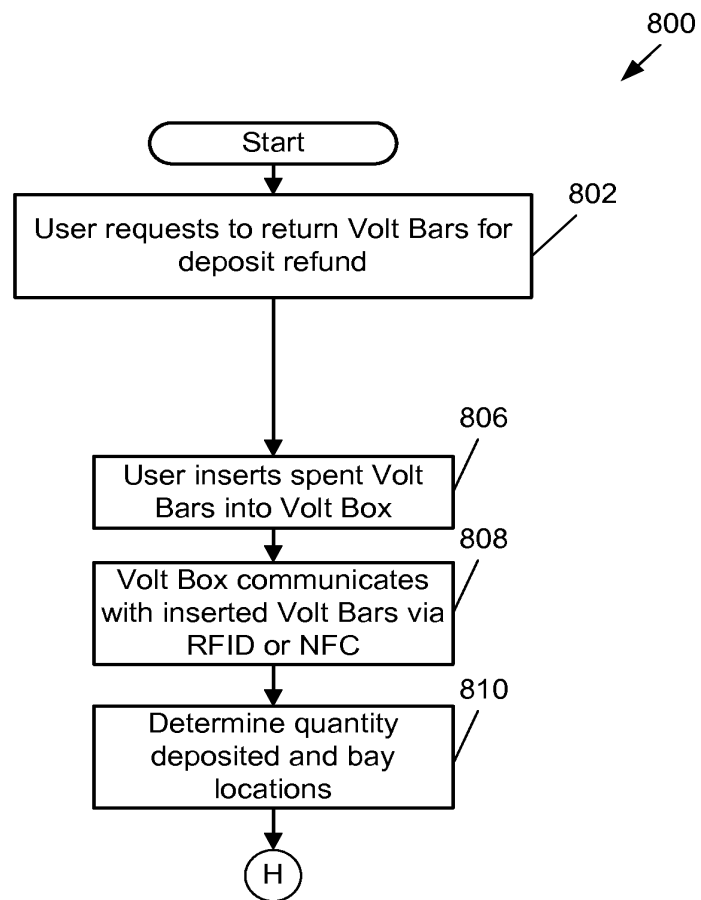
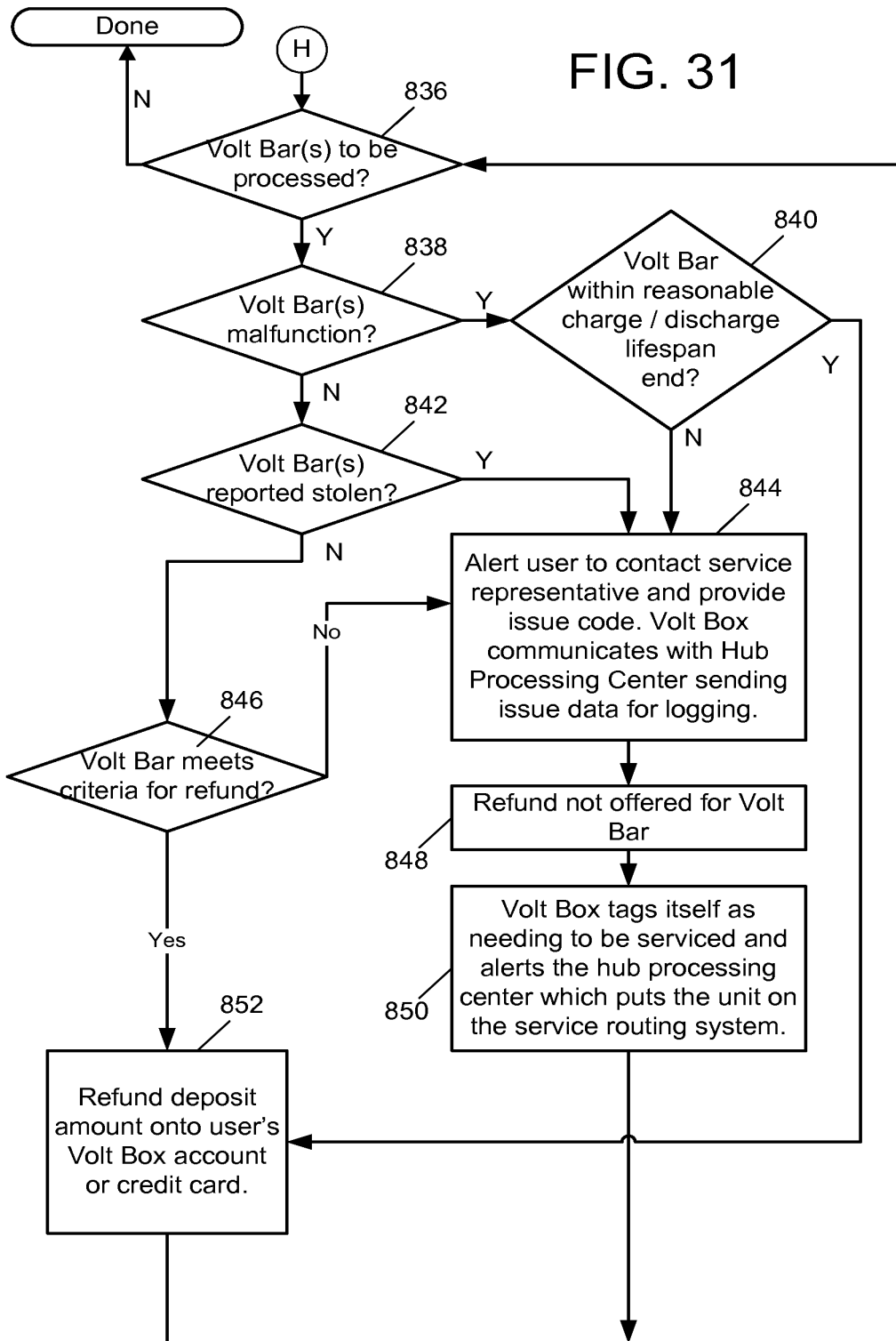
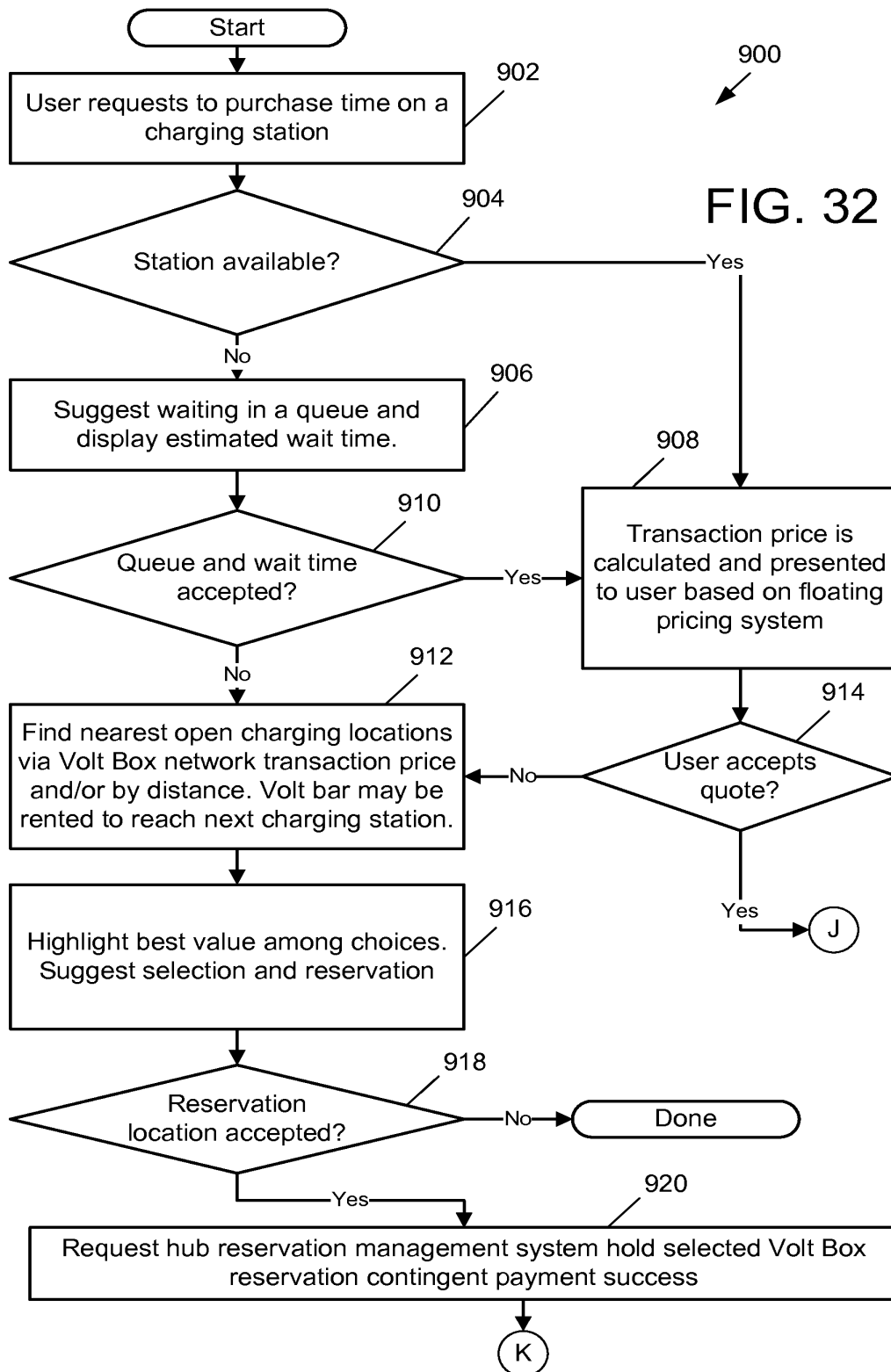


FIG. 30

FIG. 31





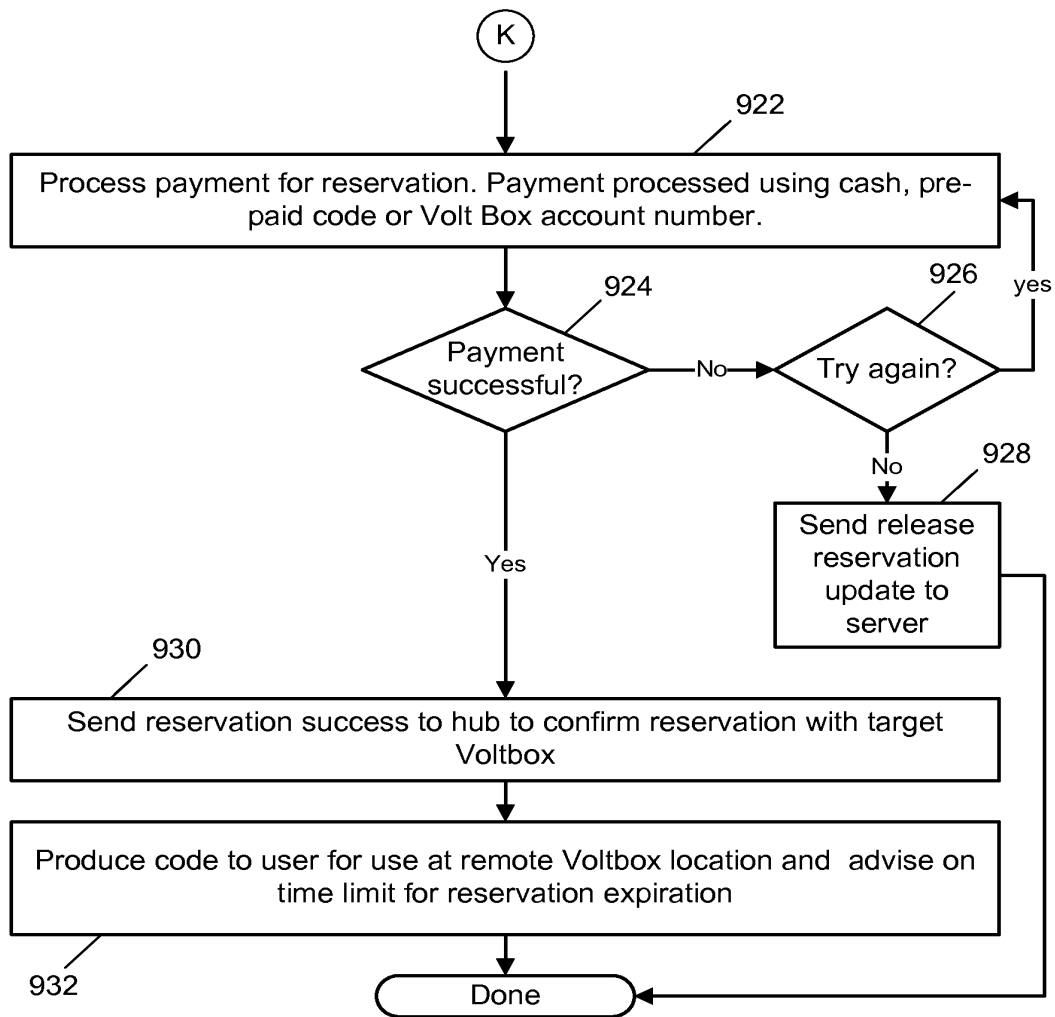


FIG. 33

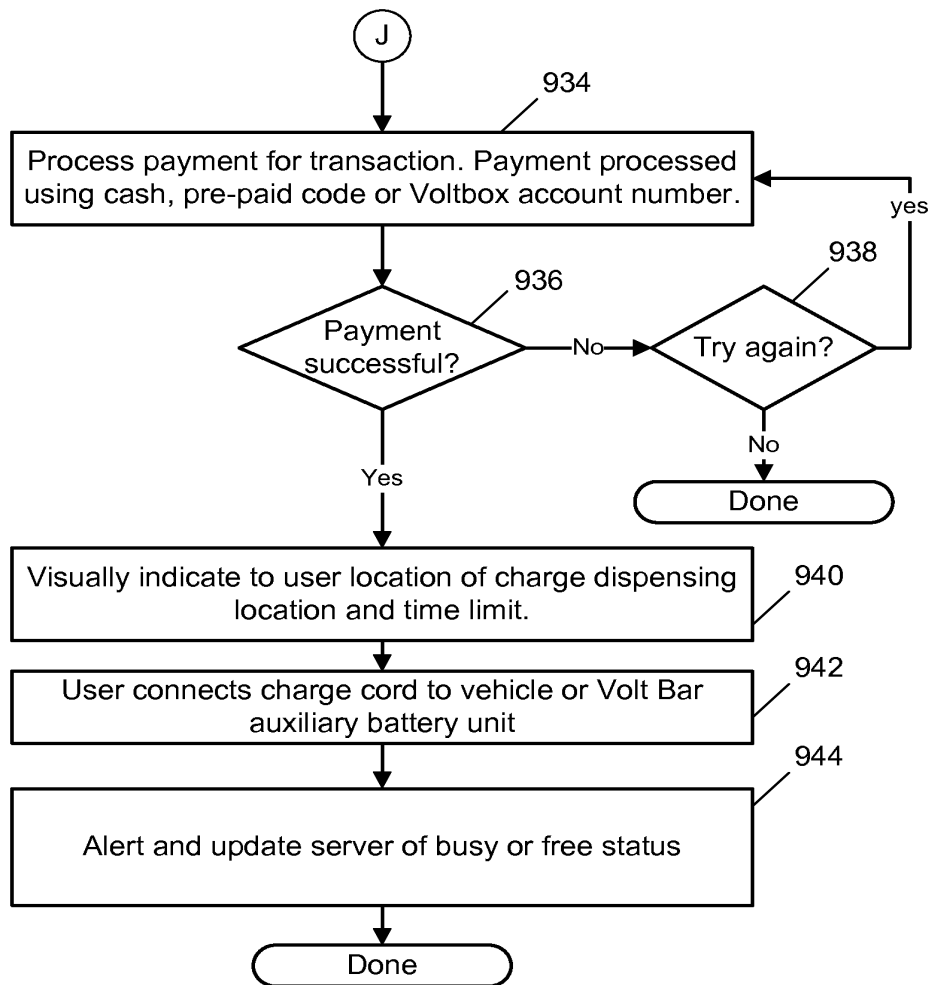


FIG. 34

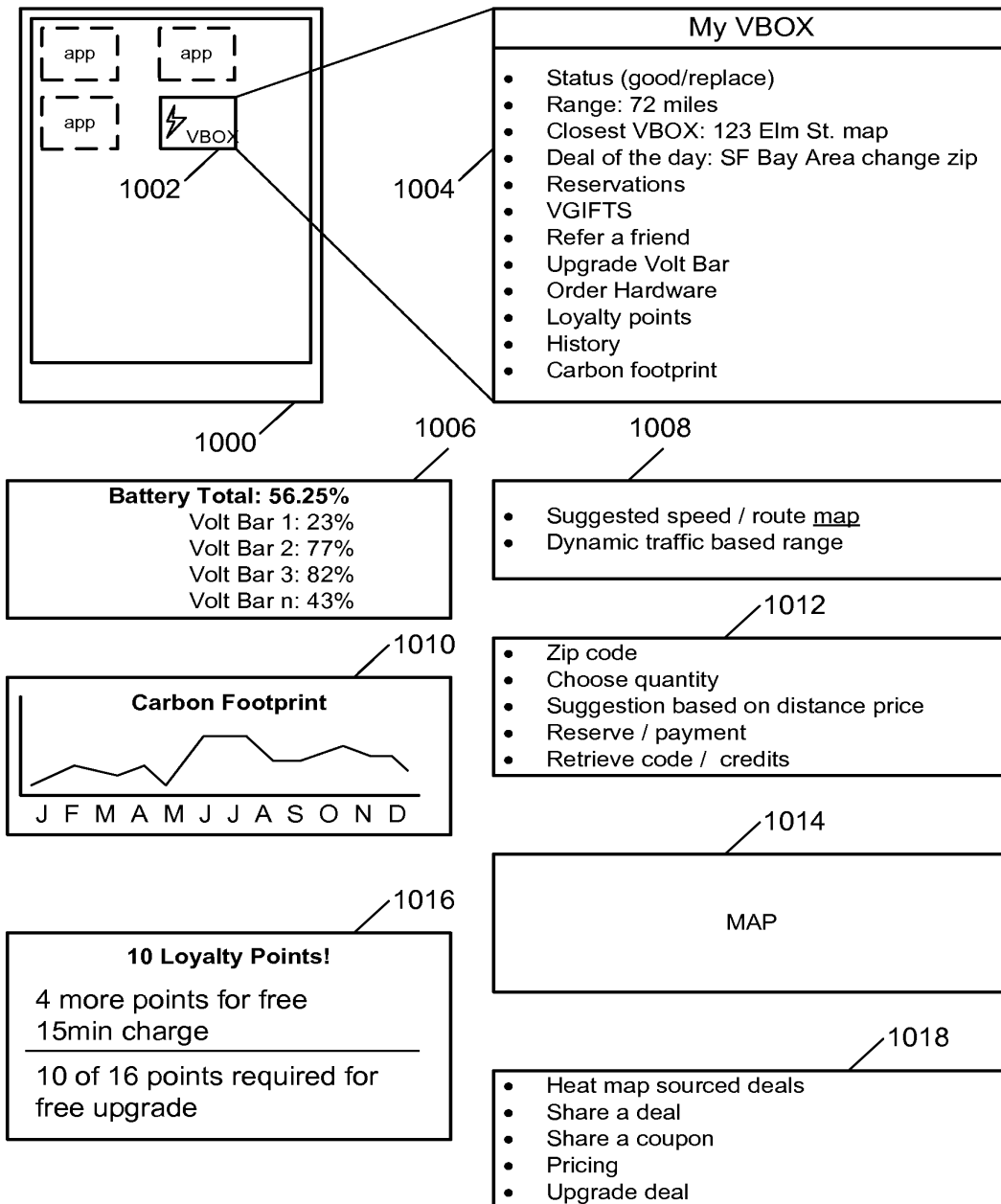


FIG. 35

FIG. 36A

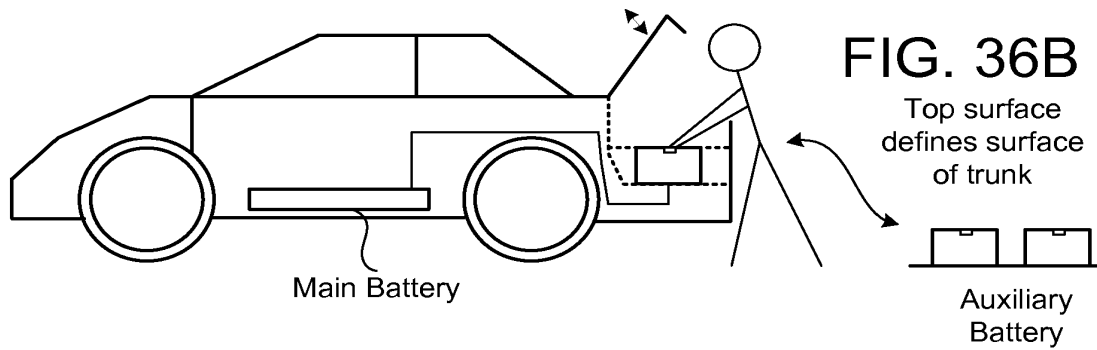
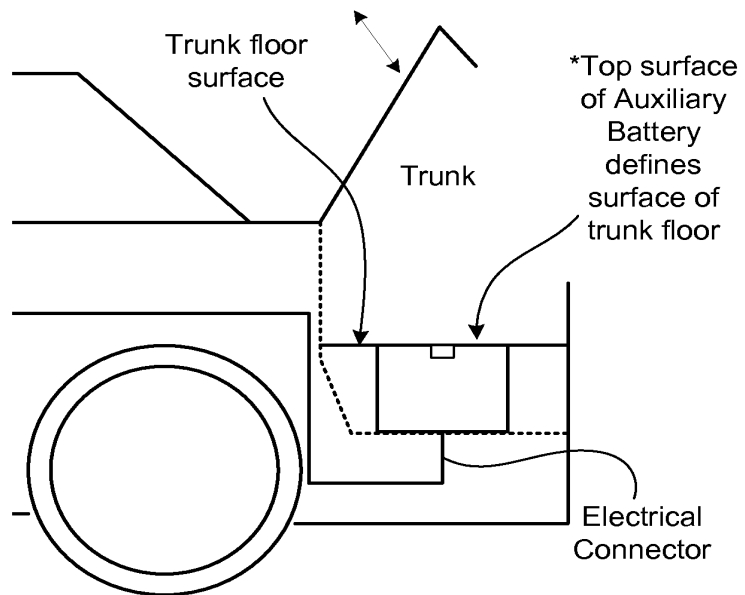


FIG. 36C

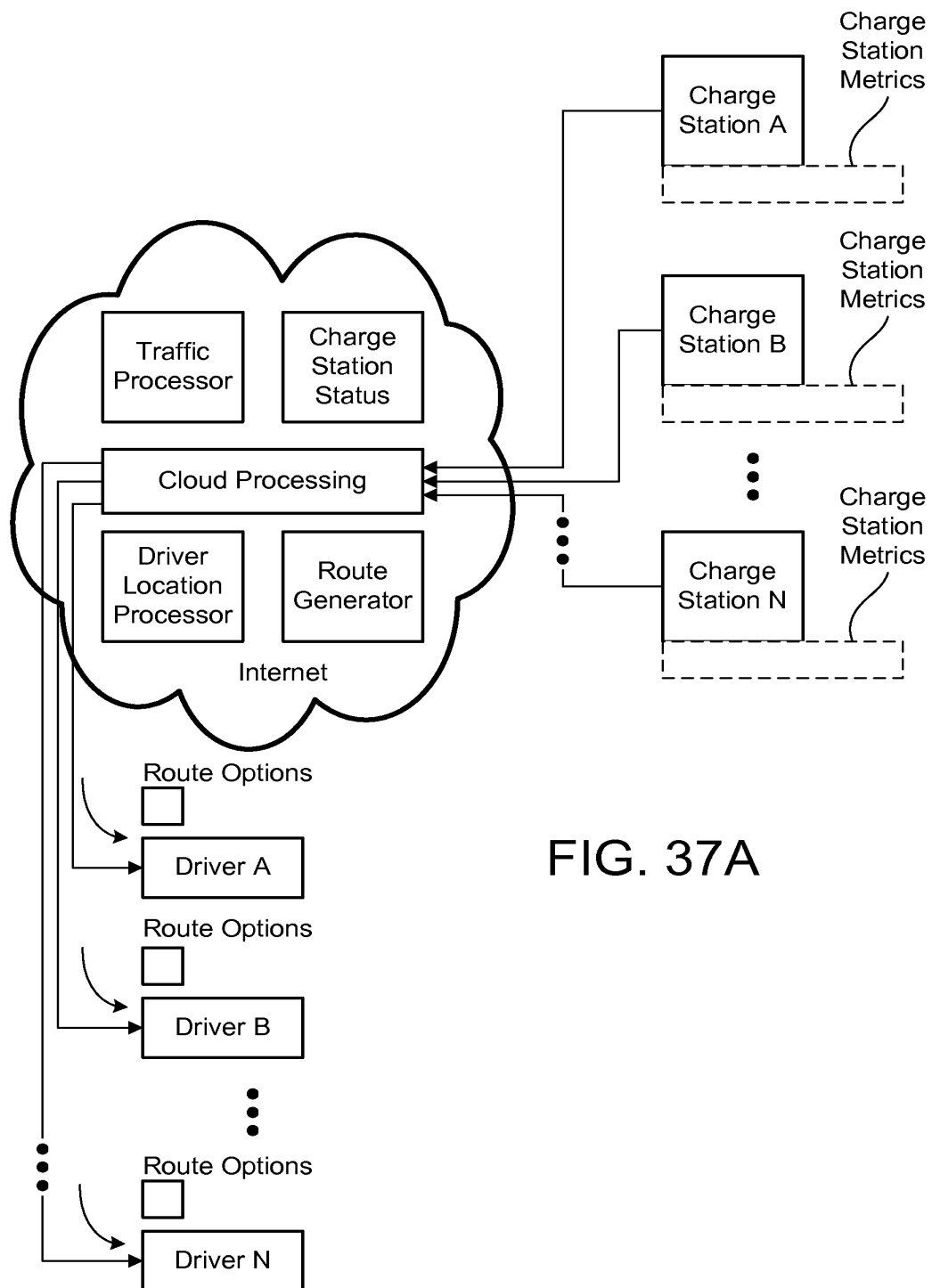


FIG. 37A

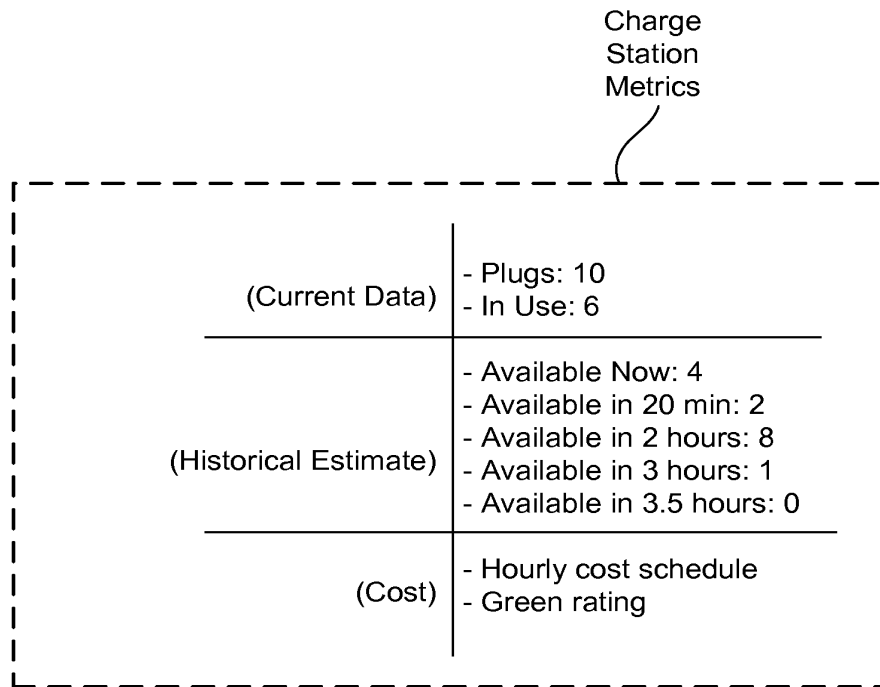
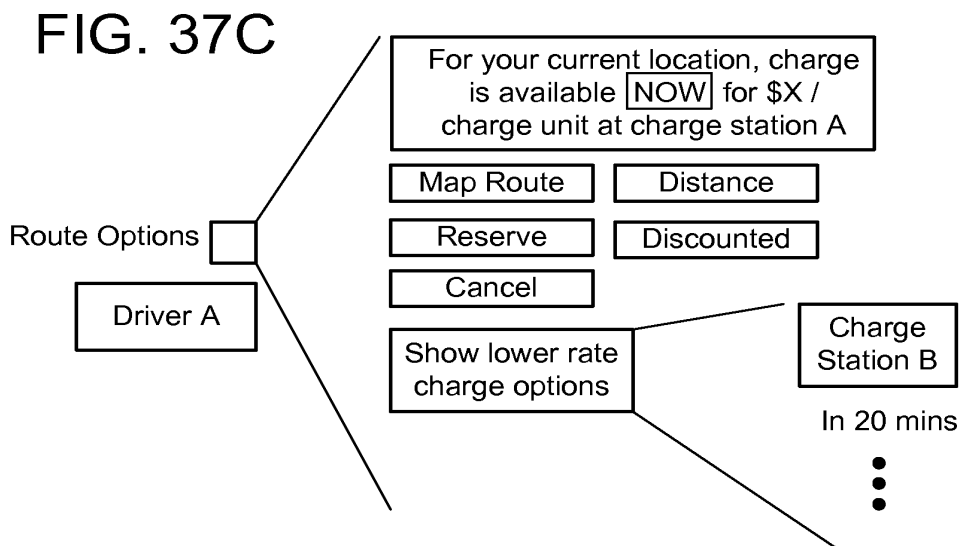
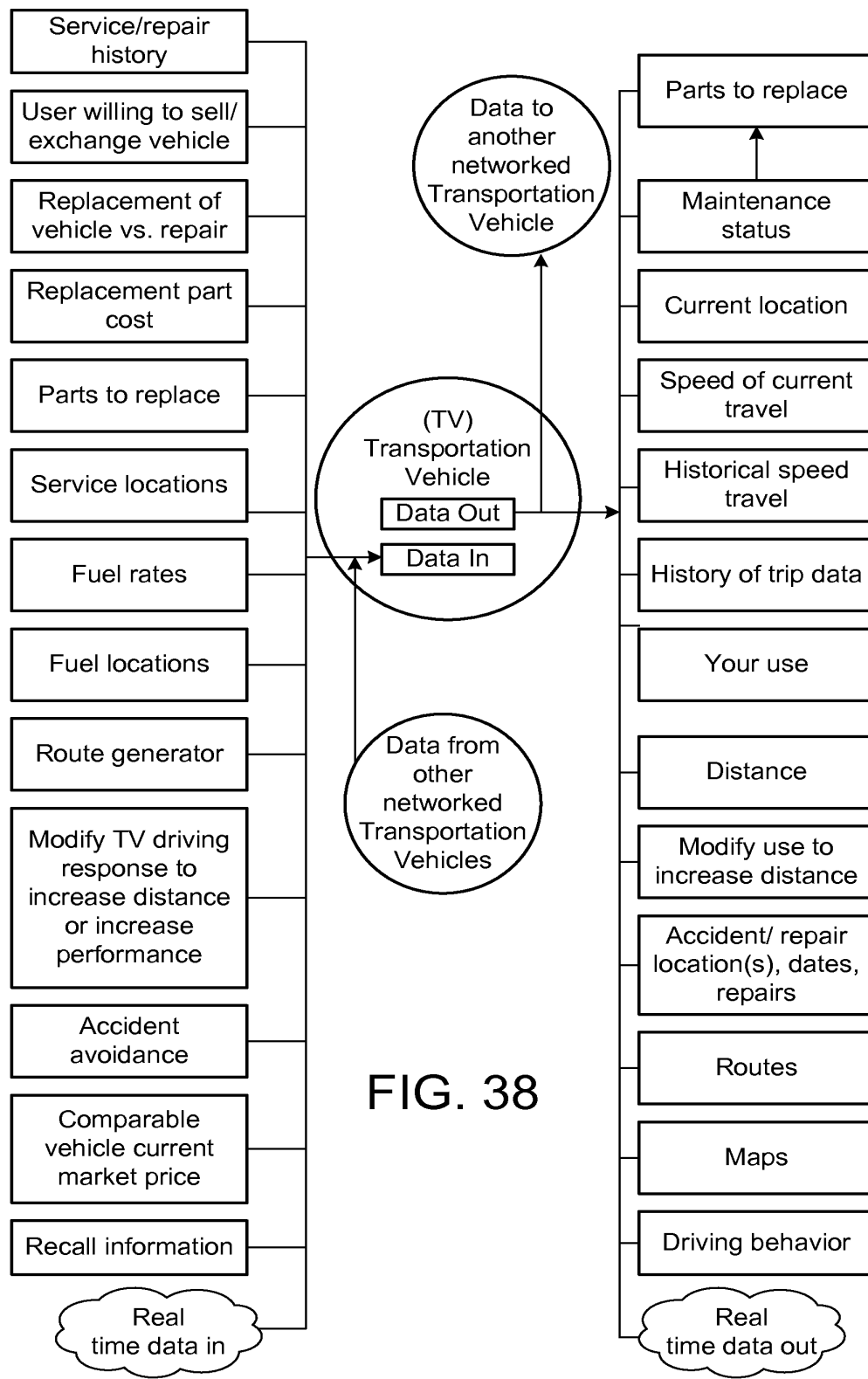


FIG. 37B





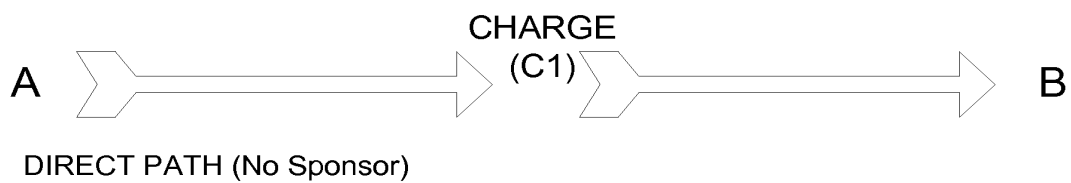
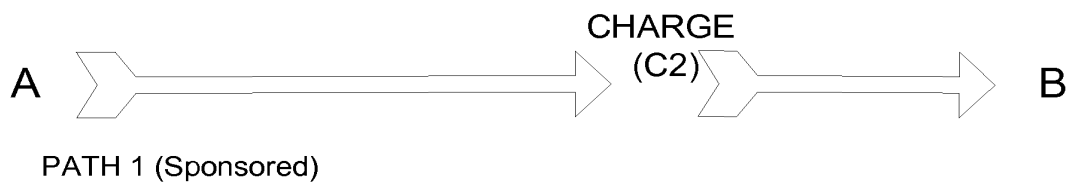
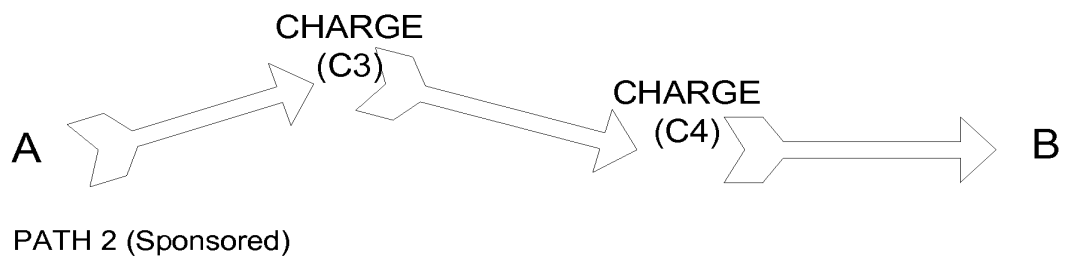
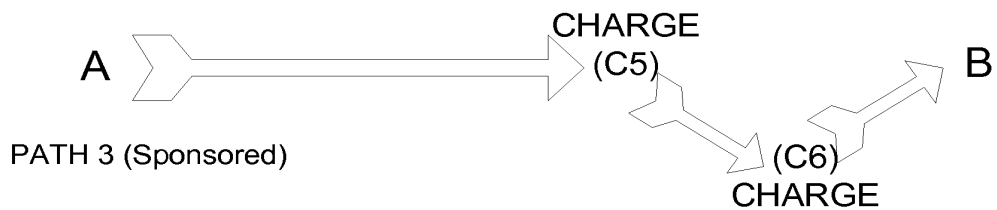
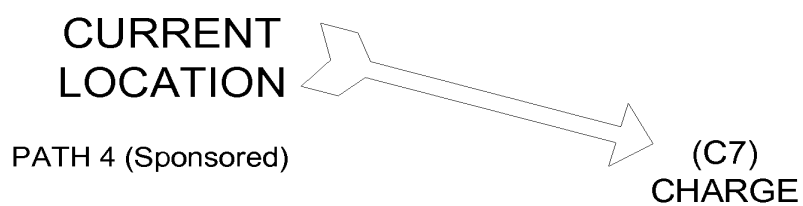


FIG. 39

PATH	Number of Stops	Charge Location(s)/ Map Path	Sponsor/Reward	Est. Trip Time, with charge stop	Est. Cost
Direct Path (no sponsor)	1	C1 /MAP	No Reward	12 min.	\$10
PATH 1 (sponsored)	1	C2: MAP (sponsored by Big Coffee Co.)	<u>Big Coffee Co.</u> \$2 off Charge bill	14 min.	\$8
PATH 2 (sponsored)	2	C3, C4 / MAP (Sponsored by: Quick Stop market & Big Coffee Co.)	<u>Quick Stop Market & Big Coffee Co.</u> \$4 off Charge bill	17 min	\$6
PATH 3 (sponsored)	2	C5, C6 / MAP (Sponsored by: Box Store & Big Coffee Co.)	<u>Box Store & Big Coffee Co.</u> \$ 5 off Charge bill	17 min	\$5
PATH 4 (sponsored)	0	C7 / MAP (Sponsored by: Big Coffee Co.)	<u>Big Coffee Co.</u> \$ 1 off Charge bill	5 min.	\$9

FIG. 40

DECLARATION AND POWER OF ATTORNEY FOR ORIGINAL U.S. PATENT APPLICATION

Attorney's Docket No.: VBOXP001

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
Electric Vehicle (EV) Range Extending Charge Systems, Distributed Networks of Charge Kiosks, and Charge Locating Mobile Apps, the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is 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.

And I hereby appoint the practitioners associated with **Customer Number 25,920**, being the attorneys and/or agents of MARTINE PENILLA GROUP, LLP as my principal attorneys and/or agents to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, provided that if any one of above-said attorneys ceases being affiliated with Customer Number 25,920, such attorney's appointment as attorney and all powers derived therefrom shall terminate on the date such attorney ceases being so affiliated.

Send Correspondence To:

Albert S. Penilla, Esq.
MARTINE PENILLA GROUP, LLP
710 Lakeway Drive, Suite 200
Sunnyvale, CA 94085
Customer No. 25920

Direct Telephone Calls To:

Albert S. Penilla at telephone number (408) 774-6903

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Typewritten Full Name of

Sole or First Inventor: Angel A. Penilla Citizenship: US

Inventor's signature: /Angel Penilla/ **Date of Signature:** April 21, 2012

Residence: (City) San Jose (State/Country) CA

Post Office Address: 710 Lakeway Drive, Suite 200, Sunnyvale, CA 95085

Typewritten Full Name of

Second Inventor: Albert S. Penilla Citizenship: US

Inventor's signature: /Albert Penilla/ **Date of Signature:** April 21, 2012

Residence: (City) Sunnyvale (State/Country) CA

Post Office Address: 710 Lakeway Drive, Suite 200, Sunnyvale, CA 95085

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS		
First Named Inventor/Applicant Name:		Angel A. Penilla		
Filer:		Albert S. Penilla		
Attorney Docket Number:		VBOXP001		
Filed as Small Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	95	95
Utility Search Fee	2111	1	310	310
Utility Examination Fee	2311	1	125	125
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 (\$)				530

Electronic Acknowledgement Receipt	
EFS ID:	12598949
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VBOXP001
Receipt Date:	22-APR-2012
Filing Date:	
Time Stamp:	00:16:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 530
RAM confirmation Number	7690
Deposit Account	500805
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Specification	VOLTP001_App_Efiled.pdf	411541 c821fca3eabc6d54d8e10f5662eda24fc2d1443	no	85
Warnings:					
Information:					
2	Drawings-only black and white line drawings	VBOXP001_Drawings_Efiled.pdf	250564 93318a27230c70bcd28cf993e87cb7f870ca2ea6	no	44
Warnings:					
Information:					
3	Oath or Declaration filed	DeclarationP001.pdf	25536 63b280ef2a9af74011840431e7bd3c34637aa437	no	1
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	33168 75f408ab13c3e51ccab6515abd6166fcbf472582	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			720809		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 13/452,882	
APPLICATION AS FILED - PART I							
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	95		N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	310		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A	
TOTAL CLAIMS (37 CFR 1.16(j))	1	minus 20 = *	x 30 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *	x 125 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
			TOTAL	530		TOTAL	
* If the difference in column 1 is less than zero, enter "0" in column 2.							
APPLICATION AS AMENDED - PART II							
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
				TOTAL ADD'L FEE			OR
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus **	=	x	=	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x	=	OR
	Application Size Fee (37 CFR 1.16(s))						OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						OR
				TOTAL ADD'L FEE			OR
* 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
13/452,882	04/22/2012	2859	530	VBOXP001	1	1

CONFIRMATION NO. 6203

25920
MARTINE PENILLA GROUP, LLP
710 LAKEWAY DRIVE
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FILING RECEIPT



OC000000054039461

Date Mailed: 05/03/2012

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

Applicant(s)

Angel A. Penilla, San Jose, CA;
Albert S. Penilla, Sunnyvale, CA;

Power of Attorney: The patent practitioners associated with Customer Number 25920

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/478,436 04/22/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

If Required, Foreign Filing License Granted: 05/01/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/452,882**

Projected Publication Date: 10/25/2012

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS

Preliminary Class

320

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page 2 of 3

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/452,882	04/22/2012	Angel A. Penilla	VBOXP001

CONFIRMATION NO. 6203

25920
MARTINE PENILLA GROUP, LLP
710 LAKEWAY DRIVE
SUITE 200
SUNNYVALE, CA 94085

PUBLICATION NOTICE



OC000000057298347

Title:ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS

Publication No.US-2012-0271723-A1

Publication Date:10/25/2012

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 publicly 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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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Angel A. Penilla

Application No: 13/452,882

Filed: April 22, 2012

For: ELECTRIC VEHICLE (EV) RANGE
EXTENDING CHARGE SYSTEMS,
DISTRIBUTED NETWORKS OF
CHARGE KIOSKS, AND CHARGE
LOCATING MOBILE APPS

Group Art Unit: 2859

Examiner: Drew A. Dunn

Atty. Docket No: VOLTP001

Date: April 19, 2013

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450 on April 19, 2013.

/Albert Penilla

Signed: _____
Albert Penilla

PRELIMINARY AMENDMENT

Honorable Commissioner for Patents
Alexandria VA 22313-1450

Dear Sir:

Please enter this preliminary amendment and remarks.

Amendments to the claims are reflected in the listing of claims which begin on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

IN THE CLAIMS

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

Listing of Claims:

1. (Currently amended) A system for providing auxiliary charge usable to supply charge to a main battery of an electric vehicle, comprising:
 - (a) an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from ~~within~~ the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery; and
 - (b) a kiosk for storing a plurality of charge units, the kiosk having,
 - (i) slots for storing and recharging the plurality of charge units;
 - (ii) control systems for communicating over a network, the control system includes logic for identifying inventory of charging units in the kiosk and logic for processing payments and fee adjustments for charge units provided or received in the slots of the kiosk; and
 - (b) display for providing an interface for enabling transactions to provide or receive charge units to customers;
 - (c) a ~~central~~ processing server center that communicates with,
 - (i) a plurality of said kiosk over a network, the ~~central~~ processing server center configured to provide for centralized rate changes to prices to charge for the charge units at each of the plurality of kiosks, wherein changing the price of the charge units is specific to each of the kiosks and is based on a plurality of metrics, including availability at each kiosk and discounts, and
 - (ii) a plurality of vehicles, the plurality of vehicles being provided with access to availability information of charge units at each of said kiosks, the availability information being custom provided to the plurality of vehicles based on their geo-location.

2. (New) The system of claim 1, wherein the processing server provides access to mobile devices regarding the availability information.

3. (New) The system of claim 1, wherein the processing server provides notifications to predefined computing devices regarding the availability information.

4. (New) The system of claim 1, wherein the processing server provides data to mobile applications or applications of one of the plurality of vehicles, the data being provided for an account of a user that is associated with a particular auxiliary battery,

wherein the data is for one or more of, status of charge units in the particular auxiliary battery of a vehicle, approximate range of miles provided by the particular auxiliary battery, identification of closest kiosks to a geo-location, deals provided at certain locations, reservations for reserving charge units ahead of arrival at a particular kiosk, gifts available, loyalty points for past use of charge units, history of use of charge units, or carbon footprint consumption by use of the charge units, or combinations thereof.

5. (New) The system of claim 1, wherein the processing server communicates notifications to particular uses having a registered account concerning availability of charge units for particular geo-locations.

6. (New) The system of claim 1, wherein the processing server communicates route options, to particular uses having a registered account, to particular kiosks having available charge units proximate to a location.

7. (New) The system of claim 6, wherein the route options provide cost estimates for charge units at each of the kiosks associated with each route option.

8. (New) The system of claim 6, wherein the route options provide discounts available for charge units at each of the kiosks associated with each route option.

9. (New) The system of claim 6, wherein each route option includes one or more of a map route, a distance, a reservation option, or a discount option.

10. (New) The system of claim 6, wherein each route option having a discount includes identification of a type of discount in fee, discount in goods, or discount in services or a combination of two or more thereof.

11. (New) The system of claim 1, wherein the processing server is a cloud processing system that has access to one or more cloud services, including a traffic service, a route generation service, a driver location service, a charge kiosk location service, or combinations thereof.

12. (New) A system for providing information regarding auxiliary charge for use by electric vehicles, comprising:

- (a) a processing server that communicates over a network with,
 - (i) a plurality of kiosks having one or more charging units available for use by the electric vehicles to supplement charge of main batteries of the electric vehicles;
 - (ii) a plurality of user accounts that are accessed via computing devices;
- (b) a database that stores data regarding the kiosks and charge units located at the

plurality of kiosks;

wherein the processing server receives requests from one or more computing devices to locate kiosks proximate to a particular geo-location, and in response to each request, the processing server returns locations proximate to the geo-location and availability of charge units at the returned locations, the processing server further identifying discounts or rates charged for charging units at the located kiosks.

13. (New) The system of claim 12, wherein discounts or rates provide an incentive to obtain charge units where charge unit excess inventory exists at particular kiosks or provide a disincentive to obtain charge units where charge unit inventory is low at particular kiosks.

14. (New) The system of claim 12, wherein the discounts or rates at the plurality of kiosks are dynamically communicated to the plurality of kiosks from a central server to maintain load balancing of inventory of charge units in a geographical region.

15. (New) The system of claim 12, wherein charge units include tracking identifiers, the tracking identifiers used to track current location of charge units when in kiosks or last known kiosk for particular charge units.

16. (New) The system of claim 12, wherein each kiosk receives electronic payments from users of the user accounts, the electronic payments provide a historical tracking of charge usage for particular accounts and associated discounts for the user accounts based on the historical tracking.

17. (New) The system of claim 12, wherein the processing server is configured to receive reservations of charge units at specific kiosks from user accounts, the reservation enables confirmation one or more reserved charge units will be available at the kiosk when a user physically arrives at the kiosk, the reservation enables pre-payment for the charged units.

18. (New) The system of claim 12, wherein the processing server generates notifications to be sent to the user accounts regarding charge unit availability or discounts.

19. (New) The system of claim 12, wherein each of the kiosks define a network of geographically dispersed kiosks that are each in communication with the processing server that operates cloud processing logic, the processing server collects information from each of the kiosks and forwards programming to each of the kiosks, the processing server is further configured to make available selected information regarding particular kiosks to the computing devices, which include one or more of hand held-devices, or computers, or vehicle computers, or tablet computers, or smartphones.

20. (New) A method for providing information regarding auxiliary charge for use by electric vehicles, comprising:

(a) providing a processing server that communicates over a network with,

(i) a plurality of kiosks having one or more charging units available for use by the electric vehicles to supplement charge of main batteries of the electric vehicles;

(ii) a plurality of user accounts that are accessed via computing devices; and

(b) providing a database that stores data regarding the kiosks and charge units located at the plurality of kiosks;

wherein the processing server receives requests from one or more computing devices to locate kiosks proximate to a particular geo-location, and in response to each request, the processing server returns locations proximate to the geo-location and availability of charge units at the returned locations, the processing server further identifying discounts or rates charged for charging units at the located kiosks;

wherein each of the kiosks define a network of geographically dispersed kiosks that are each in communication with the processing server that operates cloud processing logic, the processing server collects information from each of the kiosks and forwards programming to each of the kiosks, the processing server is further configured to make available selected information regarding particular kiosks and routing options, to the computing devices, which include one or more of hand held-devices, or computers, or vehicle computers, or tablet computers, or smartphones.

REMARKS

This paper provides a preliminary amendment. No new matter has been added by way of this amendment.

If the Examiner has any questions concerning the present amendment, the Examiner is kindly requested to contact the undersigned at (408) 749-6903. If any other fees are due in connection with filing this amendment, the Commissioner is also authorized to charge Deposit Account No. 50-0805 (Order No VOLTP001).

Respectfully submitted,
MARTINE PENILLA GROUP, LLP
/Albert Penilla/

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Sunnyvale, CA 94085
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Electronic Acknowledgement Receipt	
EFS ID:	15570891
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	19-APR-2013
Filing Date:	22-APR-2012
Time Stamp:	21:24:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	VOLTP001_PrelimAmendment.pdf	41504 263dac719da5464b535561c5b95ec50eb1a5c80	no	7

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 13/452,882		Filing Date 04/22/2012		☐ To be Mailed	
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)			SMALL ENTITY ☒ OR		OTHER THAN SMALL ENTITY		
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)		RATE (\$)	FEE (\$)			
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A				
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A				
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A				
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =		OR	X \$ =				
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =			X \$ =				
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 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			TOTAL				
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT	04/19/2013	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X \$40 =	0	OR	X \$ =	
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	X \$210 =	0	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	0	OR	TOTAL ADD'L FEE	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)
	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	
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/MARSHA RICHARDS/

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				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	Unassigned
				Examiner Name	Unassigned
Sheet	1	of	2	Attorney Docket Number	VOLTP001

U.S. Patent Documents

Examiner Initials	<u>US Patent/Application</u>
	US 20110202218 A1
	US5488283 A
	US 20120229056 A1
	US 20130020139 A1
	US 8006793 B2
	US3690397
	US3799063
	US 4052655 A
	US 4102273 A
	US 4347472 A
	US 4383210 A
	US 4789047 A
	US 5202617 A
	US 5297664 A
	US 5306999 A
	US 5315227 A
	US 5327066 A
	US 5585205 A
	US 5701706 A
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	US 6014597 A
	US 20090011639 A1
	US 20120041624 A1
	US 20120268076 A1
	US 8366371 B2

Examiner Signature		Date Considered	
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				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	Unassigned
				Examiner Name	Unassigned
Sheet	2	of	2	Attorney Docket Number	VOLTP001

U.S. Patent Documents

Examiner Initials	US Patent/Application	
	US 4450400 A	
	US 5612606 A	
	US 5760569 A	
	US 6498454 B1	
	US 20080294283 A1	
	US 5449995 A	
	US 5549443 A	
	US 5694019 A	
	US 6940254 B2	
	US 7869576 B1	
	US 20120306445	
	US 8350526 B2	
	US 20120316671 A1	
	US 20090058355 A1	
	US 4450400 A	
	US 8256553 B2	
	US 20120303397 A1	
	US 20110074350 A1	
	US 8294420 B2	
	US 20130110653 A1	
	US 8266075 B2	

Examiner Signature		Date Considered	
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¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by two-letter code (WIPO Standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶Applicant is to place a check mark here if English language translation is attached.

Electronic Acknowledgement Receipt	
EFS ID:	15790288
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	15-MAY-2013
Filing Date:	22-APR-2012
Time Stamp:	22:49:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	VOLTP001_IDS_Letter.pdf	20630 <small>2bc60af57dcf687f2594ecb0000f817a525dd232</small>	no	1

Warnings:

Information:

2	Information Disclosure Statement (IDS) Form (SB08)	1449_May2013.pdf	60901	no	2
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Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
Total Files Size (in bytes):			81531		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:	)	
	)	Group Art Unit: Unassigned
Penilla, et al.	)	
	)	Examiner: Unassigned
Application No. 13/452,882	)	
	)	Docket No: VOLTP001
Filed: April 22, 2012	)	
	)	Date: May 15, 2013
For: Electric Vehicle (EV) Range Extending Charge	)	
Systems, Distributed Networks of Charge Kiosks, and	)	
Charge Locating Mobile Apps	)	
_____	)	

CERTIFICATE OF E-FILING

I hereby certify that this correspondence is being transmitted to the United States Patent and Trademark Office via electronic filing with EFS-Web on **May 15, 2013**.

/Albert Penilla/
Albert Penilla

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§1.56 AND 1.97(c)

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

Dear Sir:

The references listed in the attached PTO Form 1449, may be material to examination of the above-identified patent application. Applicant submits these references in compliance with his duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement (IDS) is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is being filed within three (3) months of the filing date of the above-referenced application. Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-0805 (Order No. VOLTP001)

Respectfully submitted,
MARTINE PENILLA GROUP, LLP
/Albert Penilla/
Albert S. Penilla, Esq.
Reg. No. 39,487

710 Lakeway Drive, Suite 200
Sunnyvale, CA 94085
Telephone: (408) 749-6900
Customer Number 25920

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	Unassigned
				Examiner Name	Unassigned
Sheet	1	of	2	Attorney Docket Number	VOLTP001

U.S. Patent Documents

Examiner Initials	<u>US Patent/Application</u>	
	US8521599	
	US8294420	
	US7201384	
	US8836281	
	US8725551	
	US5049802	
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	US5441122	
	US5487002	
	US5492190	
	US5548200	
	US5563491	
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	US5627752	
	US5642270	
	US5736833	
	US5778326	
	US6067008	
	US6081205	
	US6225776	
	US6234932	

Examiner Signature		Date Considered	
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¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by two-letter code (WIPO Standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶Applicant is to place a check mark here if English language translation is attached.

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	Unassigned
				Examiner Name	Unassigned
Sheet	2	of	2	Attorney Docket Number	VOLTP001

U.S. Patent Documents

Examiner Initials	US Patent/Application
	US6252380
	US6285931
	US6301531
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	US6434465
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	US6915869
	US7013205
	US7402978
	US7698078
	US7740092
	US7885893

¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by two-letter code (WIPO Standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶Applicant is to place a check mark here if English language translation is attached.

	US7949435
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	US20080228613
	US20080312782
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	US20110077809
	US20090144001

Examiner Signature		Date Considered	
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¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. ³Enter Office that issued the document, by two-letter code (WIPO Standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶Applicant is to place a check mark here if English language translation is attached.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:	)	
	)	Group Art Unit: Unassigned
Penilla, et al.	)	
	)	Examiner: Unassigned
Application No. 13/452,882	)	
	)	Docket No: VOLTP001
Filed: April 22, 2012	)	
	)	Date: Oct. 13, 2014
For: Electric Vehicle (EV) Range Extending Charge	)	
Systems, Distributed Networks of Charge Kiosks, and	)	
Charge Locating Mobile Apps	)	
_____	)	

CERTIFICATE OF E-FILING

I hereby certify that this correspondence is being transmitted to the United States Patent and Trademark Office via electronic filing with EFS-Web on **Oct. 13, 2014.**

/Albert Penilla/
Albert Penilla

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§1.56 AND 1.97(c)

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Albert S. Penilla, Esq.
Reg. No. 39,487

710 Lakeway Drive, Suite 200
Sunnyvale, CA 94085
Telephone: (408) 749-6900
Customer Number 25920

Electronic Acknowledgement Receipt	
EFS ID:	20400282
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	13-OCT-2014
Filing Date:	22-APR-2012
Time Stamp:	17:02:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	1449_Oct2014.pdf	60684 78e45ec13bd6fed3322dcce15987e875e8a6d19f	no	3

Warnings:

Information:

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2	Transmittal Letter	IDS_Oct2014_Efiled.pdf	20508	no	1
			13fe9a5cfe6f8512feb90485255a45030e23 b6a		

Warnings:

Information:

Total Files Size (in bytes):	81192
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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 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.

PLUS Search Results for S/N 13452882, Searched Thu Oct 23 09:00:48 EDT 2014
 The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

U.S. Patent Documents

Examiner Initials	Initials	Reference	REF. NO.	
Examiner Initials		US8818622	Reference No.	1
Examiner Initials		US8818725	Reference No.	2
Examiner Initials		US8819414	Reference No.	3
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Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

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Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

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Examiner Initials		US20140142783	Reference No.	120
Examiner Initials		US20140163771	Reference No.	121
Examiner Initials		US20140120829	Reference No.	122
Examiner Initials		US20140125355	Reference No.	123

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

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				First Named Inventor	Angel Penilla
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				Examiner Name	
				Attorney Docket Number	VOLTP001

Examiner Initials		US20140089016	Reference No.	124
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Examiner Initials		US20130021162	Reference No.	152
Examiner Initials		US20130037339	Reference No.	153
Examiner Initials		US20120310713	Reference No.	154
Examiner Initials		US20130002876	Reference No.	155
Examiner Initials		US20120268068	Reference No.	156
Examiner Initials		US20120268242	Reference No.	157
Examiner Initials		US20120280654	Reference No.	158
Examiner Initials		US20120296512	Reference No.	159
Examiner Initials		US20120233077	Reference No.	160
Examiner Initials		US20120262002	Reference No.	161
Examiner Initials		US20120218128	Reference No.	162
Examiner Initials		US20120229085	Reference No.	163
Examiner Initials		US20120232965	Reference No.	164
Examiner Initials		US20120136802	Reference No.	165

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

Examiner Initials		US20120158244	Reference No.	166
Examiner Initials		US20120179323	Reference No.	167
Examiner Initials		US20120074903	Reference No.	168
Examiner Initials		US20120105197	Reference No.	169
Examiner Initials		US20120123670	Reference No.	170
Examiner Initials		US20120136743	Reference No.	171
Examiner Initials		US20120025765	Reference No.	172
Examiner Initials		US20120028680	Reference No.	173
Examiner Initials		US20120053754	Reference No.	174
Examiner Initials		US2012/0233077	Reference No.	175
Examiner Initials		US20120013300	Reference No.	176
Examiner Initials		US20120019204	Reference No.	177
Examiner Initials		US20110246252	Reference No.	178
Examiner Initials		US20110279083	Reference No.	179
Examiner Initials		US20110309929	Reference No.	180
Examiner Initials		US20110187521	Reference No.	181
Examiner Initials		US20110191265	Reference No.	182
Examiner Initials		US20110193522	Reference No.	183
Examiner Initials		US20110112969	Reference No.	184
Examiner Initials		US20110130885	Reference No.	185
Examiner Initials		US20110074351	Reference No.	186
Examiner Initials		US20110106329	Reference No.	187
Examiner Initials		US20100268426	Reference No.	188
Examiner Initials		US20100304349	Reference No.	189
Examiner Initials		US20110032110	Reference No.	190
Examiner Initials		US20100211643	Reference No.	191
Examiner Initials		US20100222939	Reference No.	192
Examiner Initials		US20100198513	Reference No.	193
Examiner Initials		US20100211340	Reference No.	194
Examiner Initials		US20100161482	Reference No.	195
Examiner Initials		US20100169008	Reference No.	196
Examiner Initials		US20100198508	Reference No.	197
Examiner Initials		US20100112843	Reference No.	198
Examiner Initials		US20100141206	Reference No.	199
Examiner Initials		US20100161481	Reference No.	200
Examiner Initials		US20100049639	Reference No.	201
Examiner Initials		US20100049737	Reference No.	202
Examiner Initials		US20100057306	Reference No.	203
Examiner Initials		US20100049396	Reference No.	204
Examiner Initials		US20100049533	Reference No.	205
Examiner Initials		US20100049610	Reference No.	206
Examiner Initials		US20100017045	Reference No.	207

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

Examiner Initials		US20100017249	Reference No.	208
Examiner Initials		US20090313104	Reference No.	209
Examiner Initials		US20090313174	Reference No.	210
Examiner Initials		US2010/0280956	Reference No.	211
Examiner Initials		US20100013434	Reference No.	212
Examiner Initials		US20090313033	Reference No.	213
Examiner Initials		US20090313034	Reference No.	214
Examiner Initials		US20090313098	Reference No.	215
Examiner Initials		US20090210357	Reference No.	216
Examiner Initials		US20090287578	Reference No.	217
Examiner Initials		US20090312903	Reference No.	218
Examiner Initials		US20090313032	Reference No.	219
Examiner Initials		US20090157289	Reference No.	220
Examiner Initials		US20090164473	Reference No.	221
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Examiner Initials		US20090144001	Reference No.	226
Examiner Initials		US20090043519	Reference No.	227
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Examiner Initials		US20090076913	Reference No.	229
Examiner Initials		US20080203973	Reference No.	230
Examiner Initials		US20080281663	Reference No.	231
Examiner Initials		US20090021385	Reference No.	232
Examiner Initials		US20080040129	Reference No.	233
Examiner Initials		US20080155008	Reference No.	234
Examiner Initials		US20080180027	Reference No.	235
Examiner Initials		US20070068714	Reference No.	236
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Examiner Initials		US20050231119	Reference No.	238
Examiner Initials		US20060125620	Reference No.	239
Examiner Initials		US20060182241	Reference No.	240
Examiner Initials		US20040093155	Reference No.	241
Examiner Initials		US20040265671	Reference No.	242
Examiner Initials		US20050021190	Reference No.	243
Examiner Initials		US20050044245	Reference No.	244
Examiner Initials		US20040046506	Reference No.	245
Examiner Initials		US20040064235	Reference No.	246
Examiner Initials		US20040092253	Reference No.	247
Examiner Initials		US20030153278	Reference No.	248
Examiner Initials		US20030205619	Reference No.	249

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

Examiner Initials		US20030234325	Reference No.	250
Examiner Initials		US20020085043	Reference No.	251
Examiner Initials		US20020133273	Reference No.	252

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Electronic Acknowledgement Receipt	
EFS ID:	21012158
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	18-DEC-2014
Filing Date:	22-APR-2012
Time Stamp:	22:58:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IDS_DEC2014_Efiled.pdf	20508 46c248aba61846923117cd3fd43288ed47d f017f	no	1

Warnings:

Information:

2	Information Disclosure Statement (IDS) Form (SB08)	IDS1449_DEC2014.pdf	78731 d61e55c5ca8eafb2703e7bd940370126842 d7900	no	7
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
Total Files Size (in bytes):			99239		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:	)	
	)	Group Art Unit: Unassigned
Penilla, et al.	)	
	)	Examiner: Unassigned
Application No. 13/452,882	)	
	)	Docket No: VOLTP001
Filed: April 22, 2012	)	
	)	Date: Dec. 18, 2014
For: Electric Vehicle (EV) Range Extending Charge	)	
Systems, Distributed Networks of Charge Kiosks, and	)	
Charge Locating Mobile Apps	)	
_____	)	

CERTIFICATE OF E-FILING

I hereby certify that this correspondence is being transmitted to the United States Patent and Trademark Office via electronic filing with EFS-Web on **Dec. 18, 2014.**

/Albert Penilla/
Albert Penilla

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§1.56 AND 1.97(c)

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

Dear Sir:

The references listed in the attached PTO Form 1449, may be material to examination of the above-identified patent application. Applicant submits these references in compliance with his duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement (IDS) is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is being filed within three (3) months of the filing date of the above-referenced application. Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-0805 (Order No. VOLTP001)

Respectfully submitted,
MARTINE PENILLA GROUP, LLP
/Albert Penilla/
Albert S. Penilla, Esq.
Reg. No. 39,487

710 Lakeway Drive, Suite 200
Sunnyvale, CA 94085
Telephone: (408) 749-6900
Customer Number 25920

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Angel A. Penilla

Application No: 13/452,882

Filed: April 22, 2012

For: ELECTRIC VEHICLE (EV) RANGE
EXTENDING CHARGE SYSTEMS,
DISTRIBUTED NETWORKS OF
CHARGE KIOSKS, AND CHARGE
LOCATING MOBILE APPS

Group Art Unit: 2859

Examiner: Yalkew Fantu

Atty. Docket No: VOLTP001

Date: Jan. 12, 2015

SECOND PRELIMINARY AMENDMENT

Honorable Commissioner for Patents
Alexandria VA 22313-1450

Dear Sir:

Please enter this preliminary amendment and remarks.

Amendments to the claims are reflected in the listing of claims which begin on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

IN THE CLAIMS

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

Listing of Claims:

1. (Previously presented) A system for providing auxiliary charge usable to supply charge to a main battery of an electric vehicle, comprising:
 - (a) an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery; and
 - (b) a kiosk for storing a plurality of charge units, the kiosk having,
 - (i) slots for storing and recharging the plurality of charge units;
 - (ii) control systems for communicating over a network, the control system includes logic for identifying inventory of charging units in the kiosk and logic for processing payments and fee adjustments for charge units provided or received in the slots of the kiosk; and
 - (b) display for providing an interface for enabling transactions to provide or receive charge units to customers;
 - (c) a processing server that communicates with,
 - (i) a plurality of said kiosk over a network, the processing server configured to provide for centralized rate changes to prices to charge for the charge units at each of the plurality of kiosks, wherein changing the price of the charge units is specific to each of the kiosks and is based on a plurality of metrics, including availability at each kiosk and discounts, and
 - (ii) a plurality of vehicles, the plurality of vehicles being provided with access

to availability information of charge units at each of said kiosks, the availability information being custom provided to the plurality of vehicles based on their geo-location.

2. (Previously presented) The system of claim 1, wherein the processing server provides access to mobile devices regarding the availability information.

3. (Previously presented) The system of claim 1, wherein the processing server provides notifications to predefined computing devices regarding the availability information.

4. (Previously presented) The system of claim 1, wherein the processing server provides data to mobile applications or applications of one of the plurality of vehicles, the data being provided for an account of a user that is associated with a particular auxiliary battery,

wherein the data is for one or more of, status of charge units in the particular auxiliary battery of a vehicle, approximate range of miles provided by the particular auxiliary battery, identification of closest kiosks to a geo-location, deals provided at certain locations, reservations for reserving charge units ahead of arrival at a particular kiosk, gifts available, loyalty points for past use of charge units, history of use of charge units, or carbon footprint consumption by use of the charge units, or combinations thereof.

5. (Previously presented) The system of claim 1, wherein the processing server communicates notifications to particular users having a registered account concerning availability of charge units for particular geo-locations.

6. (Previously presented) The system of claim 1, wherein the processing server communicates route options, to particular uses having a registered account, to particular kiosks having available charge units proximate to a location.

7. (Cancel).

8. (Previously presented) The system of claim 6, wherein the route options provide discounts available for charge units at each of the kiosks associated with each route option.

9. (Previously presented) The system of claim 6, wherein each route option includes one or more of a map route, a distance, a reservation option, or a discount option.

10. (Previously presented) The system of claim 6, wherein each route option having a discount includes identification of a type of discount in fee, discount in goods, or discount in services or a combination of two or more thereof.

11. (Currently amended) The system of claim 1,

wherein the processing server is a cloud processing system that has access to one or more cloud services, including a traffic service, or a route generation service, or a driver location service, or a charge kiosk location service, or combinations thereof;

wherein the electric vehicle is one of a two-wheel vehicle, or a three-wheel vehicle, or a four-wheel vehicle, or a motorcycle, or a car, or a truck, or a pickup, or a utility car, or a delivery vehicle, or an industrial vehicle.

12.- 19. (Cancel)

20. (Currently amended) A method for providing information regarding batteries available
~~auxiliary charge~~ for use by electric vehicles, comprising:

(a) providing a processing server that communicates over a network with,

(i) a plurality of kiosks having one or more batteries with charge for
exchanging batteries with reduced charge, the batteries of the kiosks being charging
units available for use by the electric vehicles to power electric motors of the electric
vehicles to supplement charge of main batteries of the electric vehicles;

(ii) a plurality of user accounts that are accessed via computing devices; and

(b) providing a database that stores data regarding the kiosks and batteries charge
units located at each of the plurality of kiosks;

wherein the processing server receives requests from one or more computing devices
to locate kiosks proximate to a particular geo-location, and in response to each request, the
processing server ~~returns~~ identifies locations proximate to the geo-location and availability of
batteries charge units at the ~~returned~~ identified locations, the processing server further
identifying discounts or rates chargeable charged for batteries charge units at the located
kiosks;

wherein each of the kiosks is part of ~~define~~ a network of geographically dispersed
kiosks that are each in communication with the processing server that operates cloud
processing logic, the processing server collects information from each of the kiosks and
forwards programming to each of the kiosks, the processing server is further configured to
make available selected information regarding particular kiosks and cause generation of
routing options, to the computing devices, which include one or more of hand held-devices,
or computers, or vehicle computers, or tablet computers, or smartphones;

wherein the electric vehicles are one of a two-wheel vehicle, or a three-wheel vehicle, or a four-wheel vehicle, or a motorcycle, or a car, or a truck, or a pickup, or a utility car, or a delivery vehicle, or an industrial vehicle.

21. (New) A system for managing batteries usable in electric vehicles, the batteries being exchangeable for charged batteries, comprising,

(a) a processing server that manages and communicates with,

(i) a plurality of kiosks having one or more batteries available for use by the electric vehicles;

(ii) a plurality of user accounts;

(iii) a plurality of applications rendered by computing devices, each application usable via a respective user account;

(b) a database that stores and provides access to data regarding the plurality of kiosks and batteries located at respective ones of the plurality of kiosks;

wherein the processing server processes requests from one or more of the plurality of applications to locate kiosks proximate to a particular geo-location, and in response to each request, the processing server identifies locations proximate to the geo-location and availability of batteries for exchange at the identified locations, the processing server further identifying discounts or rates chargeable for batteries at the located kiosks;

wherein each kiosk has a plurality of receptacle slots configured for hand-insertion of batteries into the receptacle slots and hand-removal of batteries out of the receptacle slots, wherein at least some of the receptacle slots charge batteries when disposed in the receptacle slots of the each kiosk.

22. (New) The system of claim 21, wherein the processing server manages the discounts

or rates to provide an incentive to obtain batteries where battery excess inventory exists at particular kiosks or provide a disincentive to obtain batteries where battery inventory is low at particular kiosks.

23. (New) The system of claim 21, wherein the processing server processes the discounts or rates at the plurality of kiosks to maintain load balancing of inventory of batteries in a geographical region or at particular ones of the plurality of kiosks.

24. (New) The system of claim 21, wherein batteries include tracking identifiers, the tracking identifiers being used to track a current location of batteries when in kiosks or last used kiosk for particular batteries.

25. (New) The system of claim 21, wherein each kiosk receives electronic payments from users of the user accounts, the electronic payments provide a historical tracking of battery usage for particular accounts and associated discounts for the user accounts based on the historical tracking.

26. (New) The system of claim 21, wherein the processing server is configured to receive reservations of batteries at specific kiosks from applications associated with particular user accounts, the reservation enables confirmation that one or more reserved batteries will be available at the kiosk when the electric vehicle arrives at the kiosk.

27. (New) The system of claim 21, wherein the processing server generates notifications to be sent to the user accounts regarding battery availability or discounts, or processes data for rendering one or more of status of batteries in the kiosks, or processes data to determine

nearby kiosks relative to a geo-location, or processes data to identify deals provided at certain kiosks, or processes data to make reservations for reserving batteries at a particular kiosks, or processes data to identify gifts available at particular kiosks, or processes data to identify loyalty points for past use of batteries, or processes data to render a history of use of batteries, or processes data to determine a carbon footprint consumption from use of the batteries, or combinations of two or more thereof.

28. (New) The system of claim 21, wherein each of the kiosks is part of a network of geographically dispersed kiosks that are each in communication with the processing server, the processing server collects information from each of the kiosks and forwards programming to each of the kiosks, the processing server is further configured to make available selected information regarding particular kiosks to the applications.

29. (New) The system of claim 21, wherein the electric vehicles are one of a two-wheel vehicle, or a three-wheel vehicle, or a four-wheel vehicle, or a motorcycle, or a car, or a truck, or a pickup, or a utility car, or a delivery vehicle, or an industrial vehicle

REMARKS

This paper provides a preliminary amendment. No new matter has been added by way of this amendment.

If the Examiner has any questions concerning the present amendment, the Examiner is kindly requested to contact the undersigned at (408) 749-6903. If any other fees are due in connection with filing this amendment, the Commissioner is also authorized to charge Deposit Account No. 50-0805 (Order No VOLTP001).

Respectfully submitted,
MARTINE PENILLA GROUP, LLP

/Albert Penilla/

Albert S. Penilla, Esq.
Reg. No. 39,487

710 Lakeway Drive, Suite 200
Sunnyvale, CA 94085
Telephone: (408) 749-6900
Facsimile: (408) 749-6901

Electronic Acknowledgement Receipt	
EFS ID:	21190019
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	12-JAN-2015
Filing Date:	22-APR-2012
Time Stamp:	22:46:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	VOLTP001_Amendment_2.pdf	46885 c3cd95f1b1b415ce8093dae98bb221b0c7e9a8f7	no	9

Warnings:

Information:

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.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 13/452,882		Filing Date 04/22/2012		☐ To be Mailed		
ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO										
APPLICATION AS FILED – PART I										
(Column 1)		(Column 2)								
FOR		NUMBER FILED		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 \$ =				
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$ =				
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL				
APPLICATION AS AMENDED – PART II										
(Column 1)		(Column 2)		(Column 3)						
AMENDMENT	01/12/2015		CLAIMS REMAINING AFTER AMENDMENT			HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))		* 20		Minus	** 20	= 0	X \$40 =	0	
	Independent (37 CFR 1.16(h))		* 3		Minus	***3	= 0	X \$210 =	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 \$ =		
	Independent (37 CFR 1.16(h))		*		Minus	***	=	X \$ =		
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))									
	TOTAL ADD'L FEE									
<p>* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.</p> <p>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".</p> <p>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".</p> <p>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.</p>										

LIE
/STEPHEN W. HOOVER/

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.

Form 1449 (Modified) Information Disclosure Statement By Applicant (Use Several Sheets if Necessary)	Attorney Docket No:	13/452,882
	VOLTP001	
	Applicant: Angel Penilla	
	Filing Date: April 22, 2012	Group:

Other Documents

Examiner		
Initial	No.	Author, Title, Date, Place (e.g. Journal) of Publication
	A	Angel Penilla, Related Application Specification for U.S. Application No. 14/595,186, filed Jan. 12, 2015
	B	Angel Penilla, Related Application Specification for U.S. Application No. 14/599,541, filed Jan. 18, 2015
	C	Angel Penilla, Related Application Specification for U.S. Application No. 14/602,256, filed Jan. 21, 2015
Examiner		Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Acknowledgement Receipt	
EFS ID:	21300073
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	23-JAN-2015
Filing Date:	22-APR-2012
Time Stamp:	22:24:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	VOLTP001_IDS_Cite_Related_Apps.pdf	22485 c8c63d9b81f4e218996ec5c10b6d3de47e2c14da	no	1

Warnings:

Information:

This is not an USPTO supplied IDS fillable form					
2	Other Reference-Patent/App/Search documents	VOLTP001C1_App_Efiled.pdf	403478 d254a9278d98f39c8b795e49d9411fdb79becf5	no	86
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	VOLTP001C2_App_Efiled.pdf	406471 9164a8f7d13792e7cef843be0bcdcb068c0139a88	no	86
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	VOLTP001C3_App_Efiled.pdf	402841 a55e49221d36fd969fa46c23424f127a8024da0e	no	85
Warnings:					
Information:					
Total Files Size (in bytes):			1235275		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

U.S. Patent Citations

Examiner Initial	Patent	Issue Date	Inventor(s)
	<u>1387848</u>	August 1921	Good
	<u>4087895</u>	May 1978	Etienne
	<u>4216839</u>	August 1980	Gould et al.
	<u>5187423</u>	February 1993	Marton
	<u>5339250</u>	August 1994	Durbin
	<u>5349535</u>	September 1994	Gupta
	<u>5544784</u>	August 1996	Malaspina
	<u>5596261</u>	January 1997	Suyama
	<u>5627752</u>	May 1997	Buck et al.
	<u>5631536</u>	May 1997	Tseng
	<u>5642270</u>	June 1997	Green et al.
	<u>5815824</u>	September 1998	Saga et al.
	<u>5898282</u>	April 1999	Drozdz et al.
	<u>5998963</u>	December 1999	Aarseth
	<u>6016882</u>	January 2000	Ishikawa
	<u>6177867</u>	January 2001	Simon et al.
	<u>6177879</u>	January 2001	Kokubu et al.
	<u>6403251</u>	June 2002	Baggaley et al.
	<u>6498457</u>	December 2002	Tsuboi
	<u>6515580</u>	February 2003	Isoda et al.
	<u>6822560</u>	November 2004	Geber et al.
	<u>6899268</u>	May 2005	Hara
	<u>6952795</u>	October 2005	O'Gorman et al.
	<u>7010682</u>	March 2006	Reinold et al.

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>			Complete if Known	
			Application Number	13/452,882
			Filing Date	April 22, 2012
			First Named Inventor	Angel Penilla
			Art Unit	
			Examiner Name	
			Attorney Docket Number	VOLTP001

	<u>7131005</u>	October 2006	Levenson et al.
	<u>7392068</u>	June 2008	Dayan et al.
	<u>7415332</u>	August 2008	Ito et al.
	<u>7495543</u>	February 2009	Denison et al.
	<u>7567166</u>	July 2009	Bourgine De Meder
	<u>7617893</u>	November 2009	Syed et al.
	<u>7761307</u>	July 2010	Ochi et al.
	<u>7778746</u>	August 2010	McLeod et al.
	<u>7868591</u>	January 2011	Phillips et al.
	<u>7908020</u>	March 2011	Pieronek
	<u>7948207</u>	May 2011	Scheucher
	<u>7979147</u>	July 2011	Dunn
	<u>7993155</u>	August 2011	Heichal et al.
	<u>8006793</u>	August 2011	Heichal et al.
	<u>8006973</u>	August 2011	Toba et al.
	<u>8013571</u>	September 2011	Agassi et al.
	<u>8035341</u>	October 2011	Genzel et al.
	<u>8063762</u>	November 2011	Sid
	<u>8068952</u>	November 2011	Valentine et al.
	<u>8106631</u>	January 2012	Abe
	<u>8118132</u>	February 2012	Gray, Jr.
	<u>8164300</u>	April 2012	Agassi et al.
	<u>8229625</u>	July 2012	Lal et al.
	<u>8265816</u>	September 2012	LaFrance
	<u>8301365</u>	October 2012	Niwa et al.
	<u>8326259</u>	December 2012	Gautama et al.

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	13/452,882
		Filing Date	April 22, 2012
		First Named Inventor	Angel Penilla
		Art Unit	
		Examiner Name	
		Attorney Docket Number	VOLTP001

	<u>8412401</u>	April 2013	Bertosa et al.
	<u>8437908</u>	May 2013	Goff et al.
	<u>2002/0070851</u>	June 2002	Raichle et al.
	<u>2003/0141840</u>	July 2003	Sanders
	<u>2003/0163434</u>	August 2003	Barends
	<u>2003/0209375</u>	November 2003	Suzuki et al.
	<u>2004/0236615</u>	November 2004	Msndy
	<u>2004/0246119</u>	December 2004	Martin et al.
	<u>2006/0047380</u>	March 2006	Welch
	<u>2006/0208850</u>	September 2006	Ikeuchi et al.
	<u>2007/0035397</u>	February 2007	Patenaude et al.
	<u>2007/0090921</u>	April 2007	Fisher
	<u>2007/0159297</u>	July 2007	Paulk et al.
	<u>2009/0024872</u>	January 2009	Beverly
	<u>2009/0033456</u>	February 2009	Castillo et al.
	<u>2009/0082957</u>	March 2009	Agassi et al.
	<u>2009/0112394</u>	April 2009	Lepejian et al.
	<u>2009/0240575</u>	September 2009	Bettez et al.
	<u>2010/0052588</u>	March 2010	Okamura et al.
	<u>2010/0089547</u>	April 2010	King et al.
	<u>2010/0094496</u>	April 2010	Hershkovitz et al.
	<u>2010/0114798</u>	May 2010	Sirton
	<u>2010/0161481</u>	June 2010	Littrell
	<u>2010/0201482</u>	August 2010	Robertson et al.
	<u>2010/0308989</u>	December 2010	Gaspar
	<u>2011/0025267</u>	February 2011	Kamen et al.

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Complete if Known	
		Application Number	13/452,882
		Filing Date	April 22, 2012
		First Named Inventor	Angel Penilla
		Art Unit	
		Examiner Name	
		Attorney Docket Number	VOLTP001

	<u>2011/0029157</u>	February 2011	Muzaffer
	<u>2011/0031929</u>	February 2011	Asada et al.
	<u>2011/0032110</u>	February 2011	Taguchi
	<u>2011/0071932</u>	March 2011	Agassi et al.
	<u>2011/0106329</u>	May 2011	Donnelly et al.
	<u>2011/0112710</u>	May 2011	Meyer-Ebeling et al.
	<u>2011/0114798</u>	May 2011	Gemmati
	<u>2011/0148346</u>	June 2011	Gagosz et al.
	<u>2011/0160992</u>	June 2011	Crombez
	<u>2011/0169447</u>	July 2011	Brown et al.
	<u>2011/0200193</u>	August 2011	Blitz et al.
	<u>2011/0202476</u>	August 2011	Nagy et al.
	<u>2011/0224900</u>	September 2011	Hiruta et al.
	<u>2011/0270480</u>	November 2011	Ishibashi et al.
	<u>2011/0279257</u>	November 2011	Au et al.
	<u>2011/0303509</u>	December 2011	Agassi et al.
	<u>2012/0019196</u>	January 2012	Fung
	<u>2012/0038473</u>	February 2012	Fecher
	<u>2012/0062361</u>	March 2012	Kosugi
	<u>2012/0068817</u>	March 2012	Fisher
	<u>2012/0078413</u>	March 2012	Baker, Jr.
	<u>2012/0109519</u>	May 2012	Uyeki
	<u>2012/0158229</u>	June 2012	Schaefer
	<u>2012/0194346</u>	August 2012	Tsai et al.
	<u>2012/0248868</u>	October 2012	Mobin et al.
	<u>2012/0256588</u>	October 2012	Hayashi et al.

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

	<u>2012/0259665</u>	October 2012	Pandhi et al.
	<u>2012/0316671</u>	December 2012	Hammerslag et al.
	<u>2013/0024306</u>	January 2013	Shah et al.
	<u>2013/0026972</u>	January 2013	Luke et al.
	<u>2013/0027183</u>	January 2013	Wu et al.
	<u>2013/0030581</u>	January 2013	Luke et al.
	<u>2013/0030630</u>	January 2013	Luke et al.
	<u>2013/0033203</u>	February 2013	Luke et al.
	<u>2013/0046457</u>	February 2013	Pettersson
	<u>2013/0074411</u>	March 2013	Ferguson et al.
	<u>2013/0090795</u>	April 2013	Luke et al.
	<u>2013/0093271</u>	April 2013	Luke et al.
	<u>2013/0093368</u>	April 2013	Luke et al.
	<u>2013/0093384</u>	April 2013	Nyu et al.
	<u>2013/0116892</u>	May 2013	Wu et al.
	<u>2013/0119898</u>	May 2013	Ohkura
	<u>2013/0127416</u>	May 2013	Karner et al.
	<u>2013/0132307</u>	May 2013	Phelps et al.
	<u>2013/0181582</u>	July 2013	Luke et al.
	<u>2013/0254097</u>	September 2013	Marathe et al.
	<u>2013/0282254</u>	October 2013	Dwan et al.
	<u>2014/0028089</u>	January 2014	Luke et al.

Foreign Patent Citations

Examiner Initial	Patent No.	Issue Date	Country
	0 693 813	Jan 1996	EP
	2 101 390	Sep 2009	EP

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

	2 230 146	Sep 2010	EP
	2 428 939	Mar 2012	EP
	07-031008	Jan 1995	JP
	7-36504	Jul 1995	JP
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	10170293	Jun 1998	JP
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	11-049079	Feb 1999	JP
	11-51681	Feb 1999	JP
	11-176487	Jul 1999	JP
	11-205914	Jul 1999	JP
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	2000-102103	Apr 2000	JP
	2000-341868	Dec 2000	JP
	2001-128301	May 2001	JP
	2003-118397	Apr 2003	JP
	2003-262525	Sep 2003	JP
	2005-67453	Mar 2005	JP
	2009-171646	Jul 2009	JP
	2009-171647	Jul 2009	JP
	4319289	Aug 2009	JP
	2010-191636	Sep 2010	JP
	2010-200405	Sep 2010	JP
	2010-269686	Dec 2010	JP
	2011-126452	Jun 2011	JP
	2011-131631	Jul 2011	JP

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

	2011-142704	Jul 2011	JP
	1998-045020	Sep 1998	KR
	2004-0005146	Jan 2004	KR
	20100012401	Feb 2010	KR
	10-0971278	Jul 2010	KR
	20110004292	Jan 2011	KR
	20110041783	Apr 2011	KR
	200836452	Sep 2008	TW
	I315116	Sep 2009	TW
	M371880	Jan 2010	TW
	M379269	Apr 2010	TW
	M379789	May 2010	TW
	M385047	Jul 2010	TW
	201043986	Dec 2010	TW
	201044266	Dec 2010	TW
	98/21132	May 1998	WO
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	2010/143483	Dec 2010	WO
	2011/138205	Nov 2011	WO
	2012/160407	Nov 2012	WO
	2012/160557	Nov 2012	WO
	2013/024483	Feb 2013	WO
	2013/024484	Feb 2013	WO
	2013/074819	May 2013	WO
	2013/080211	Jun 2013	WO

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Substitute for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>				Complete if Known	
				Application Number	13/452,882
				Filing Date	April 22, 2012
				First Named Inventor	Angel Penilla
				Art Unit	
				Examiner Name	
				Attorney Docket Number	VOLTP001

	2013/102894	Jul 2013	WO
	2013/108246	Jul 2013	WO
	2013/118113	Aug 2013	WO
	2013/142154	Sep 2013	WO
	2013/144951	Oct 2013	WO

Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to Applicant.

Electronic Acknowledgement Receipt	
EFS ID:	21319253
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	27-JAN-2015
Filing Date:	22-APR-2012
Time Stamp:	13:35:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS1449_Jan272015.pdf	93994 b78e6cd458ae7740206806fe56d5b657c1481634	no	8

Warnings:

Information:

This is not an USPTO supplied IDS fillable form

Total Files Size (in bytes):

93994

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.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:	)	
	)	Group Art Unit: Unassigned
Penilla, et al.	)	
	)	Examiner: Unassigned
Application No. 13/452,882	)	
	)	Docket No: VOLTP001
Filed: April 22, 2012	)	
	)	Date: Jan. 27, 2015
For: Electric Vehicle (EV) Range Extending Charge	)	
Systems, Distributed Networks of Charge Kiosks, and	)	
Charge Locating Mobile Apps	)	
_____	)	

CERTIFICATE OF E-FILING

I hereby certify that this correspondence is being transmitted to the United States Patent and Trademark Office via electronic filing with EFS-Web on **Jan. 27, 2015**.

/Albert Penilla/
Albert Penilla

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§1.56 AND 1.97(c)

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

Dear Sir:

The references listed in the attached PTO Form 1449, may be material to examination of the above-identified patent application. Applicant submits these references in compliance with his duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement (IDS) is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is being filed before the first Office action on the merits. Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-0805 (Order No. VOLTP001)

Respectfully submitted,
MARTINE PENILLA GROUP, LLP
/Albert Penilla/
Albert S. Penilla, Esq.
Reg. No. 39,487

710 Lakeway Drive, Suite 200
Sunnyvale, CA 94085
Telephone: (408) 749-6900
Customer Number 25920

Electronic Acknowledgement Receipt	
EFS ID:	21319225
Application Number:	13452882
International Application Number:	
Confirmation Number:	6203
Title of Invention:	ELECTRIC VEHICLE (EV) RANGE EXTENDING CHARGE SYSTEMS, DISTRIBUTED NETWORKS OF CHARGE KIOSKS, AND CHARGE LOCATING MOBILE APPS
First Named Inventor/Applicant Name:	Angel A. Penilla
Customer Number:	25920
Filer:	Albert S. Penilla
Filer Authorized By:	
Attorney Docket Number:	VOLTP001
Receipt Date:	27-JAN-2015
Filing Date:	22-APR-2012
Time Stamp:	13:33:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

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Warnings:

Information:

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Information:					
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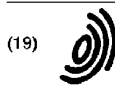
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(54) Battery vending system

(57) A battery vending system including a monitoring main frame (1) for controlling charging batteries, calculation and receipt, and a plurality of battery vending devices (2) connected thereto. The battery vending devices (2) each have a battery in-slot (25) and battery out-slot (25a), an element (28) for identifying the specification of batteries, a charger (21) and a convey device (20) which has a multiplicity of batteries (26) placed thereon. Each battery is recharged during off-peak hours of power consumption and batteries are sold or exchanged during normal hours via the battery in-slot (25) and out-slot (25a) through the control of the monitoring main frame (1) to achieve the objects of storing energy during off-peak hours of power consumption and supplying or exchanging batteries at any time.

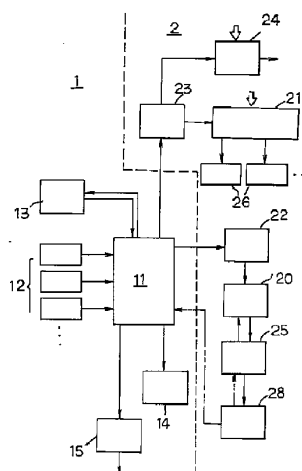


FIG. 1

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Description

The present invention relates generally to a battery vending system, and more particularly to a system in which charged batteries are served any time and empty batteries stored in the system are recharged during off-peak hours of power consumption.

Since electric energy is less likely to cause air pollution, electric vehicles are receiving more and more attention, and advanced countries are putting more effort on developing electric motorcycles, electric automobiles, etc. With the sudden increase in the demand for batteries and in view of the problem that electric vehicles cannot travel long distance, many manufacturers are researching on and developing quick charge devices to provide speedy recharge service for equipment or machines utilizing batteries as a power source; these include Japan Storage Battery Co., Ltd., The Kansai Electric Power Co., Inc., and Corporation for Utilization by Osaka City Government. They offer quick charge devices which achieve 80% of the charged energy within 30 minutes the soonest. But since consumers still have to wait for at least 30 minutes, such devices cannot actually be said to be quick and convenient.

As is commonly known, the chief reason why power generation technology is constantly being developed to increase power output and new power plants are constantly being established is that power consumption during daytime peak hours rises drastically, while power consumption during off-peak hours does not likewise increase. If power consumption during daytime peak hours can be distributed to off-peak hours, it will be of great benefit to the power generation system. That is why power institutions all over the world encourage consumers to utilize electric power during off-peak hours by offering cheaper power rates. However, due to the lack of practically feasible devices to allow consumers to utilize power during off-peak hours, the distribution of peak power consumption has little effect. The above-mentioned quick charge devices evidently do not make good use of electric energy during off-peak hours.

At present, the principal units that make good use of off-peak power are power storage plants in power generation institutions. These storage plants store energy during off-peak hours to output it during peak hours. However, there is much loss of power during the process of storage and supply; for instance, 10,000 kilowatts of power stored in the storage plants may have only 8,000 kilowatts of power remained when released, and this loss of power occurs before power is supplied to end users, obviously not a good solution in terms of economic profits.

Therefore, the primary object of the present invention is to provide a battery vending method for selling charged batteries or exchanging charged batteries with empty batteries which are later automatically recharged at a preset time.

Preferably, another object of the present invention is to provide a method and apparatus for automatically

recharging batteries stored in the apparatus during off-peak hours of power consumption, wherein the apparatus has stored therein a number of charged batteries to be directly supplied to consumers, and a monitoring main frame controls the operation of charging each empty battery in the apparatus during off-peak hours of power consumption.

Preferably, a further object of the present invention is to provide a battery vending apparatus for automatically supplying charged batteries stored therein to consumers.

Preferably, a still further object of the present invention is to provide a battery exchange device for exchanging charged batteries stored therein with batteries to be recharged supplied by consumers.

Preferably, still another object of the present invention is to provide a quick charger adapted for use in conjunction with any of the system, apparatus and devices mentioned above.

According to the present invention, the battery vending system comprises a plurality of battery vending devices for storing, charging, and conveying batteries, and which are controlled by a monitoring computer to proceed recharging empty batteries stored therein during off-peak hours of power consumption, and the batteries are automatically sold to consumers on the conditions of payment by coin, card, etc. The system may further include a quick charger to provide quick charge service to consumers who may need it.

The foregoing and other features and advantages of the present invention will be more clearly understood from the following detailed description and the accompanying drawings, in which,

Fig. 1 is a system diagram of the monitoring main frame of the present invention;

Fig. 2 is a plan view of a preferred embodiment of the battery vending apparatus of the present invention;

Fig. 3 is a partial side view of Fig. 2 taken along line 3-3;

Fig. 4 is a sectional view of Fig. 3 taken along line 4-4;

Fig. 5 is a plan view of a second preferred embodiment of the battery vending apparatus of the present invention; and

Fig. 6 is a plan view of a third preferred embodiment of the battery vending apparatus of the present invention.

The battery vending system according to the present invention provides automatic sale and exchange of batteries. When the user operates the system and keys in data in accordance with the preset conditions of the vending system, it will provide a charged battery. The vending system comprises:

(1) Storing a multiplicity of charged batteries in at least one battery vending device of a battery vending

apparatus comprising the vending device and a monitoring main frame having a central processing unit for prestoring control programs, the battery vending device having a battery in-slot and a battery out-slot, and the monitoring main frame being connected to an operation device, an identification element, a convey device and a charger;

(2) Transmitting an operation signal to the central processing unit via the operation device when the user operates the system;

(3) Identifying the identity of a battery to be recharged disposed in the battery in-slot by the user by means of the identification element, and sending an identification signal to the central processing unit;

(4) Comparing the operation signal and the identification signal with prestored data in the central processing unit, and

(5) Initiating the convey device to deliver a charged battery to the battery out-slot when the operation data and the identification data fit in with the prestored data in the central processing unit after comparison.

A further step may also be included to collect said battery to be recharged disposed in said battery in-slot by the user onto said convey device at the time when said battery out-slot delivers a charged battery.

The above-mentioned operation device comprises coin payment means and card payment means. If necessary, the operation device may also comprise a keyboard for keying in certain data, and a display for indicating the operation result.

If a further step of setting the time to start charging empty batteries is included in the above-described system so that the charger starts charging each empty battery stored in the automatic vending device during off-peak hour of power consumption, the balancing effect of distributing peak power consumption may be achieved. Obviously, it is often necessary to include a still further step of providing a quick charger in the system so that the quick charge device may exist outside of the control programs of the central processing unit to provide quick charge service to consumers at any time.

Hereinbelow, preferred embodiments are used to illustrate the ways of utilizing the present invention and its advantages.

The battery vending apparatus according to the present invention mainly comprises a monitoring main frame 1, at least one battery vending device 2, and a charger 21. Fig. 2 shows a first preferred embodiment of the present invention in which the monitoring main frame 1 is connected to a plurality of vending devices 2, wherein a plurality of chargers 21 the number thereof corresponding to the number of vending devices 2 are disposed in the monitoring main frame 1. In another preferred embodiment shown in Fig. 5, each charger 21 is disposed in its corresponding vending device 2. A third embodiment is shown in Fig. 6, in which the monitoring

main frame and the vending device are combined into a single unit.

The monitoring main frame 1 monitors charging time, charging conditions, charging cycle, fee calculation, receipt, input and display of relevant data, etc. An example of one of the control flowcharts of the vending system is shown in Fig. 1.

As shown in Fig. 1, the monitoring main frame 1 is provided with a central processing unit 11 having an intelligent electricity meter. The central processing unit 11 compares input data such as identification data, time data and payment data with preset data 13 and then processes, calculates and displays the result obtained. When the input data fit in with the preset data, the central processing unit 11 subsequently sends a signal to a convey device 20 in the battery vending device 2 to collect a battery to be recharged placed in a battery in-slot 25 by the user and to deliver a charged battery to a battery out-slot 25a, and the central processing unit simultaneously controls a switch 22 to open a door 254 of the battery out-slot 25a for the user to collect the required battery. The central processing unit 11 also controls the on/off state of a switch 23 of the charger 21 to operate at a preset time so that only a quick charger 24 provides charge service at any time.

The monitoring main frame 1 may also be provided with card payment means 16 and coin payment means 17, and the operating conditions, such as local standard time, card data, amount calculated, code number of the battery vending device and its on/off state, etc., may be indicated by a display 14. These data may also be collected via a communication interface 15 to a particular control center for upstream monitoring.

With reference to Figs. 2, 3 and 4, the battery vending device 2 comprises the charger 21 and the convey device 20. A preferred embodiment of the convey device 20 is, as shown in Fig. 2, an O-shaped chain belt which moves cyclically along a predetermined path, and the battery in-slot 25 and battery out-slot 25a are both arranged at a suitable point thereon. The vending device 2 stores a large number of batteries 26 so that they may be recharged during off-peak hours of power consumption, or during a preset period from twelve midnight to 6 am, for instance. The batteries 26 are disposed on their corresponding cope plates 201 along the convey device 20. The connection between each battery 26 and the charger 21 may be manual or automated. Similarly, the battery in-slot and out-slot may be configured to be a single opening for receiving as well as delivering batteries. In the preferred embodiments shown in Figs. 2 through 6, the battery in-slot and out-slot share a single plate 253 upon which batteries are placed.

In the following description, an example of automatic process is used to illustrate the present invention, but in whatever cases, the battery vending device 2 is controlled by the monitoring main frame 1. Generally, all the stored empty batteries are recharged only during off-peak hours, or during a preset period from twelve midnight to six a.m. Furthermore, when the amount of empty

batteries stored in the vending device 2 is full, the vending device 2 will not accept any more batteries to be recharged; additionally, when all the empty batteries are not completely recharged, the battery vending device 2 will not deliver any battery. Obviously, the present invention provides a series of battery vending devices, such as vending devices A, B and C shown in Figs. 2 and 5, for storing a large number of charged batteries, and the availability of batteries stored in each vending device 2 is indicated by the display 14.

It is preferable to provide an identification element 28, such as a photo-sensor, in the battery in-slot 25 for discerning whether the battery placed therein by the user fits the charging specification; the specification (to be described hereinbelow) may be checked by the photo-sensor and the result obtained transmitted to the monitoring main frame 1.

The present invention further provides a battery with an identity number and particular specification. This type of batteries have a uniform identity number 261. As shown in Fig. 4, the identity number 261 may be stuck onto the side of the battery by means of a code label. When a battery to be recharged is placed in the in-slot 25, the identification element 28 reads the code label and then sends the data signal acquired to the central processing unit 11 to be compared with the preset data to determine whether the battery matches the charger 21 of the present invention, if not, then the display 14 will notify the user, restrict the convey device 20 from rotating and prevent the door 254 of the battery out-slot 25a from opening so that the user cannot collect a charged battery, unless the user pays up the amount for "new battery" or "purchase."

The battery identity number may also be used to calculate the accumulated charging cycles and charge hours of the battery so that when a predetermined value is exceeded the battery is disposed of to maintain high battery quality supplied by the automatic battery vending device.

If a battery 26A to be recharged is recognized by the identification element 28, the monitoring main frame 1 sends a command to a displacement means consisting of, for example, a first press element 251 and a second press element 252. The battery 26A is pushed by the first press element 251 onto an empty cope plate 201 of the convey device 20 and which aligns with the plate 253 of the battery in-slot 25, while the second press element 252 utilizes the oil pressure of the back-flow of the first press element 251 to push a charged battery 26B on another cope plate 201a on the other side of the convey device 20, the cope plate 201a also aligning with the plate 253 of the battery out-slot 25a, onto the plate 253 of the battery out-slot 25a. When the battery 26A to be recharged is positioned on the cope plate 201, its battery terminals are then respectively connected to two charging chucks 27 of the opposite polarity; these charging chucks 27 are collectively linked to the charger 21. At this time, the convey device 20 displaces a predetermined distance so that another stored charged battery

on its respective cope plate aligns with the plate 253 of the battery out-slot 25a, and another empty cope plate of the convey device 20 also aligns with the plate 253 of the battery in-slot 25 to prepare for collecting another battery to be recharged. When all the charged batteries in one vending device 2 are totally removed, then another vending device 2 takes the turn of performing the same operation. When it is off-peak hours of power consumption, the monitoring main frame 1 automatically activates the charger 21 to start charging the empty batteries in the corresponding vending device 2.

The manner of connection between the charging chucks 27 and the charger 21 may be by means of a bundle of cables 211, as shown in Fig. 4, or by means of an electric brush or other method of conduction. Obviously, if cables 211 are used as connection, the central processing unit 11 will control the convey device 20 to rotate one cycle and then counter-rotate to return to its original position in order to prevent the cables 211 from breaking due to continuous rotation in one single direction. Other similar techniques are considered to be details of the present invention and are not discussed in detail herein.

By means of the system of the present invention, empty batteries to be recharged are collectively recharged during off-peak hours of power consumption to achieve the object of energy storage; besides, the users do not have to wait for a long time and may exchange empty batteries for charged batteries after payment. As described above, a separate quick charger 24 (see Fig. 2) of the conventional type may also be provided in the present system to recharge batteries not in accordance with the particular battery specification of the present system. In view of the above, the present invention has the advantages of storing energy during off-peak hours of power consumption, easy operation and automatic recharge of batteries to supply charged batteries at any time. These features of the present invention are not disclosed in any prior art.

Although the present invention has been illustrated and described with reference to the preferred embodiments thereof, it should be understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the skilled person.

Claims

1. A battery vending system for selling and exchanging batteries in which when a user operates said vending system and keys in data in accordance with preset conditions stored in said vending system, said system then supplies a charged battery, said vending system comprising the followings steps of:
Storing a plurality of charged batteries in at least one battery vending device of a battery vending apparatus comprising said vending device and a monitoring computer having a central processing unit for prestoring control programs, and said monitoring

computer being connected to an operation device, an identification element, a convey device and a charger;

Transmitting an operation signal to said central processing unit via said operation device when the user operates said system;

Identifying the identity of a battery to be recharged and sending an identification signal to said central processing unit;

Comparing said operation signal and said identification signal with prestored data in said central processing unit, and

Initiating said convey device to deliver a charged battery after comparison.

2. The battery vending system as claimed in claim 1, comprising an additional step of:

Collecting said battery to be recharged disposed in a battery opening onto said convey device at the time when said battery opening delivers a charged battery.

3. The battery vending system as claimed in claim 1, comprising an additional step of:

Charging each of said batteries stored in said battery vending device by means of said charger.

4. The battery vending system as claimed in claim 3, wherein said charger starts charging each of said batteries in said battery vending device at a preset time.

5. The battery vending system as claimed in any of the above claims, comprising an additional step of:

Providing a quick charger in said battery vending apparatus, said quick charger being separately provided outside of the control programs of said central processing unit.

6. The battery vending system as claimed in any of the above claims, wherein said operation device comprises coin payment means and card payment means, a keyboard for data input, and a display for indicating operation results.

7. A battery vending apparatus utilizing off-peak power to store energy, said apparatus comprising:

a monitoring computer for processing and displaying various data, said computer outputting a control signal after processing; and

at least one battery vending device connected to said monitoring computer, said vending device having a charger disposed therein and a convey device moving along a predetermined path, a battery opening being disposed at a suitable position on said path for receiving batteries to be recharged and supplying stored charged batteries, said battery opening being provided with an identification element for identifying the specification of a

battery to be recharged and transmitting the identification result to said monitoring computer, wherein said convey device is controlled by said control signal from said monitoring computer to rotate, and batteries to be recharged accepted into said battery vending device are connected to said charger the switch thereof being controlled by said control signal from said monitoring computer.

8. The battery vending apparatus as claimed in claim 7, wherein a cope plate on said convey device aligns with a plate of said battery opening.

9. The battery vending apparatus as claimed in claim 7 or claim 8, wherein said monitoring computer is provided with a communication interface for gathering data of said monitoring computer to a control center.

10. The battery vending apparatus as claimed in any one of claims 7 to 9, wherein said monitoring computer is provided with card or coin payment means.

11. The battery vending apparatus as claimed in any one of claims 7 to 10, further comprises a quick charger.

12. The battery vending apparatus as claimed in any one of claims 7 to 11, wherein said battery vending device further comprises a displacement means which is controlled by said control signal from said monitoring computer to move a battery to be recharged placed in said battery opening onto an empty cope plate adjacent thereto and to move a charged battery on another cope plate adjacent to said battery opening to the plate of said battery opening.

13. The battery vending apparatus as claimed in any one of claims 7 to 12, wherein said charger is disposed in said monitoring computer.

14. The battery vending apparatus as claimed in any one of claims 7 to 13, wherein said monitoring computer and said battery vending device are formed into one single unit.

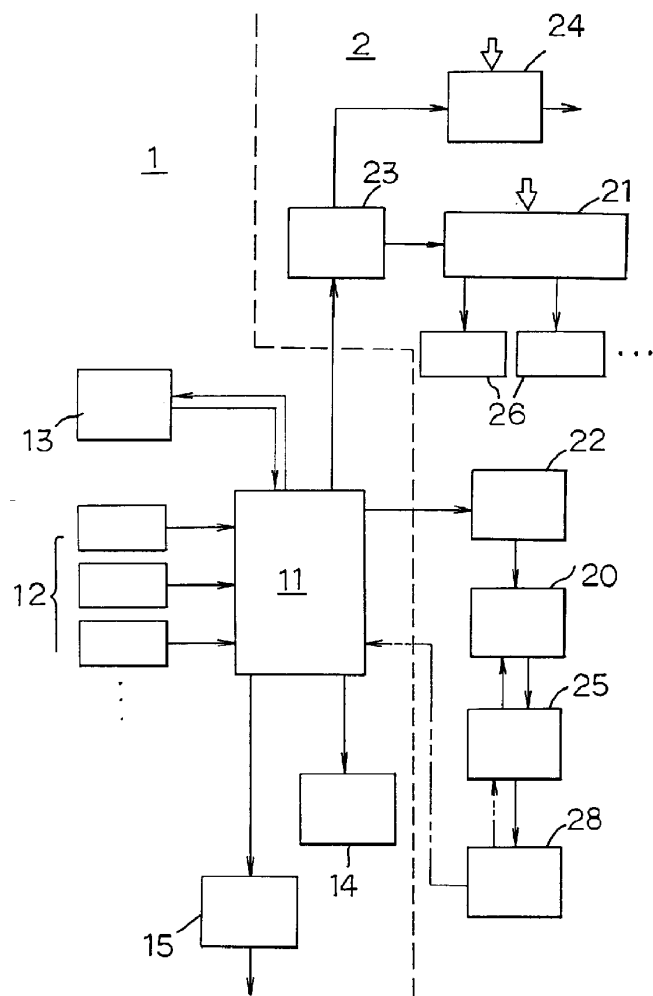


FIG. 1

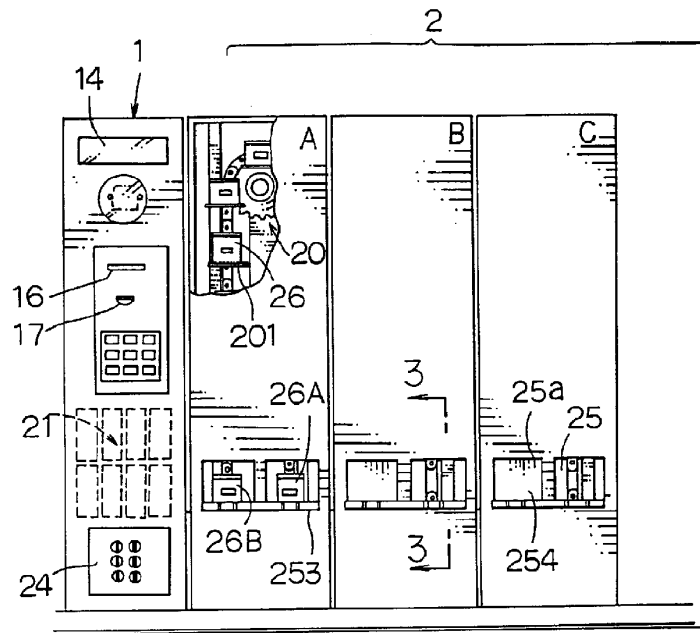


FIG. 2

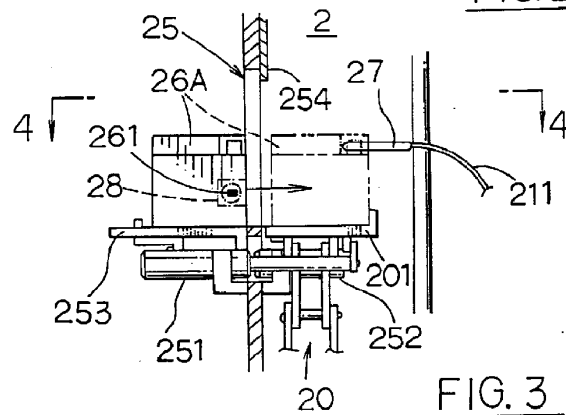


FIG. 3

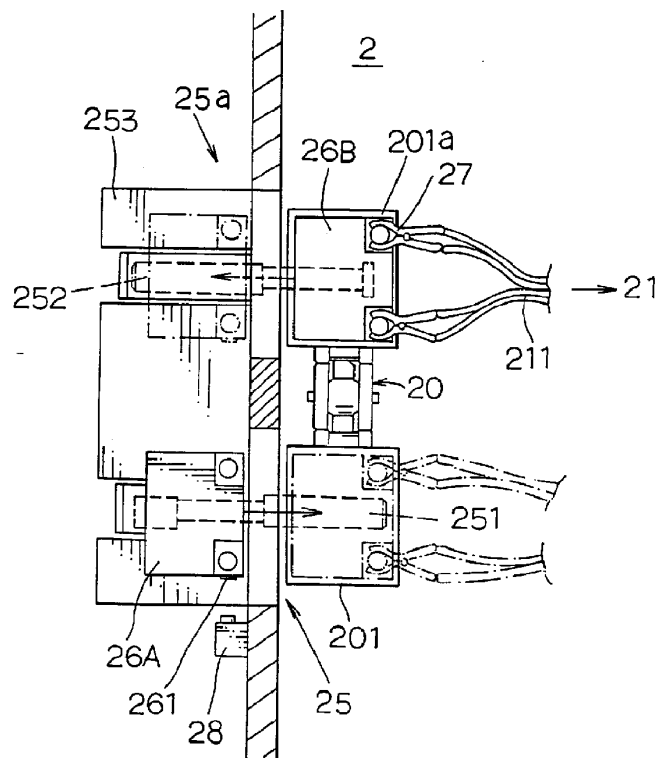
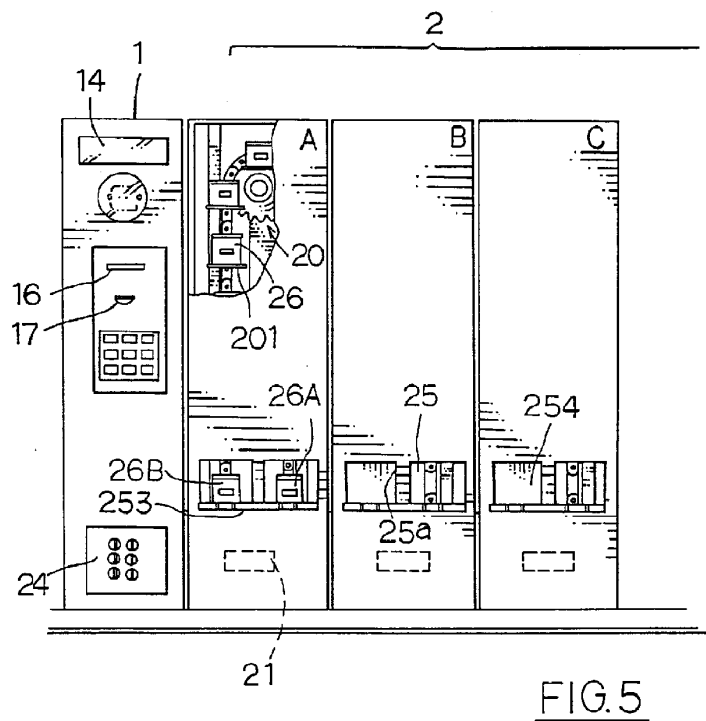


FIG. 4



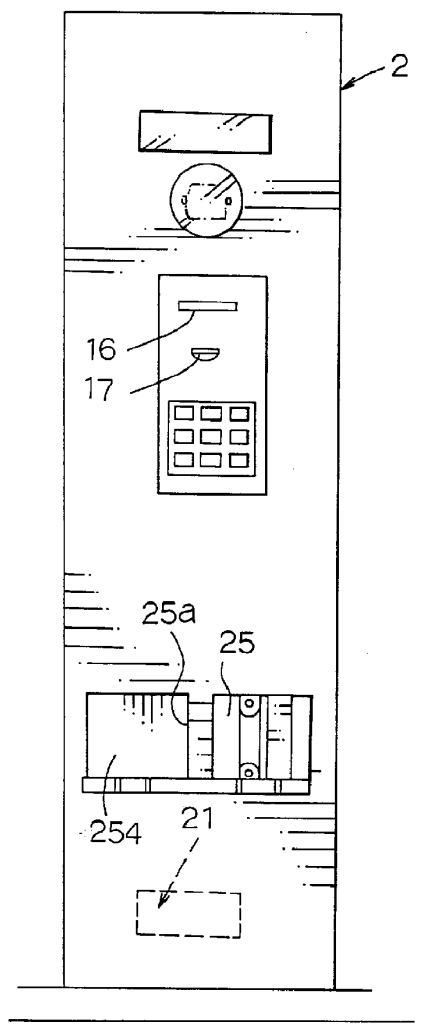


FIG. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 5428

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y A	EP-A-0 156 505 (PEAKMICRO LTD.) * page 6, line 16 - page 15, line 4; figures 1-3 *	1,6,7 3,10,12	H02J7/00 G07F7/06
Y	US-A-4 951 308 (BISHOP ET AL) * column 4, line 12 - column 10, line 15; figures 1,2 *	1,6,7	
A	PATENT ABSTRACTS OF JAPAN vol. 15, no. 184 (P-1200) 13 May 1991 & JP-A-03 041 594 (NTT) 22 February 1991 * abstract *	1-3,7,12	
A	US-A-4 532 418 (MEESE ET AL) * column 2, line 6 - column 8, line 61; figures 1-3B *	1,3-5,7, 9-11	
A	EP-A-0 592 335 (ELECTRICITE DE FRANCE) * column 4, line 7 - column 7, line 7; figures 1,2 *	1,6,7,9, 10	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 448 (P-942) 9 October 1989 & JP-A-01 173 289 (NIPPON TMI) 7 July 1989 * abstract *	1,6,7	H02J G07F
A	US-A-5 184 058 (HESSE ET AL) * column 2, line 15 - column 4, line 53; figures 1,2 *	4,7	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 December 1994	Examiner Calarasanu, P
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : number of the same patent family, corresponding document</p>			

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(54) **Method and device for the self service charging of batteries and portable electronic devices**

(57) The subjects of the invention are self-service device for charging batteries and operating electronic devices and a method of a self-service device functioning for charging and operating of electronic device. More pre-

cisely, the solution concerns a device which uses network chargers recommended for particular models of electronic devices, thus ensuring the safety of the charging process.

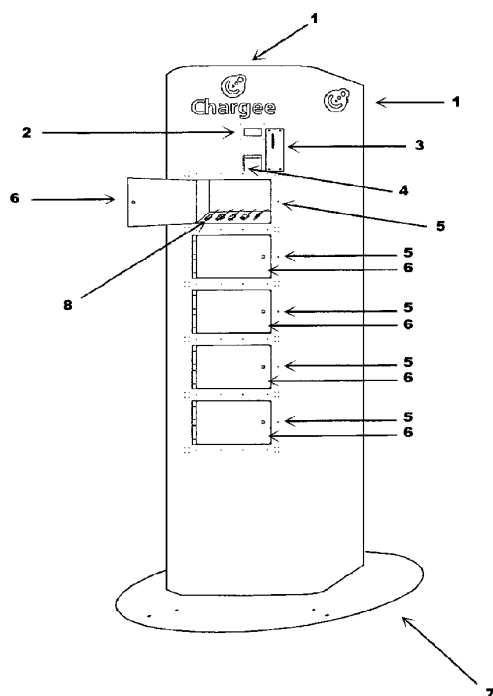


Fig. 1

EP 2 101 390 A2

Description

[0001] The subjects of the invention are self-service device for charging batteries and operating electronic devices and a method of a self-service device functioning for charging and operating of electronic device. More precisely, the solution concerns a device which uses network chargers recommended for particular models of electronic devices, thus ensuring the safety of the charging process.

[0002] Within the last few years the number of mobile phones and portable electronic devices used has risen notably. In an effort to meet the demands of the market, manufacturers develop devices that integrate more and more functions in one casing - phone, e-mail client, minicomputer, camera, digital camera, music player, movie player, GPS receiver. These features require bigger and bigger hardware resources and power supply, which causes significantly quicker discharging of the batteries in such devices. A parallel trend is the miniaturization of devices which makes it impossible to equip them with batteries or accumulators of greater capacity. The effect is that their operational time decreases, unless they are recharged. As a consequence, the users of such devices find it hard to function in the public space without frequent recharging of the batteries. The lack of ability to charge portable electronic appliances in public places means that many active people, who tend to be increasingly pressed for time, are experiencing a huge discomfort and restriction of personal and professional activity.

[0003] Charging devices available on the market are developed individually, while the number and types of cables implemented in them, which enable charging of specific type of batteries, is limited in view of the growing number of manufacturers and models of devices with different types of charging plugs. Therefore the installed devices are very quickly "removed from the market".

[0004] The patent description EP0773519 (published on 13 November 1996) describes a vending machine for charging of a secondary battery of a mobile phone, provided with a plurality of charging blocks each conforming to a specific type of mobile phone and the mobile phone secondary battery, used for charging many kinds of secondary batteries depending on the type of the mobile phone. This device comprises charging time selection buttons for setting the charging time corresponding to each of the many charging blocks, lock/unlock mechanism for locking/unlocking a key on the door provided in each of the charging blocks, a stocker for receiving at least one coin and/or at least one banknote, a calculator for calculating the amount of money of said coin and/or bill which have been received in the stocker, and a charging control circuit for controlling each of the many charging blocks to charge a secondary battery of a mobile phone attached in one of the many charging blocks, in accordance with the amount of money calculated by the calculator and the charging time set by the selection buttons.

[0005] The patent description GB2433355 (published on 20 June 2007) describes a charge station with multiple electrical sockets. The electrical sockets are mounted on the outside of the station. The charge station has a cover fastened on hinges and small notches. All sockets are connected to the main cable. The station may be mounted on a wall by means of openings in the side surface. It may be produced of metal or plastic and be equipped with RDC system. The charge station is a base for connection of low voltage discharging systems for such devices, as mobile phones, camcorder batteries, music players, torches, electronic games - every type of device that can be safely charged in one place.

[0006] The patent application KR20030042401 (published on 28 May 2003) describes an appliance for automatic and manual charging of electronic device batteries for improving application of battery charging by means of a method of measurement and control of the charging process with the use of an engine, a sensor and a microprocessor. The appliance charges different types of electronic devices, e.g. mobile phones, PDAs, portable electronic games, notebooks, digital cameras and camcorders. The first level is started the moment the battery is placed in the charging device in a horizontal or vertical position, which makes the terminal move up and down pressing the battery. At that time the second level is started and as a result of this activity the terminal is linked with the battery.

[0007] The patent application KR1020060017846 (published on 28 August 2007) contains a description of a docking station which offers the possibility of charging batteries and of a way of controlling the charging process of replacement notebook batteries, which may be used for charging multiple batteries at the same time.

[0008] Despite the charging solutions for electronic appliances available on the market, which are nothing but lending of chargers in public places for free or against payment or devices enabling charging of mobile phone batteries in a way that does not guarantee safety of devices placed inside them, there is a constant need to develop a solution which would eliminate the abovementioned fears and ensure safety of devices without the use of power cables of unknown origin or even simply mounted electrodes. An additional problem is the guarantee of an easy replacement of available chargers as the market trends and terminal location determinants change, as well as securing the operation of the device in spite of power supply failure. It is equally important to ensure maintenance of the manufacturer's guarantee on an electronic device in case of its paid charging in terminals having its own power cables or charging electrodes.

[0009] The purpose of this invention is provision of means that could be used in order to create a solution that would allow to save time allotted to recharging batteries parallel to securing the deposited device even after completion of the charging process. In greater detail, the purpose of this solution was to construct a self-service device - a vending machine - used to charge electronic

device batteries ranging beyond the scope of mobile phone batteries, with an additional capacity of data transmission from deposited electronic devices, parallel to ensuring maximum security of access to the devices locked in the terminal.

[0010] This invention is an accomplishment of this purpose and a solution of problems described in the state of technology, concerning developing a mechanism that is simple in use and resistant to any errors and changes in the workflow and at the same time protecting the user against the loss of paid money and deposited device. What is more, by employment of network chargers available on the market and recommended for particular models of electronic devices, the solution comprises a device that guarantees safety of the charging process (without damage to the deposited devices) and calms user's anxiety with regard to power cables used in existing devices.

[0011] The subject of the invention is a self-service device for battery charging containing many charging compartments adjusted to portable electronic devices, comprising charging compartments, a mechanism for locking/unlocking of the compartments, charger plugs in the compartments, a coin slot with a validator, a charging control system used for monitoring each of the many battery charging compartments, selection buttons, an LCD display, characterised in that a self-service device has at least 3 compartments with lockable doors, where each of the compartments is equipped with at least 1 transmission cable plug-in jack, preferably 1 to 10 different transmission cable plug-in jacks, and chargers for electronic devices to which a discharged device is connected, a compartment door closing mechanism (servomechanism), compartment lighting, signal diodes, each device being equipped with a user identity control module interface located on the external casing, preferably fingerprint scanner.

[0012] Preferably, the user identification module is a biometric reader (a fingerprint reader, a palm vein pattern reader, a wrist vein pattern reader, a retina pattern reader) or a credit card reader.

[0013] Preferably, a device is at the same time intended for operation of electronic devices, preferably for making back-up copies of data contained in the charged device and for installing and updating its software.

[0014] Preferably, a device is intended for delivery of advertisements sent via WiFi or Bluetooth communication module.

[0015] Preferably, the electronically controlled compartment door closing mechanism is an electromagnet or a key lock.

[0016] Preferably, the electronically controlled compartment door closing mechanism allows the bolting of the compartment door and/or the key to be turned and removed from the lock only when the following happens simultaneously: an electronic device is connected to an appropriate plug in the compartment, the service is paid for and the compartment door closed which is confirmed by the closed door sensor.

[0017] Preferably, the device is equipped with a closed door sensor, preferably by means of a reed relay.

[0018] Preferably, the signal diodes inform about operational mode of the compartment.

5 **[0019]** Preferably, for interaction with the user the device is equipped with an LCD display informing about subsequent steps of service completion and operation mode.

10 **[0020]** Preferably, a device supports portable electronic devices, advantageously mobile phones, cameras, digital cameras, Mp3 players, PDAs, palmtops, portable electronic games and game consoles, notebooks, iPods, BlackBerry devices, GPS receivers, Bluetooth sets.

15 **[0021]** Preferably, the communication module is a GSM/EDGE/UMCS, and/or WiMax, and/or WiFi, and/or LAN module network adapter, and/or Ultra-Wideband module, and/or Bluetooth module.

20 **[0022]** Preferably, the payment module is a cash validator, banknote validator, and/or a payment card validator, and/or a credit card validator, and/or NFC payment module, and/or SMS Premium payment module, and/or micropayment module and that the payment is possible in at least one currency, preferably two currencies.

25 **[0023]** Preferably, in the case of power supply failure the accumulator maintains the device in operational mode allowing reclaiming of deposited devices and informs about emergency mode.

30 **[0024]** The next subject of this invention is a method of a self-service device functioning for charging and operating of electronic devices, characterized in that the user identity control module - a biometric reader, and/or a payment card reader, and/or a credit card reader, preferably a fingerprint reader, saves the user's identity key comprising at least 1 fingerprint, preferably 2 fingerprints, and stores it in the memory until repeat verification, a message confirming successful scanning and creation of a personal access key or a repeat scanning message is displayed, after the user pays the fee the discharged device is connected in one of the compartments and afterwards the door is closed and a repeat user identification is made in order to confirm the correctness of the procedure, next the information on the set charging time is sent to the compartment and the door is locked, after the prepaid charging time has elapsed the central system control module communicates with the compartment controller and orders disconnecting the charger from the telephone, thus completing the charging service, after which the terminal starts calculating a programmed free deposit time and after it has elapsed - payable deposit time - for the device left in the compartment, wherein the compartment door is opened after subsequent user identification performed through the identification module based on a comparison with one of the fingerprints saved during creation of the user identity key. Preferably, if a TAMPER input protects the device against unauthorized access, and in addition in the case of incorrect verification of the service person's fingerprint saved in the database of the identification module or the lack of such identifica-

tion, prior to opening of the back service door the device saves this fact in the event history and immediately informs the service centre; additionally all functions accessible from the inside of the terminal are blocked, advantageously opening of compartments and editing fingerprints of the service personnel.

[0025] For better understanding of the invention, the solution and way of operating is presented with reference to figures.

Figure 1 represents devices for charging batteries of electronic devices, where: 1 - neon

2 - LCD display

3 - coin slot

4 - fingerprint scanner

5 - signal diode

6 - compartment with doors

7 - base

8 - plugs

Figure 2 represents the perspective of the device.

Figure 3 represents the design of the device structure, where:

9 - LCD panel

10 - communication module

11 - payment module

12 - key, fingerprint scanner

13 - central system control module

14 - power supply bus

15 - compartment set

16 - pins

17 - communication and control bus

18 - compartment control system

19 - door closing mechanism

20 - closed door sensor

21 - status indicator

22 - 230 V power supply

23 - emergency power supply

24 - lock

Figure 4 represents the mechanism of functioning of the device for charging electronic device batteries.

[0026] An example solution based on the invention is presented below.

Example

[0027] Like every vending machine selling products/ providing services of low value, the device has in the basic version a coin slot, which may be replaced with a banknote reader, a credit card or chip card reader on the markets where low value banknotes are used or in case of provisioning of services with higher value. It may also be supported by micropayment interface. The device-terminal with a generic service of charging batteries/accumulators of electronic devices with the ability to implement a simultaneous data transmission via the DATA cable in accordance with an SMS order during the charging process.

[0028] Versatility of devices supported by the terminal has been achieved by employment of network chargers produced and launched along with marketing of new electronic device models. These chargers have been incorporated into mechanisms and software for managing detection of connected devices and activation of power supply on a given plug of the network charger. Thus the very process of battery charging is controlled by factory-made devices (network chargers), what guarantees correctness of the charging process itself, positive user experience and maintenance of manufacturer's guarantee on the device. The application of chargers - ready market products - allows quick and flexible customization of the chargers available in the device in accordance with usage statistics and local determinants.

[0029] The terminal has lockable compartments 6 in which user devices are locked during the charging process, what enables their owners to move away while their device battery is being charged.

[0030] Compartments 6 have electronically controlled servomechanism (alternatively electromagnet, key) which controls the terminal software.

[0031] The safety of the lock and of the access to compartments 6 is achieved by (aside from the metal sheeting of the terminal) explicit and unique identification keys that are not used by other users, created by a fingerprint scanner 4 and comprising at least one fingerprint, preferably two fingerprints, (alternatively a retina scanner) or other identification solutions - proximity cards, code cards.

[0032] The design of the device structure has been presented in Fig. 2. It comprises communication buses 17, 14, modular outputs enabling extension and replacement of different types of identification, payment and communication solutions, depending on immediate needs.

[0033] The terminal has been equipped with an accumulator sustaining the operation of electronics and enabling keeping the compartments locked, user identification, release of devices deposited in the terminal and emergency/service communication.

[0034] The terminals are equipped with an LCD display 2 presenting user manuals, displaying commands and confirmations for the user in at least one language, preferably two languages. Due to the ability to complete the charging service despite display failure/unavailability, the procedure and instructions, along with the rules, are presented in a text/graphic format on the casing of the device.

[0035] The correctness of user operations and additional interaction of the device is indicated by tricolour diodes 5 signalling the state of each of the compartments 6: "closed compartment taken service completed", "closed compartment taken service in progress", "open compartment with detected connected electronic device".

[0036] The terminal has sensors detecting device connections, compartment door opening, service door opening, sabotage attempts and communication between in-

dividual subassemblies remaining in interaction with the notification system informing the service centre of events in the device.

[0037] Efficient functioning of the terminal is ensured by the device operation system depicted in Fig. 3. It takes into consideration all predictable actions, user behaviour during service provisioning, faults and obstacles that users may encounter, and shortens the whole procedure to four simple steps: fingerprint scanning, payment - coin insertion, connecting the device to the charger plug and closing compartment door. Simplifying the operation procedure of such a complex device to four simple steps is the result of solutions applied in this invention. The whole work of the device is controlled by developed terminal software with configurable operation parameters.

Detailed example of terminal realization

Requirements regarding the Terminal:

[0038]

- ability to provide battery charging services for electronic devices;
- the device comprises a casing with compartments - compartments 6 for different types of devices;
- access to the compartments - compartments 6 is secured by way of a fingerprint scanner 4;
- electronic charging control system, compartment - compartment 6 access control system and notifications via GSM/EDGE/UMTS network 10 system;
- the casing is intended for indoor assembly on a pedestal or directly to the floor;
- every compartment 6 can have only one attached device at a time;
- the terminal allows the use of all compartments at the same time.

Terminal main elements and components

[0039] Lockable compartments 6 - each terminal has 5 lockable compartments for depositing and attaching of electronic devices. The compartments are equipped with sensors detecting the position of the door - reed relay, as well as a closing mechanism fitted with servomechanism (other variants of compartment door bolting: electromagnet, patent lock). The compartments have lighting activated when the compartment door opens.

Charger plugs

[0040] Each terminal compartment is equipped with five different charger jacks/plugs 8 of chargers supporting makes of electronic devices most frequently used on the given market, e.g.: Apple, Acer, Asus, HP, Palm, Qtek, Mitac, Nokia, Sony Ericsson, LG, Sagem, Sharp, SPV, HTC, Motorola, Samsung, Siemens. The device contains chargers supporting both dedicated device makes and

universal plugs for devices by many manufacturers, e.g. mini USB, USB. The number, layout and type of chargers in the compartments is modifiable and linked to the frequency of occurrence on the market of the given device make and model supported by the charger placed in the compartment. The number and type of chargers available in the terminal depends on the local market and may be adjusted.

Signal diodes

[0041] Tricolour signal diodes 5 placed next to each compartment inform the user whether main actions during the use of the device have been performed correctly (compartment free and ready to render the service, device properly attached in the compartment, compartment occupied with charging process completed) with respect to given compartment.

LCD display

[0042] The terminal is equipped with an LCD 2 display which facilitates its operation. The display shows instructions in at least one language, preferably two languages, and guides the user through the whole process of battery charging service for electronic devices. Besides, the display communicates irregularities in the operation of the device by the user or irregularities in the functioning of the device itself.

Coin slot

[0043] The device accepts payments for provisioned services by means of an installed payment interface - a coin slot 3 (banknote reader, payment card reader, microchip card reader, SMS reception module, prepaid micropayment confirmations module) accepting coins in at least one currency system, preferably two currency systems, programmed via the motherboard of the device.

Fingerprint scanner

[0044] A module controlling user identification 4 in the terminals which are equipped with electronically controlled compartment bolting (e.g. servomechanism, electromagnet).

Compartment control system

[0045] A module controlling given compartment 6: detection of closing/opening of the door, device attachment detection, charging time adjustment, controlling of compartment bolting mechanism, activating and deactivating of power supply in individual charger plugs depending on the prepaid charging time.

[0046] This module cooperates with the device motherboard and the terminal control software.

Motherboard

[0047] Central unit of the device 13 equipped with GSM/EDGE/UMTS communication module 10 (WIFI, Bluetooth, wireless, Wimax, LAN) connected with compartment control systems 18, power source and other components of the device responsible for payment verification, user identification, LCD display, external communication and terminal compartments control by means of a communication bus 17 and a supply bus 14. The unit has terminal control and configuration software installed. Central unit has service configuration connectors. It may also be controlled and configured via GSM/EDGE/UMTS communication module or other, depending in the model of the terminal.

Casing

[0048] Metal casing has the following dimensions:

Width: 40 - 55 cm
Height: 170 - 210 cm
Depth: 30 - 45 cm
Number of compartments - 5
Compartment dimensions:

Width: 20-35 cm
Height: 10 - 25 cm
Depth: 15 - 25 cm

[0049] Compartments - the compartments 6 are separated from one another with a distance of 1 - 3 cm.

[0050] Each compartment - compartment 6 can be independently disassembled for replacement without disturbing other compartments.

[0051] At the front the casing has doors for each of the compartments 6, allowing access to their content. At the back there is a service door allowing access to the terminal subassemblies. Each door is equipped with a blockade controlled electronically from the level of compartment control system. The side of the casing has assembly holes for informational leaflet dispensers.

[0052] The base 7 is formed by a pedestal/stabilizer (15 - 35 kg in weight) in the shape of an ellipsis or a cut ellipsis allowing placing the terminals directly by the wall and alternative assembly to the floor with screws.

Functional requirements regarding terminal models with fingerprint scanners and coin slots:

[0053] The state of the door prior to paying for the service may be "open" or "closed", whereas after closing them properly they are bolted and blocked.

[0054] Opening of the door after charging may occur only in the situation permitted by the CCS system (compartment control system - 18).

[0055] The front part of the compartment 6 has a "flange" at the bottom which protects its contents from

slipping out of the locker after opening of the door.

[0056] On the front side of the casing there is a user operation field with: a coin slot 3, LCD display 2, fingerprint scanner 4 and a place to put user manual and price list. The coin chamber is accessible through the door in the back of the casing.

[0057] The back door is equipped with a lock protecting the contents of the locker against unauthorized access and a sensor connected to Central Management Module 13.

[0058] The structure of the back door allows replacement of the compartments 6, replacement of electronics, replacement of the door closing mechanism 19 as well as order subassemblies. The board with the compartment control system (CCS) (18) is mounted on the back wall of each compartment. Central system management module 13 with a GSM/EDGE/UMTS communication module 10 is mounted on the top part below the neon 1.

[0059] Each compartment is equipped with a closed compartment door sensor 20 allowing to determine the door position (open or closed).

[0060] For interaction with the user the unit is equipped with an LCD display informing about subsequent steps of service completion, and each of the compartments 6 has a tricolour signal diode (LED) 5 indicating its operational state.

[0061] The terminal has an accumulator 23 sustaining the power supply of compartment door closing mechanisms and device electronics.

Payment module - coins validator

[0062] Payment module - coins validator - the type of coins used may be programmed:

User identification module - fingerprint scanner 12

Motherboard with GSM/EDGE/UMTS communication module 10

[0063] The motherboard with communication module 10 ensures the transfer of information concerning the terminal's work and its software via SMS/packet data transmission, controls the compartments and communicates with CCS module and FP module. It is mounted on the front inner side of the locker wall.

[0064] It is possible to programme the device settings via configuration SMS, RS port.

[0065] Besides, the device is equipped with a BUZZER for sound signalling of events in the system, while the GSM signal level is indicated by the 4 LED diodes.

[0066] The board 13 contains 5 SWITCHES used to open individual compartments in the service mode and to program FINGERPRINT patterns of the service personnel, an LCD display 2 for interaction with the user and a RESET button which programmatically resets the GSM system and initializes the IDLE state of the CSS modules;

the device stores system event information.

Compartment control system

[0067] The compartment door closing mechanism 19 is controlled through checking of the charging process in individual channels for the given compartment, communication with the communication module and the motherboard of the compartment control system mounted on the back wall of the compartment; closed compartment door sensor 20 - reed relay monitors if the compartment door has been closed, while the tricolour LED diode signals the compartment state. Individual chargers placed in the compartment, as well as transmission cables, are controlled through the compartment control system. Individual compartment control systems 18 are connected to one another and to the Central system management module by means of a communication bus 17 and a power supply bus 14. *Motherboard with GSM/EDGE/UMTS communication module 10*

[0068] Central device in the system that controls all other cooperating electronic devices.

Functioning of the device

[0069] The controller works in accordance with the following scheme:

Idle state - the device is idle and waiting for the charging service to be paid for.

Fingerprint scanning detected-we are checking if it is possible to add a user, who is then saved until repeat verification. A message is shown that confirms successful scanning and creation of a personal access key or a message encouraging the user to repeat scanning in case of undecipherable reading of the scanned finger.

[0070] The controller checks if coins have been inserted into the validator (minimal value programmed in the validator = 0,1 PLN). The messages on the display update the amount inserted in the coin slot 3 and corresponding charging time that has been paid for in accordance with current price list of the device.

[0071] Insertion of a coin starts countdown of Tload* time during which the discharged device should be connected. Each insertion of a coin reactivates the countdown and updates the displayed message about prepaid charging time.

[0072] The monitoring of the discharged device connection process begins. If the discharged device is not attached during the Tload time - a respective message is displayed and the user loses prepaid credit.

[0073] The system checks if only one device has been connected to the charger. In the case of attaching more devices, a respective message requests the user to leave only one connected device in the given compartment.

[0074] After the device has been attached correctly, the terminal starts countdown of the time during which the door should be closed - a message is displayed informing user that additional coins may be inserted in order to prolong the covered charging time or requesting closing of the door. Exceeding of the Tclose time causes the loss of prepaid credit. After the device is disconnected but before the door is closed the user may insert additional coins and increase the credit. Insertion of a coin reactivates the Tclose time.

[0075] Once the door is closed, the fingerprint is scanned for the second time in order to verify the correctness of performed activities and, if it matches the pattern saved at the beginning of the procedure, the information on prepaid charging time is sent to the given compartment and the door is locked. Any irregularities in the selection of the compartment will cause the loss of prepaid credit, opening of the door, thus the end of the service.

[0076] Once the door is closed, there is no possibility to make any changes in the compartment and its opening means resignation from the service that has been paid for.

[0077] The door is opened after fingerprint scanning subsequent to that made by the closing of the door. If the scanning occurs before the prepaid charging time has elapsed, the service is considered completed and the compartment vacated.

[0078] The condition of the fingerprint scanner is being checked by the system at all times. It undertakes any measures necessary to maintain the scanning function.

[0079] All actions to be performed by the user are preceded by messages informing him/her about subsequent steps in the operation of the terminal. After their completion a respective LCD display message confirms correctness of the procedure.

[0080] After the prepaid charging time has elapsed (unless the device has been collected earlier) the GSM controller communicates with the compartment controller and orders disconnecting the phone from the charger, thus ending the charging service. The terminal starts calculating a programmed free deposit time and after it has elapsed - payable deposit time - for the device left in the compartment. When collecting the device during payable deposit time, the user is required to pay for the deposit time, in accordance with respective messages shown on the display.

[0081] In the case that the user does not collect the deposited device and exceeds permitted deposit time (BUSY_TIME), the system should communicate his fact to the service centre via SMS. At the same time, if the user collects the phone after permitted deposit time has elapsed, the system should send an SMS message informing the service centre about this fact in order to call the service person off.

[0082] If the phone is lying in the compartment longer than permitted time (Tdep) allows, on attempting to collect it the user should pay a fine proportional to exceeded

compartment occupation time.

Amount of fine = Fine rate[PLN/min.]*[min]

where:

$$T = T_x - T_{dep}$$

T_x - time since the end of charging until now

T_{dep} - permitted phone deposit time (for $T_{dep} = 0$ the fine option is disabled)

Fine rate and T_{dep} are programmable through an PC application.

[0083] Only after the payment is done will the bolt lock be released, enabling deposited device to be collected.

[0084] The controller saves information and may communicate via SMS the prepaid credit amount, type of charger chosen, hour, exceeded permitted locker occupation time after the end of charging, etc.

[0085] The GSM communication controller has programmable parameter, such as: service centre number, number of person responsible for service, PIN, etc. Configuration of these parameters is made by means of special software. The parameters may be entered only during device restarting and the communication of GSM module with the software may not last longer than 1 minute. After this time the GSM module enters normal operation mode.

[0086] GSM communication module controller monitors also power supply voltage and after its failure or recovery (Tac time elapsed since the failure/recovery) sends a message about this event to the RAP and SERV numbers. Since the supply voltage failure till its recovery the operation of the device is blocked; it does not accept coins or provide any services.

[0087] The terminal enters a mode enabling retrieving of deposited devices.

[0088] GSM communication module 10 communicates with CCS 18 and, in the case of ten subsequent failures in communication with any of the modules, stops provisioning of services (but completes current ones) and notifies about it the service person or service centre.

[0089] LED diodes (*these are other diodes*) - GSM communication module has four LED diodes used for indicating the GSM signal level. Additionally in the service mode they signal currently performed tasks/requests.

[0090] BUZZER - used for sound signalling and confirming performed tasks. The device generates a short sound signal in case of an order carried out correctly and a long sound signal for an error during its completion. A sound signal confirms also button operations.

[0091] TAMPER input - protects the device against unauthorised access. If disturbance of the TAMPER input is not preceded by a correct scanning of a service person fingerprint saved by the identification module, the device stores this fact in the memory and immediately informs the service centre.

[0092] Additionally, all functions accessible from the

inside of the terminal are blocked (opening compartments and editing service personnel fingerprints, etc.).

[0093] In the case of authorised access the device realises all available service functions.

5 **[0094]** In the case of service works the device shows a relevant message on the LCD display 2, informing the user of the situation. At that time phones cannot be deposited or collected.

[0095] The TAMPER input will not be monitored if the system did not register any service person (factory device - not programmed).

10 **[0096]** RESET button - programmatically RESETS the GSM programme and also the CCS 18 systems. The use of this button involves losing all information about provisioned charging services, while the compartments - compartments 6 move into IDLE state and are considered vacated.

[0097] The MENU buttons have two functions:

- 20 - opening of compartments,
- fingerprint patterns editing mode.

25 **[0098]** In the compartment opening mode the buttons have the functions labelled 1 - 5. This mode is entered after the 4/ADD button has been pressed for 3 sec.

[0099] This is signalled by the lighting of LED diodes (5) (lowest GSM signal level diode flashes). Once the mode is activated, pressing the button 1 - 5 opens the relevant compartment.

30 **[0100]** In the pattern edition mode the buttons activate the functions labelled 1,2,3, ADD, ERASE. This mode is entered after the 4/add button has been pressed for 3 sec. This is signalled by the lighting of LED diodes (all GSM signal level diodes flash). Once this mode is activated, pressing the button 1,2, or 3 and then ADD or ERASE will switch to an add/erase fingerprint pattern mode. The number of chosen position should be displayed by flashing of the GSM signal level diodes (flashing diode 1 - position 1; 1 and 2 - position 2; 1,2 and 3 - position 3).

Pattern adding

45 **[0101]** Once the position number is chosen and ADD button pressed, the LCD display (2) should show the information about user added mode and a usual procedure should be performed.

50 Pattern erasing

[0102] Once the position number is chosen and ERASE button pressed, the pattern is erased.

55 **[0103]** Exit from the service mode should follow automatically after 5 minutes of idleness or after closing of the door (TAMPER) and after repeat scanning of the fingerprint of the service person who activated the mode (reverse procedure).

[0104] Each time a button is pressed in the service mode a sound signal is heard (BUZZER).

*) Tload - 1-240 sec.

**) Tclose - 1-240 sec.

***) Tac - 1-1440 min.

Claims

1. A self-service device for battery charging containing many charging compartments adjusted to portable electronic devices, comprising charging compartments, a mechanism for locking/unlocking of the compartments, charger plugs in the compartments, a coin slot with a validator, a charging control system used for monitoring each of the many battery charging compartments, selection buttons, an LCD display, **characterised in that** a self-service device has at least 3 compartments with lockable doors (6), where each of the compartments (6) is equipped with at least 1 transmission cable plug-in jack (8), preferably 1 to 10 different transmission cable plug-in jacks, and chargers for electronic devices to which a discharged device is connected, a compartment door closing mechanism (19) (servomechanism), compartment lighting, signal diodes (5), each device being equipped with a user identity control module interface (4) located on the external casing, preferably fingerprint scanner.
2. A device according to claim 1, **characterized in that** the user identification module is a biometric reader (a fingerprint reader, a palm vein pattern reader, a wrist vein pattern reader, a retina pattern reader) or a credit card reader.
3. A device according to claim 1, **characterised in that** it is at the same time intended for operation of electronic devices, preferably for making back-up copies of data contained in the charged device and for installing and updating its software.
4. A device according to claim 1 or 2, **characterised in that** it is intended for delivery of advertisements sent via WiFi or Bluetooth communication module.
5. A device according to claim 1 or 2, **characterised in that** the electronically controlled compartment (6) door closing mechanism (19) is an electromagnet or a key lock.
6. A device according to claim 4, **characterised in that** the electronically controlled compartment door closing mechanism (19) allows the bolting of the compartment door and/or the key to be turned and re-

moved from the lock only when the following happens simultaneously: an electronic device is connected to an appropriate plug (8) in the compartment (6), the service is paid for and the compartment door closed which is confirmed by the closed door sensor (20).

7. A device according to claim 1 or 2, **characterised in that** the device is equipped with a closed door sensor (20), preferably by means of a reed relay.

8. A device according to claim 1 or 2, **characterised in that** the signal diodes (5) inform about operational mode of the compartment (6).

9. A device according to claim 1 or 2 or 7, **characterised in that** for interaction with the user the device is equipped with an LCD (2) display informing about subsequent steps of service completion and operation mode.

10. A device according to claim 1 or 2, **characterised in that** it supports portable electronic devices, advantageously mobile phones, cameras, digital cameras, Mp3 players, PDAs, palmtops, portable electronic games and game consoles, notebooks, iPods, BlackBerry devices, GPS receivers, Bluetooth sets.

11. A device according to claim 1 or 1, **characterised in that** the communication module is a GSM/EDGE/UMCS, and/or WiMax, and/or WiFi, and/or LAN module network adapter, and/or Ultra-Wideband module, and/or Bluetooth module.

12. A device according to claim 1 or 2, **characterised in that** the payment module (3) is a cash validator, banknote validator, and/or a payment card validator, and/or a credit card validator, and/or NFC payment module, and/or SMS Premium payment module, and/or micropayment module and that the payment is possible in at least one currency, preferably two currencies.

13. A device according to claim 1 or 2, **characterised in that** in the case of power supply failure the accumulator maintains the device in operational mode allowing reclaiming of deposited devices and informs about emergency mode.

14. A method of a self-service device functioning for charging and operating of electronic devices, **characterized in that** the user identity control module (4) - a biometric reader, and/or a payment card reader, and/or a credit card reader, preferably a fingerprint reader, saves the user's identity key comprising at least 1 fingerprint, preferably 2 fingerprints, and stores it in the memory until repeat verification, a message confirming successful scanning and crea-

tion of a personal access key or a repeat scanning message is displayed, after the user pays the fee the discharged device is connected in one of the compartments (6) and afterwards the door is closed and a repeat user identification is made in order to confirm the correctness of the procedure, next the information on the set charging time is sent to the compartment and the door is locked, after the pre-paid charging time has elapsed the central system control module (13) communicates with the compartment controller (18) and orders disconnecting the charger from the telephone, thus completing the charging service, after which the terminal starts calculating a programmed free deposit time and after it has elapsed - payable deposit time - for the device left in the compartment (6), wherein the compartment door is opened after subsequent user identification performed through the identification module (4) based on a comparison with one of the fingerprints saved during creation of the user identity key.

15. A method according to claim 13, **characterised in that** if a TAMPER input protects the device against unauthorized access, and in addition in the case of incorrect verification of the service person's fingerprint saved in the database of the identification module (12) or the lack of such identification, prior to opening of the back service door the device saves this fact in the event history and immediately informs the service centre; additionally all functions accessible from the inside of the terminal are blocked, advantageously opening of compartments and editing fingerprints of the service personnel.

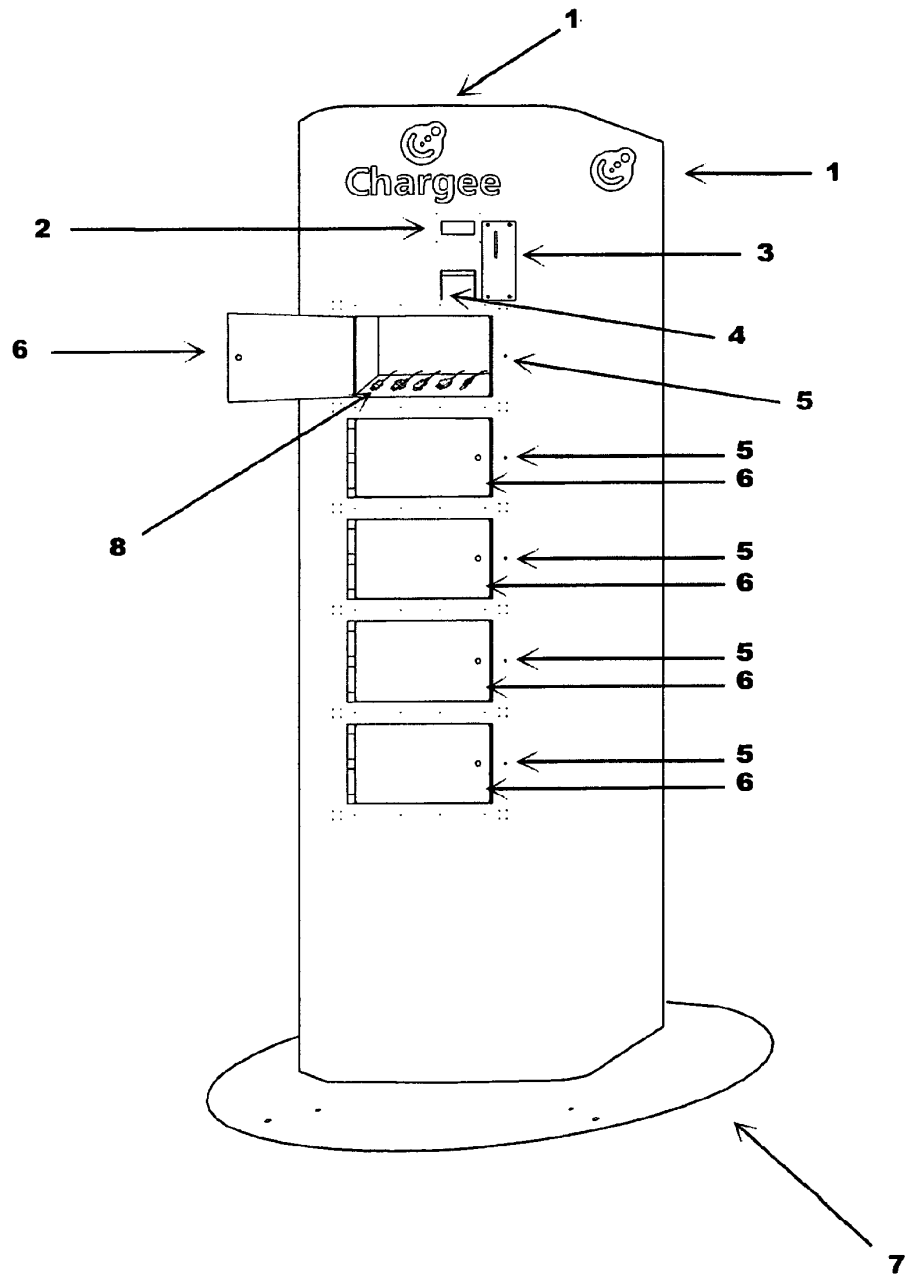


Fig. 1

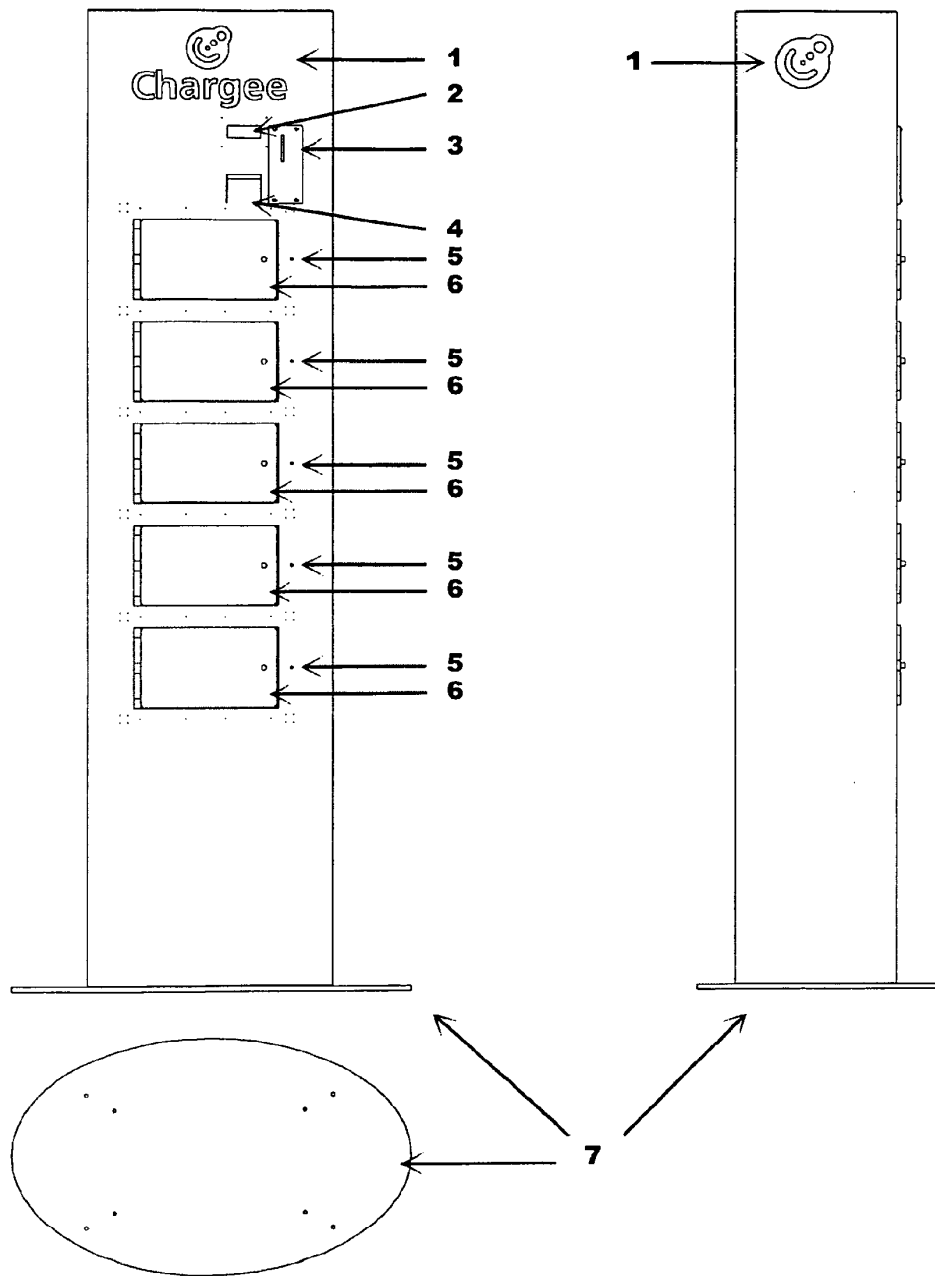


Fig.2

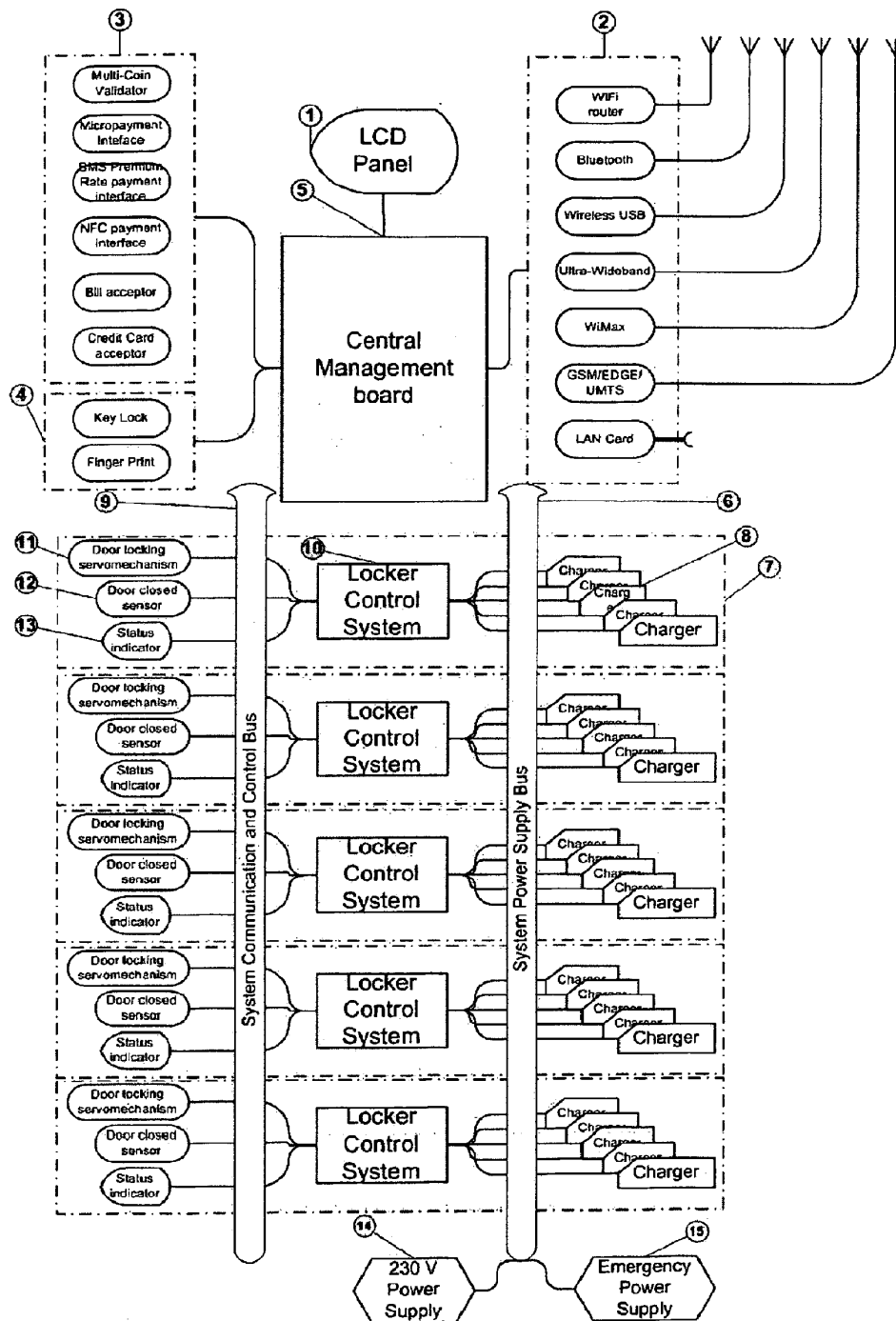
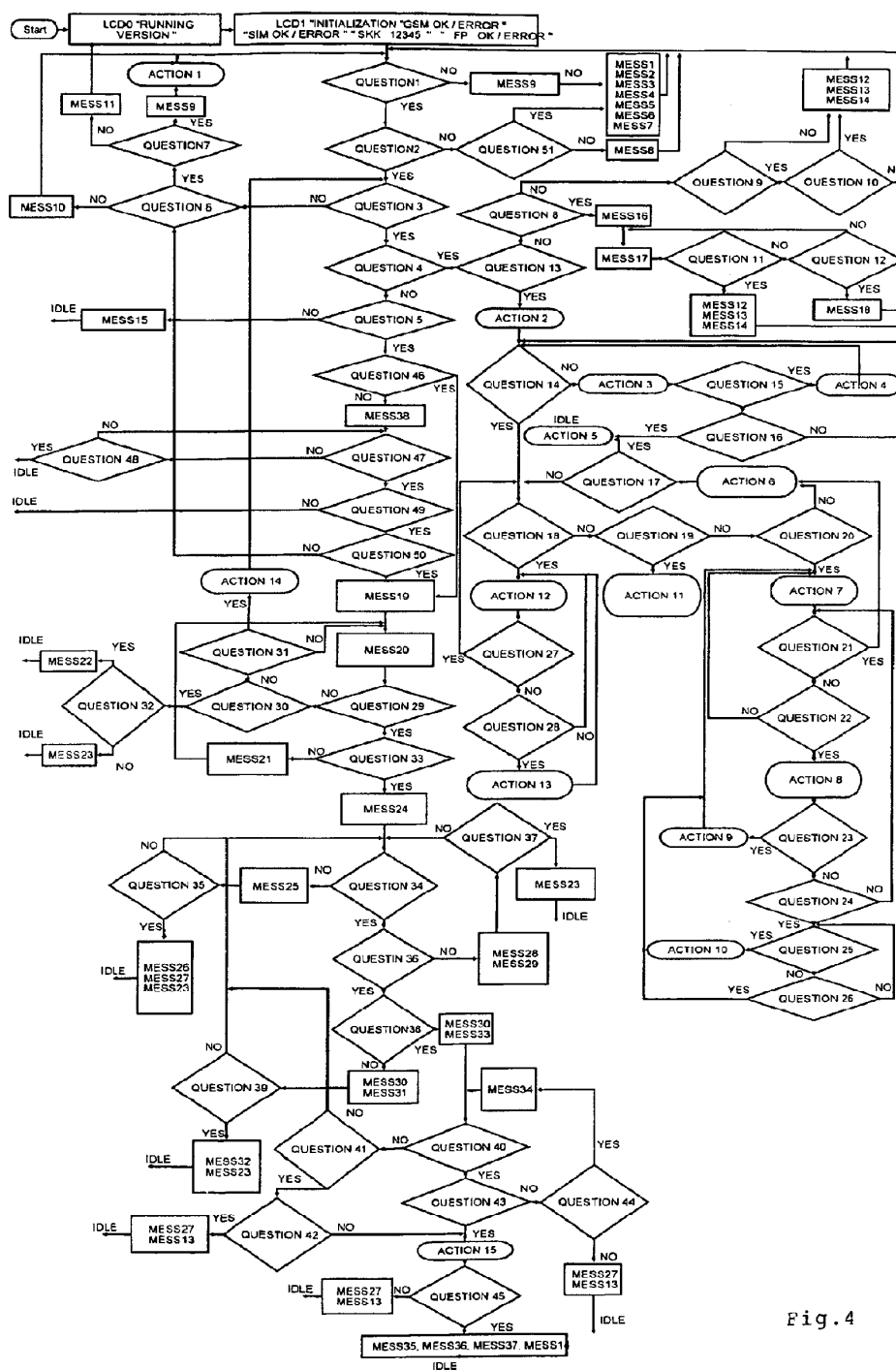


Fig. 3



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REFERENCES CITED IN THE DESCRIPTION

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Record 1/1 EP2428939A1 Automatic service machine for using and/or charging an energy storage device for an electric bicycle | Serviceautomat zum Beziehen und/oder Aufladen eines Energiespeichers für ein Elektrofahrrad | Automate de service destiné au revêtement et/ou au chargement d'un accumulateur d'énergie pour un vélo électrique

Publication Number: EP2428939A1

Title: Automatic service machine for using and/or charging an energy storage device for an electric bicycle | Serviceautomat zum Beziehen und/oder Aufladen eines Energiespeichers für ein Elektrofahrrad | Automate de service destiné au revêtement et/ou au chargement d'un accumulateur d'énergie pour un vélo électrique

Priority Number: DE102010040388A

Priority Date: 2010-09-08

Application Number: EP2011166840A

Application Date: 2011-05-20

Publication Date: 2012-03-14

Assignee/Applicant: Siemens Aktiengesellschaft,80333 München,DE,101362070

Abstract (English):

Abstract - DWPI:

Abstract - DWPI Novelty:

The machine (1) has freely arranged machine housing (3) including a receiving chamber (4, 4') with access openings (5, 5') for a user for delivering and/or outputting energy storages (2). Cover elements (6, 6') close and/or release the access openings, and are locked by a locking system (7). An authentication system co-operates with the locking system for operating the locking system by an authenticated user. The authentication system includes a machine-side reading device (8) for an identification unit (9) carried by the user.

Abstract - DWPI Use:

Service machine for obtaining and/or loading energy storage for an electrical bicycle.

Abstract - DWPI Advantage:

The machine obtains and/or loads the energy storage for the electrical bicycle in a user friendly manner with high degree of automation for a determined cycle of authorized users and an increased comfort for the rider of the electrical bicycle.

Abstract - DWPI Drawing Description: The drawing shows a schematic view of a service machine.

1 Service machine

2 Energy storages

3 Freely arranged machine housing

4, 4' Receiving chamber

5, 5' Access openings

6, 6' Cover elements

7 Locking system

8 Machine-side reading device

9 Identification unit



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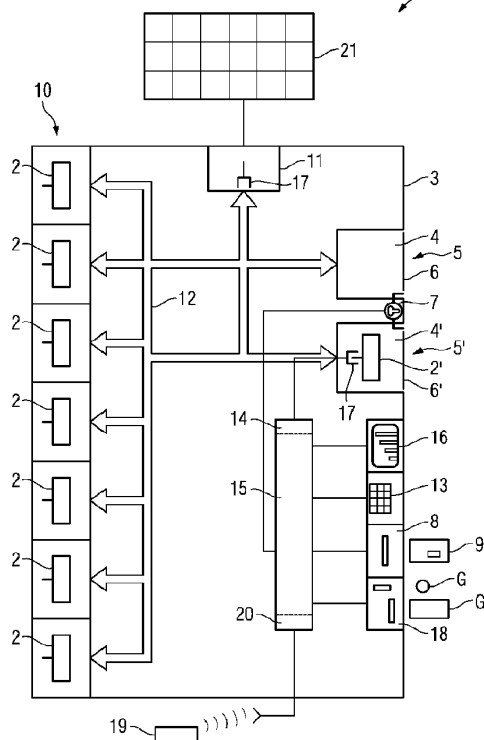
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(30) Priorität: 08.09.2010 DE 102010040388

(54) Serviceautomat zum Beziehen und/oder Aufladen eines Energiespeichers für ein Elektrofahrrad

(57) Die Erfindung betrifft einen Serviceautomaten (1) zum Beziehen und/oder Aufladen eines Energiespeichers (2, 2') für ein Elektrofahrrad. Der Serviceautomat (1) umfasst ein im Freien aufstellbares Automatengehäuse (3), welches wenigstens ein Aufnahmefach (4, 4') mit einer Zugriffsöffnung (5, 5') für einen Benutzer zur Abgabe bzw. Ausgabe des Energiespeichers (2', 2) aufweist. Ferner umfasst er ein Abdeckelement (6, 6') zum Verschließen bzw. Freigeben der Zugriffsöffnung (5, 5'), welches mittels eines Verriegelungssystems (7) verriegelbar ist. Außerdem umfasst er ein mit dem Verriegelungssystem (7) zusammenwirkendes Authentifizierungssystem zur Betätigung des Verriegelungssystems (7) durch einen authentifizierten Benutzer. Hierdurch ist ein Beziehen bzw. Aufladen eines Energiespeichers (2, 2') für ein Elektrofahrrad mit hohem Automatisierungsgrad für einen bestimmbaren Kreis berechtigter Benutzer möglich.

FIG 1



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Beschreibung

[0001] Die Erfindung bezieht sich auf einen Serviceautomaten zum Beziehen und/oder Aufladen eines Energiespeichers für ein Elektrofahrrad gemäß dem Oberbegriff des Patentanspruches 1.

[0002] Bei Elektrofahrrädern werden Elektromotoren als Anfahrhilfe, zur Unterstützung der Kurbelbewegung oder zur vollständigen Traktionsübernahme eingesetzt. Die Energieversorgung des Elektromotors wird durch einen austauschbar am Fahrrad angeordneten Speicher für elektrische Energie bewerkstelligt. Häufig werden Nickel-Metall-Hydrid-, Nickel-Cadmium- oder Lithium-Ionen-Akkumulatoren als Energiespeicher verwendet. Die speicherbare elektrische Energie beträgt beispielsweise bis zu 18 Ah bei 24 V oder 36 V Nennspannung. Lithium-Ionen-Akkumulatoren haben zwar einen Gewichtsvorteil, sind aber kostenaufwändiger in der Anschaffung. Allen Energiespeichern ist jedoch gemeinsam, dass sie eine begrenzte Speicherkapazität aufweisen, was die Reichweite von Elektrofahrrädern bei motorunterstützter Fahrt grundsätzlich beschränkt. Fahrer von Elektrofahrrädern müssen daher ein Ladegerät mitführen, um einen entladenen Energiespeicher unterwegs wieder aufladen zu können. Dieser Ladevorgang erfordert einen geeigneten Stromnetzanschluss mit passender Steckverbindung und bedarf einer größeren Wartezeit, bis der umständliche Ladevorgang abgeschlossen ist. Alternativ kann der Fahrer mit seinem Elektrofahrrad einen aufgeladenen Energiespeicher zur Reserve mitführen, den er bei Bedarf gegen den entladenen Energiespeicher unterwegs austauschen kann. Dabei führt er aber zusätzlichen Ballast mit, was beim Fahrradfahren im Allgemeinen unerwünscht ist.

[0003] In Gebieten mit erhöhtem Fahrradverkehr, etwa in Naherholungsgebieten, in Urlaubsregionen sowie an Fernradwegen, haben sich daher Servicestationen etabliert, an denen Fahrer von Elektrofahrrädern ihren entladenen Energiespeicher gegen einen aufgeladenen Energiespeicher austauschen können. Bei diesen Servicestationen handelt es sich in der Regel um Feriengasthöfe oder Hotels, die für Radtouristen Energiespeicher bereithalten, die an einem Ladegerät im Hause aufgeladen und auf Anfrage im Austausch gegen einen entladenen Energiespeicher ausgehändigt werden.

[0004] So ist aus der Offenlegungsschrift DE 10 2008 036 595 A1 beispielsweise ein nachhaltiges Verkehrssystem bekannt, das auf einer elektrisch betriebenen Flotte aus speziellen Fahrzeugen basiert, deren Batterien in kurzer Zeit in Akkutankstellen ausgetauscht werden können. Bei den Fahrzeugen handelt es sich um Elektrobusse, Elektrofahrzeuge, Stadtfahrzeuge aber auch um Elektrofahrräder. Außer beim Elektrofahrrad werden die Batterien durch automatisierte Wechseleinrichtungen seitlich entnommen bzw. zugeführt. Das Einlagern und Entnehmen der Batterieeinheiten oder auch ganzer Batteriemodule erfolgt über einen automatischen Zuführroboter. Es ist auch möglich jede Batterieeinheit ein-

zeln oder in Gruppen zu laden. Hierzu kann an jeder Wechseleinrichtung eine Testmessung an den Batterien vorgenommen werden, die deren aktuellen Lade- und Leistungszustand erfasst und eventuelle Defekte feststellt.

[0005] Über die technische Ausgestaltung der Batterie-Wechselstation für Elektrofahrräder sowie die Benutzungsmöglichkeiten bzw. -berechtigungen dieser bekannten Wechselstationen für Fahrer von Elektrofahrrädern ist nichts offenbart.

[0006] Der Erfindung liegt die Aufgabe zugrunde, einen Serviceautomaten der eingangs genannten Art derart weiterzubilden, dass ein Beziehen bzw. Aufladen eines Energiespeichers für ein Elektrofahrrad mit hohem Automatisierungsgrad für einen bestimmbaren Kreis berechtigter Benutzer möglich ist.

[0007] Die Aufgabe wird gelöst durch einen gattungsgemäßen Serviceautomaten mit den im kennzeichnenden Teil des Patentanspruches 1 angegebenen Merkmalen. Zunächst umfasst der Serviceautomat ein im Freien aufstellbares Automatengehäuse, das mittels geeigneter Oberflächenbehandlung und Dichtungssätze als wetterfeste und mittels dicker Stahlbleche sowie weniger Ansatzfugen für Aufbruchwerkzeuge als gegen Vandalismus armierte Außenhaut des Serviceautomaten ausgebildet sein kann. Das Automatengehäuse weist wenigstens ein Aufnahmefach mit einer Zugriffsöffnung, durch die ein Energiespeicher von einem Benutzer abgegeben beziehungsweise vom Automaten ausgegeben werden kann. Dabei kann der Serviceautomat genau ein Aufnahmefach, das sowohl als Abgabe- als auch als Ausgabefach dient, oder mehrere Aufnahmefächer aufweisen, wovon die einen als Abgabefach und die anderen als Ausgabefach dienen oder ebenfalls beide Funktionen haben. Der Serviceautomat umfasst ferner ein Abdeckelement zum Verschließen bzw. Freigeben einer Zugriffsöffnung, welches mittels eines Verriegelungssystems verriegelbar ist. Ist die Zugriffsöffnung durch das Abdeckelement verschlossen, kann ein Benutzer nicht in das Aufnahmefach greifen, um einen Energiespeicher abzugeben oder zu entnehmen. Hierzu muss die Zugriffsöffnung durch das Abdeckelement freigegeben sein, was je nach vorgesehenem Mechanismus beispielsweise durch Aufklappen oder Aufschieben des Abdeckelements erfolgen kann. Im verschlossenen Zustand ist das Abdeckelement beispielsweise durch mechanische oder elektromechanische Schließelemente verriegelbar, so dass nur ein Benutzer, der das Verriegelungssystem betätigen kann, das Abdeckelement entriegeln und damit den Zugriff ins Aufnahmefach freimachen kann. Außerdem umfasst der Serviceautomat ein mit dem Verriegelungssystem zusammenwirkendes Authentifizierungssystem, das die Betätigung des Verriegelungssystems durch einen authentifizierten Benutzer ermöglicht. Über das Authentifizierungssystem lässt sich ein Kreis berechtigter Benutzer definieren, der bei einem hohen Automatisierungsgrad des Serviceautomaten geladene Energiespeicher für Elektrofahrräder, gegebe-

nenfalls im Austausch gegen einen voll- oder teilentladenen Energiespeicher, beziehen und/oder einen voll- oder teilentladenen Energiespeicher aufladen kann. Außer zu Wartungszwecken ist hier kein Personal für den Betrieb des Serviceautomaten erforderlich, so dass diese auch an entlegenen Orten im Freien aufstellbar sind, um ein nach den Bedürfnissen von Elektrofahrradfahrern ausgerichtetes, dichtes Netz an Serviceautomaten bereitzustellen.

[0008] In einer vorteilhaften Ausgestaltung des erfindungsgemäßen Serviceautomaten weist das Authentifizierungssystem eine automatenseitige Leseinrichtung für vom Benutzer mitgeführte Identifizierungsmittel auf. Die Identifizierungsmittel können beispielsweise als Chipkarte ausgebildet sein, die in einen am Serviceautomaten angeordneten Kartenleser einführbar ist, um die auf der Chipkarte gespeicherte Benutzungsberechtigung auszulesen. Alternativ können die Identifizierungsmittel als Transponderkarte ausgebildet sein, die über eine geeignete Funkleseinrichtung durch Radiofrequenzsignale auslesbar ist. Des Weiteren können die Identifizierungsmittel durch ein Mobilfunkgerät gebildet werden, über das sich der Benutzer an einer automatenseitigen Kommunikationsschnittstelle durch Identifikation authentisiert. Schließlich kann am Serviceautomaten auch ein Eingabeeinheit, etwa eine Tastatur oder ein Touchscreen, über das ein Benutzer seine Berechtigung durch Eingabe einer persönlichen Identifikationsnummer nachweist. In jedem Fall kann nach Authentifizierung eines berechtigten Benutzers automatisch eine Betätigung des Verriegelungssystems erfolgen, so dass dieser Zugriff auf ein Aufnahmefach erhält.

[0009] In einer bevorzugten Ausführungsform umfasst der erfindungsgemäße Serviceautomat ein Magazin, in welchem aufgeladene Energiespeicher für den Austausch gegen abgegebene Energiespeicher oder für deren Bezug ohne Austausch bereitstellbar sind, und/oder eine Ladeeinrichtung zum Aufladen eines abgegebenen Energiespeichers mit elektrischer Energie. Je nach Ausgestaltung kann der Serviceautomat als reine Bezugs- oder Wechselstation, als reine Ladestation oder als Kombination aus beidem ausgebildet sein. Bei dem Magazin kann es sich um ein Vielzahl von Aufnahmefächern handeln oder um ein davon getrenntes Regalsystem oder Karussellsystem.

[0010] In einer bevorzugten Ausgestaltung umfasst der erfindungsgemäße Serviceautomat ein automatisches Transportsystem zur Zuführung eines in das Aufnahmefach abgegebenen Energiespeichers zum Magazin oder zur Ladeeinrichtung bzw. zur Zuführung eines aufgeladenen Energiespeichers vom Magazin oder von der Ladeeinrichtung zum Aufnahmefach. Wenn das Magazin und/oder die Ladeeinrichtung im Automatengehäuse getrennt von den Aufnahmefächern angeordnet sind, können hierdurch die Energiespeicher automatisch von und zu diesen beispielsweise durch ein Linearsystem mit motorisch bewegten Schlitten transportiert werden.

[0011] In einer vorteilhaften Ausführungsform umfasst der erfindungsgemäße Serviceautomat eine Eingabeeinrichtung zur wahlweisen Anforderung eines Austausches eines Bezuges oder einer Aufladung mit oder ohne Schnellladefunktion des abgegebenen Energiespeichers durch einen authentifizierten Benutzer. Nach Authentifizierung hat ein berechtigter Benutzer hierdurch die Möglichkeit, eine dem gewünschten Service entsprechende Eingabe vorzunehmen. Die Eingabeeinrichtung kann beispielsweise als Tastatur oder als Touchscreen ausgebildet sein. Nach erfolgter Eingabe können mögliche Bedienschritte über eine Anzeigeeinrichtung mitgeteilt werden.

[0012] In einer weiteren vorteilhaften Ausgestaltung umfasst der erfindungsgemäße Serviceautomat eine Diagnoseeinrichtung zur Überprüfung von Ladezustand und/oder Qualität und/oder Funktionstüchtigkeit des abgegebenen Energiespeichers und eine Anzeigeeinrichtung zur Darstellung eines Diagnoseergebnisses. Die Diagnoseeinrichtung kann Messeinrichtungen für elektrische Größen sowie eine Auswertungseinrichtung für Messergebnisse aufweisen. Nach Abgabe eines auszu-tauschenden oder aufzuladenden Energiespeichers erfolgt zunächst eine elektrische Kontaktierung des Energiespeichers mit der Diagnoseeinrichtung, worauf dieser auf Defekte untersucht wird und bei festgestellter Funktionstüchtigkeit der aktuelle Ladungszustand und die noch zur Verfügung stehenden Ladekapazität gemessen wird. Das Diagnoseergebnis wird dem Benutzer auf einer Anzeigeeinrichtung dargestellt; insbesondere kann die Annahme eines defekten Energiespeichers durch den Serviceautomaten verweigert werden.

[0013] Vorzugsweise ist im Automatengehäuse eines erfindungsgemäßen Serviceautomaten wenigstens ein Steckanschluss für eine elektrische Kontaktierung eines abgegebenen Energiespeichers mit der Ladeeinrichtung und/oder der Diagnoseeinrichtung angeordnet. Der Steckanschluss entspricht demjenigen, mittels dessen der Energiespeicher am Elektrofahrrad angeschlossen wird. Ein derartiger Steckanschluss kann in einem oder jedem Aufnahmefach installiert sein, damit der Benutzer einen Energiespeicher in eine definierte Position verbringen oder von dieser entnehmen kann. In der Kontaktposition kann eine elektrische Verbindung zur Diagnoseeinrichtung oder zum Ladegerät hergestellt werden. Steckanschlüsse können auch in den Positionen des Magazins installiert sein, von wo aus angeschlossene Energiespeicher diagnostiziert oder aufgeladen werden können. Des Weiteren können Steckanschlüsse direkt an der Diagnoseeinrichtung und am Ladegerät im Automatengehäuse angeordnet sein, um eine Kontaktherstellung mit dem Energiespeicher zu ermöglichen. Außerdem können Steckanschlüsse für die Kontaktierung unterschiedlicher Typen von Energiespeichern vorgesehen sein.

[0014] In einer weiteren bevorzugten Ausführungsform umfasst der erfindungsgemäße Serviceautomat ein Bezahlssystem zur Entrichtung der für einen durch einen Benutzer in Anspruch genommenen Service fälligen Ge-

büher. In dem Bezahlssystem können unterschiedliche Gebühren für den Bezug eines aufgeladenen Energiespeichers, für den Austausch eines entladenen gegen einen aufgeladenen Energiespeicher und für das Aufladen eines entladenen Energiespeichers hinterlegt sein. Eine Messvorrichtung ermittelt die bezogene Energieladung sowie den in Anspruch genommenen Service einer Normal- oder Schnellladung, auf dessen Grundlage von dem Bezahlssystem die fällige Gebühr ermittelt wird. Das Bezahlssystem ist mit dem Verriegelungssystem derart gekoppelt, dass dieses automatisch, aber erst dann betätigt wird, wenn die fällige Gebühr entrichtet wurde. Daraufhin kann der Benutzer das Abdeckelement desjenigen Aufnahme-fachs öffnen, in welchem der geladene Energiespeicher zur Ausgabe vorgesehen ist. Das Bezahlssystem kann zur Bezahlung mittels Bargeld und/oder mittels Geld- oder Kreditkarte und/oder mittels Mobilfunkverbindung ausgebildet sein.

[0015] In einer weiteren bevorzugten Ausgestaltung umfasst der erfindungsgemäße Serviceautomat ein Reservierungssystem zur Reservierung eines geladenen Energiespeichers durch einen authentifizierten Benutzer. Das Reservierungssystem kann durch eine Internet- oder eine Mobilfunkverbindung seitens des Benutzers bedient werden, indem dieser sich über einen Internetanschluss oder ein Mobilfunkgerät direkt am Serviceautomaten oder über den Server des Serviceautomatenbetreibers durch eine Identifikationsnummer authentifiziert. Daraufhin kann der Benutzer den oder die Serviceautomaten auswählen, in denen ein Energiespeicher eines auswählbaren Typs innerhalb eines auswählbaren Zeitraums für den exklusiven Bezug durch diesen Benutzer bereitgestellt ist. Das Reservierungssystem bestätigt dem Benutzer nach Eingabe seines Reservierungswunsches, ob diesem nachgekommen werden kann.

[0016] In einer weiteren vorteilhaften Ausführungsform umfasst der erfindungsgemäße Serviceautomat ein Solarpaneel zur Bereitstellung von elektrischer Energie für die Ladeeinrichtung und/oder den Betrieb des Automaten. Mittels des Solarpaneels, welches auf oder auch neben dem Automatengehäuse angeordnet werden kann, ist eine autarke Energieversorgung des Serviceautomaten möglich, so dass dieser auch an Standorten ohne Stromnetzanschluss aufstellbar ist. Hierdurch kann die Dichte des Netzes an Serviceautomaten und damit die Benutzerfreundlichkeit erhöht werden.

[0017] Weitere Vorteile und Eigenschaften der Erfindung ergeben sich aus einem nachfolgend anhand von Zeichnungen beschriebenen Ausführungsbeispiel, in denen

- FIG 1 ein erfindungsgemäßer Serviceautomat in einer Prinzipdarstellung,
- FIG 2 eine Frontansicht einer ersten Variante eines erfindungsgemäßen Serviceautomaten und
- FIG 3 eine perspektivische Darstellung einer zweiten Variante eines erfindungsgemäßen Serviceautomaten

schematisch veranschaulicht sind.

[0018] An einem Serviceautomat 1 gemäß FIG 1 bis FIG 3 kann ein Benutzer, der bestimmungsgemäß Fahrer eines Elektrofahrrades ist, entweder einen aufgeladenen Energiespeichers 2 neu oder im Austausch gegen einen voll- oder teilentladenen Energiespeicher 2' beziehen oder aber letzteren wieder aufladen.

[0019] Erfindungsgemäß umfasst der Serviceautomat 1 hierfür ein Automatengehäuse 3, das im Freien aufstellbar ist und daher witterungsbeständig und vandalismussicher ausgebildet ist. Das Automatengehäuse 3 weist in den Ausführungsbeispielen gemäß FIG 1 und FIG 2 je ein Aufnahme-fach 4 bzw. 4' für einen Energiespeicher 2 bzw. 2' auf, wobei das eine Aufnahme-fach 4' für die Abgabe eines entladenen Energiespeichers 2' und das andere Aufnahme-fach 4 für die Ausgabe eines aufgeladenen Energiespeichers 2 vorgesehen ist. Zur Abgabe bzw. Ausgabe eines Energiespeichers 2' bzw. 2 muss der Benutzer durch eine Zugriffsöffnung 5' bzw. 5 greifen, was nur möglich ist, wenn diese von einem Abdeckelement 6' bzw. 6 freigegeben wird. Das Abdeckelement 6' bzw. 6 verschließt im Normalzustand die Zugriffsöffnung 5' bzw. 5, um unberechtigten Benutzern den Zugriff zu verwehren. Ein berechtigter Benutzer kann das Abdeckelement 6' bzw. 6 nach Betätigung eines Verriegelungssystems 7 aufschieben oder gemäß FIG 3 aufklappen, um einen entladenen Energiespeicher 2' abzugeben oder einen zur Ausgabe vorgesehenen geladenen Energiespeicher 2 zu entnehmen. Das Verriegelungssystem 7 weist nicht dargestellte mechanische oder elektromechanische Schließeinrichtungen auf, die ein Abdeckelement 2' bzw. 2 im die Zugriffsöffnung 5' bzw. 5 verschließenden Zustand verriegeln.

[0020] Erfindungsgemäß umfasst der Serviceautomat 1 ein Authentifizierungssystem, welches mit dem Verriegelungssystem 7 derart zusammenwirkt, dass ein authentifizierter Benutzer das Verriegelungssystem 7 durch seine Authentifizierung automatisch oder danach durch einen weiteren Bedienschritt betätigt. Hierzu weist das Authentifizierungssystem eine automaten-seitige Leseeinrichtung 8 für vom Benutzer mitgeführte Identifizierungsmittel 9 auf. Bei der Leseeinrichtung 8 kann es sich um einen Kartenleser für eine Chipkarte handeln, welche einem Benutzer als Identifizierungsmittel 9 dient. Nach Einführen der Chipkarte in den Kartenleser werden hinterlegte Identifikationsdaten - gegebenenfalls in Kombination mit der Eingabe einer persönlichen Identifikationsnummer über eine Eingabeeinrichtung - ausgelesen, um den Benutzer zu authentisieren. Hierdurch ist es möglich die Automatenbenutzung nur einem eingeschränkten Kreis an Benutzern vorzubehalten, welches Recht der Fahrer beim Kauf eines Elektrofahrrades oder auch gesondert erwerben kann.

[0021] Im Inneren des Automatengehäuses 3 ist ein Magazin 10 angeordnet, welches als Regalssystem ausgebildet sein kann. An der Rückwand des Automatengehäuses 3 sind in definierten Regalpositionen geladenen Energiespeicher 2 bereitgestellt, die mittels eines Trans-

portsystems 12 automatisch entnommen werden. Das Transportsystem 12 ist als Linearsystem mit Transportschlitten ausgebildet und bewerkstelligt die automatische Zuführung von Energiespeichern 2' bzw. 2 im Serviceautomaten 1. Ein abgegebener Energiespeicher 2' wird vom Abgabefach 4' entweder zu einer freien Regalposition im Magazin 10 geführt oder direkt zu einem im Automatengehäuse 3 angeordneten Ladeeinrichtung 11. Umgekehrt wird ein aufgeladene Energiespeicher 2 entweder vom Magazin 10 oder vom Ladegerät 11 zum Ausgabefach 4 transportiert. Die Ladeeinrichtung 11 wird durch ein auf dem Automatengehäuse 3 angeordnetes Solarpaneel 21 mit elektrischer Energie versorgt; sollte aufgrund des Aufstellungsortes kein Stromnetzanschluss verfügbar sein, so kann der komplette Serviceautomat 1 auf dieser Weise mit Energie versorgt werden. Damit können erfindungsgemäße Serviceautomaten 1 auch an entlegenen Standorten aufgestellt werden.

[0022] Damit der Benutzer wählen kann, ob er einen aufgeladenen Energiespeicher 2 mit oder ohne Austausch gegen einen entladenen Energiespeicher 2' bezieht oder ob er einen entladenen Energiespeicher 2' mit oder ohne Schnelladefunktion auflädt, ist am Automatengehäuse 3 eine Eingabeeinrichtung 13 in Form einer Tastatur angeordnet. Zur Bezahlung des gewählten Service ist ein Bezahlungssystem 18 vorgesehen, das sowohl Bezahlung mittels Bargeld G über einen Münzeinwurf und einen Banknoteneinzug als auch über eine Kredit- oder Geldkarte ermöglicht. Des Weiteren ist ein Reservierungssystem vorgesehen, durch das ein authentifizierter Benutzer an einem wählbaren Serviceautomaten 1 einen geladenen Energiespeicher 2 für eine wählbare Zeitspanne reservieren kann. Hierzu bedient der Benutzer eine Anforderungseinheit 19, etwa ein Mobiltelefon, um die gewünschte Reservierung über eine entsprechende Kommunikationsstelle 20 an eine zentrale Recheneinheit 15 des Serviceautomaten 1 zu übertragen. Dies erhöht die Benutzerfreundlichkeit erheblich, da eine Routenplanung mit einem Elektrofahrrad hierdurch unterstützt werden kann.

[0023] Um den aktuellen Ladezustand oder auch die zur Verfügung stehende Ladekapazität eines abgegebenen Energiespeichers 2' zu ermitteln, ist im Automatengehäuse 3 eine Diagnoseeinrichtung 14 angeordnet. Über Messeinrichtungen und Auswertungseinrichtungen, die Teil der Recheneinrichtung 15 ist, kann damit nicht nur die beim Aufladen bezogene, gebührenpflichtige Energiemenge und die Qualität des Energiespeichers 2' festgestellt werden, sondern auch dessen Funktionstüchtigkeit. So ist es insbesondere möglich, die Annahme defekter Energiespeicher 2' zu verweigern. Um einem Benutzer das Diagnoseergebnis einschließlich der Annahmeverweigerung eines defekten Energiespeichers 2' mitzuteilen, umfasst die Diagnoseeinrichtung 14 eine Anzeigeeinrichtung 16, die als LCD-Anzeige ausgebildet sein kann. Zur Kontaktierung der Energiespeicher 2' bzw. 2 umfasst der Serviceautomat 1 Steckanschlüsse 17, die dem am zugehörigen Elektrofahrrad ent-

sprechen. Damit ist eine definierte Kontaktposition beispielsweise in den Aufnahmefächern 4' bzw. 4, im Magazin 10, an der Ladeeinrichtung 17 und an der Diagnoseeinrichtung 14 gegeben.

[0024] Während die Ausführungsform gemäß FIG 2 als Hochschrank eine Nebeneinanderanordnung als Erweiterungsmöglichkeit beinhaltet, so ist zur Kapazitätserweiterung der Ausführungsform nach FIG 3 eine Über-einanderanordnung von Automatengehäusen 3 vorgesehen. Der modulare Aufbau gestattet jedenfalls eine einfache Erweiterung erfindungsgemäßer Serviceautomaten 1, falls der Bedarf an Energiespeichern 2 an einem Standort größer wird.

Patentansprüche

1. Serviceautomat (1) zum Beziehen und/oder Aufladen eines Energiespeichers (2, 2') für ein Elektrofahrrad,
gekennzeichnet durch ein im Freien aufstellbares Automatengehäuse (3), welches wenigstens ein Aufnahmefach (4, 4') mit einer Zugriffsöffnung (5, 5') für einen Benutzer zur Abgabe bzw. Ausgabe des Energiespeichers (2', 2) aufweist, **durch** ein Abdeckelement (6, 6') zum Verschließen bzw. Freigeben der Zugriffsöffnung (5, 5'), welches mittels eines Verriegelungssystems (7) verriegelbar ist, und **durch** ein mit dem Verriegelungssystem (7) zusammenwirkendes Authentifizierungssystem zur Betätigung des Verriegelungssystems (7) **durch** einen authentifizierten Benutzer.
2. Serviceautomat (1) nach Anspruch 1, wobei das Authentifizierungssystem eine automaten-seitige Leseeinrichtung (8) für vom Benutzer mitgeführte Identifizierungsmittel (9) aufweist.
3. Serviceautomat (1) nach Anspruch 1 oder 2, mit einem Magazin (10), in welchem aufgeladene Energiespeicher (2) für den Austausch gegen abgegebene Energiespeicher (2') oder den Bezug ohne Austausch bereitstellbar sind, und/oder mit einer Ladeeinrichtung (11) zum Aufladen eines abgegebenen Energiespeichers (2') mit elektrischer Energie.
4. Serviceautomat (1) nach einem der Ansprüche 1 bis 3, mit einem automatischen Transportsystem (12) zur Zuführung eines in das Aufnahmefach (4') abgegebenen Energiespeichers (2') zum Magazin (10) oder zur Ladeeinrichtung (11) bzw. eines aufgeladenen Energiespeichers (2) vom Magazin (10) oder von der Ladeeinrichtung (11) zum Aufnahmefach (4).
5. Serviceautomat (1) nach einem der Ansprüche 1 bis 4, mit einer Eingabeeinrichtung (13) zur wahlweisen

Anforderung eines Austausches eines Bezuges oder einer Aufladung mit oder ohne Schnellladefunktion des abgegebenen Energiespeichers (2') durch einen authentifizierten Benutzer.

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6. Serviceautomat (1) nach einem der Ansprüche 1 bis 5, mit einer Diagnoseeinrichtung (14) zur Überprüfung von Ladezustand und/oder Qualität und/oder Funktionstüchtigkeit des abgegebenen Energiespeichers (2') und einer Anzeigeeinrichtung (16) zur Darstellung eines Diagnoseergebnisses.

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7. Serviceautomat (1) nach einem der Ansprüche 3 bis 6, wobei im Automatengehäuse (3) wenigstens ein Steckanschluss (17) für eine elektrische Kontaktierung eines abgegebenen Energiespeichers (2') mit der Ladeeinrichtung (11) und/oder der Diagnoseeinrichtung (14) angeordnet ist.

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8. Serviceautomat (1) nach einem der Ansprüche 1 bis 7, mit einem Bezahlssystem (18) zur Entrichtung der für einen durch einen Benutzer in Anspruch genommenen Service fälligen Gebühr.

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9. Serviceautomat (1) nach einem der Ansprüche 1 bis 8, mit einem Reservierungssystem (19, 20) zur Reservierung eines geladenen Energiespeichers (2) durch einen authentifizierten Benutzer.

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10. Serviceautomat (1) nach einem der Ansprüche 1 bis 9, mit einem Solarpaneel (21) zur Bereitstellung von elektrischer Energie für die Ladeeinrichtung (11) und/oder den Betrieb des Serviceautomaten (1).

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FIG 1

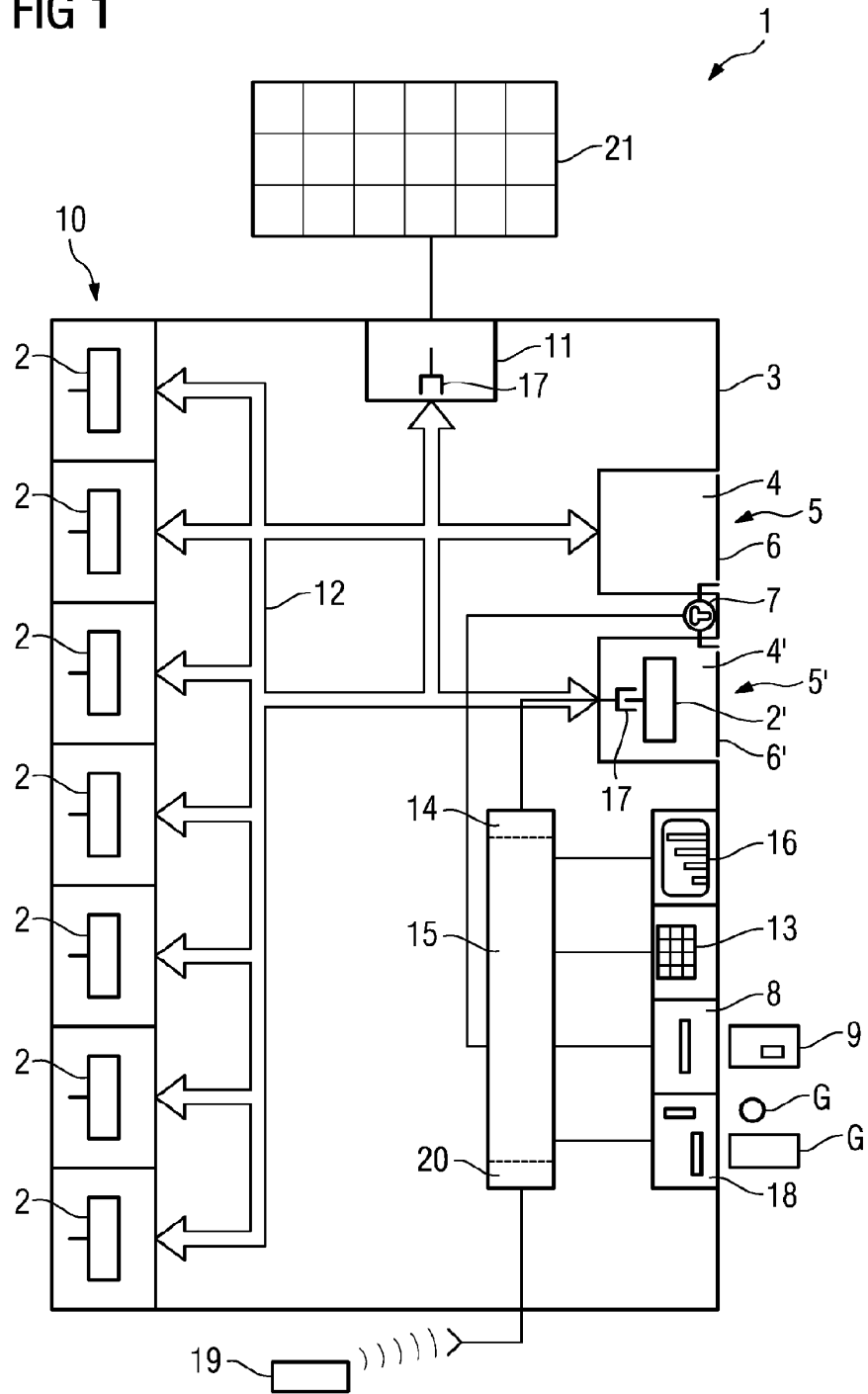


FIG 2

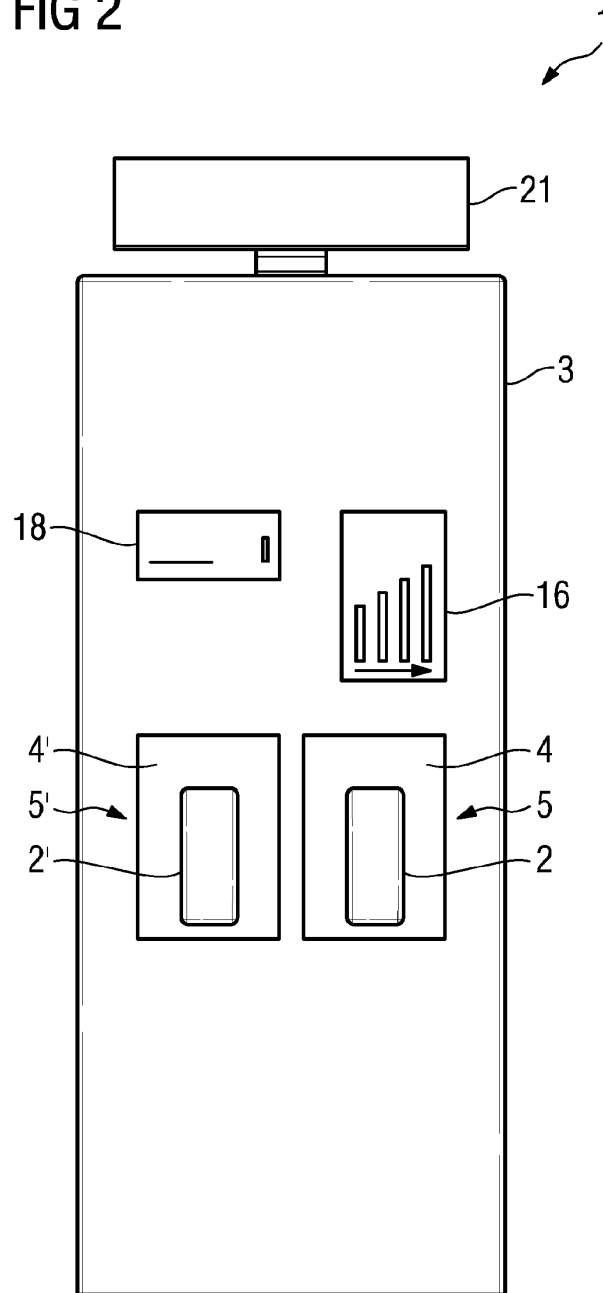
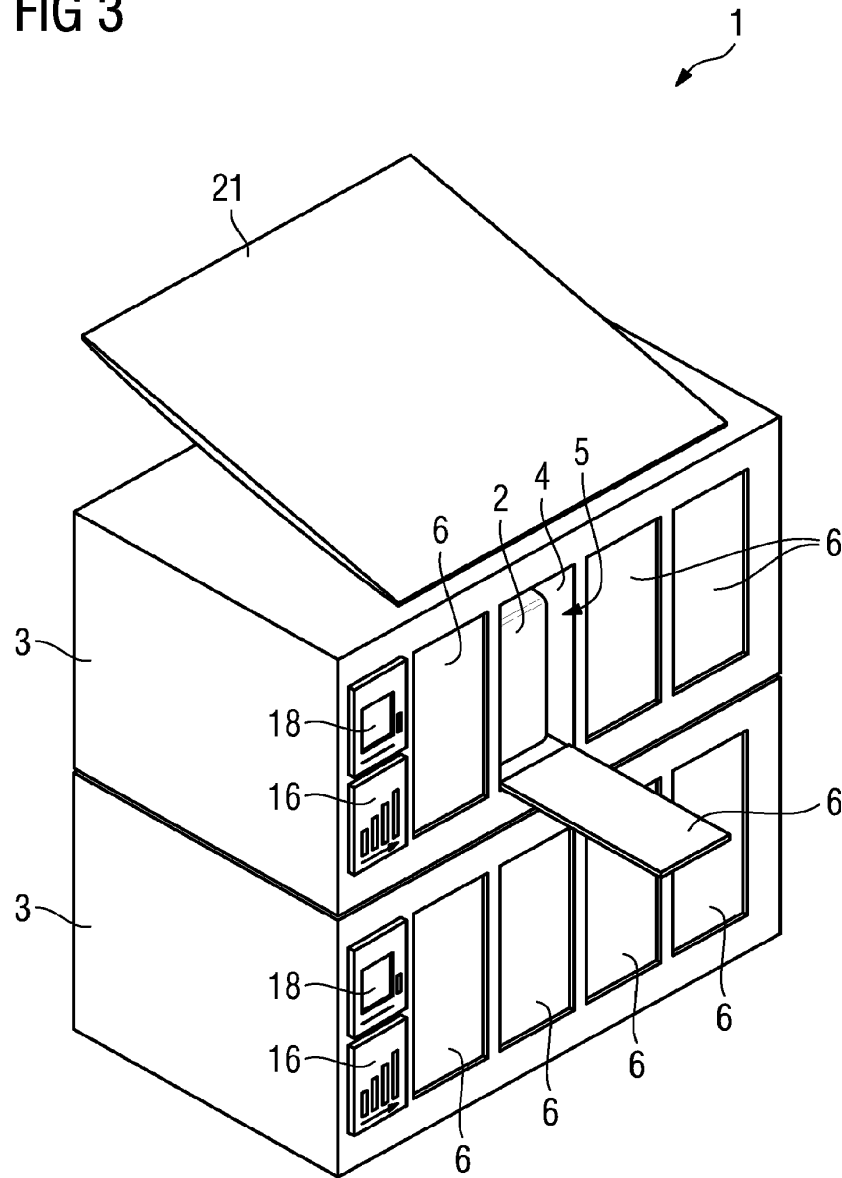


FIG 3





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Den Haag		7. November 2011	
		Prüfer	
		Breugelmans, Jan	
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07-11-2011

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Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82

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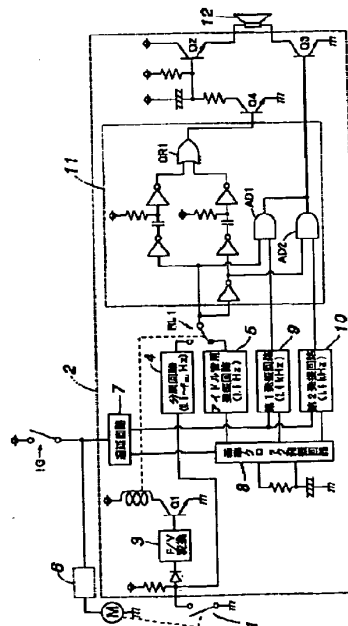
(54) 【考案の名称】 疑似エンジン音発生装置

(57) 【要約】

【目的】 電気自動車の種々の運転状態に応じた好適な疑似エンジン音を発生する。

【構成】 駆動用モータを回転可能にするためのイグニッションスイッチ I G の信号と、車速センサ 1 からの車速パルス信号とを制御回路 2 に入力し、イグニッションスイッチ I G のオン状態で、車両の停止状態（車速パルスの入力が無し）の時には 0.5 Hz の電子チャイム音をスピーカ 10 から発生し、走行状態（車速パルスの入力があり）の時には車速パルスの周波数に応じて 0.5 ~ F_{max} Hz（任意の最大周波数）の電子チャイム音をスピーカ 10 から発生する。

【効果】 アイドリング状態や走行時のエンジン回転数の大きさに応じた疑似エンジン音にて車両の状態を、運転者や歩行者に好適に知らせることができる。



【実用新案登録請求の範囲】

【請求項 1】 電気自動車の駆動用モータを回転可能にするための準備スイッチと、車速を検出するための車速検出手段と、発音体と、前記発音体から疑似エンジン音を発生させるための発音体駆動制御手段とを有する疑似エンジン音発生装置であって、

前記発音体駆動制御手段が、前記準備スイッチにより前記モータの回転可能状態を検出した場合に於いて、前記車速検出手段により前記電気自動車の停止状態を検出した場合には前記発音体から比較的小さい音圧または低い周波数の音を発生させ、前記車速検出手段により前記電気自動車の走行状態を検出した場合には車速の上昇に伴って前記音圧を増大しまたは前記周波数を高めるように制御することを特徴とする疑似エンジン音発生装置。

【図面の簡単な説明】

【図 1】 本発明が適用された電気自動車の疑似エンジン

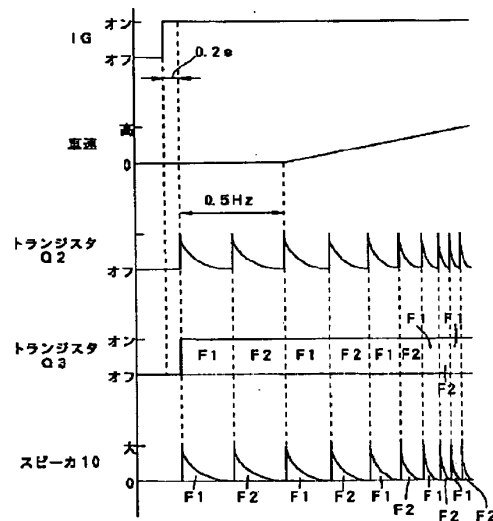
音発生回路全体を示す図。

【図 2】 疑似エンジン音の発生要領を示すタイムチャート。

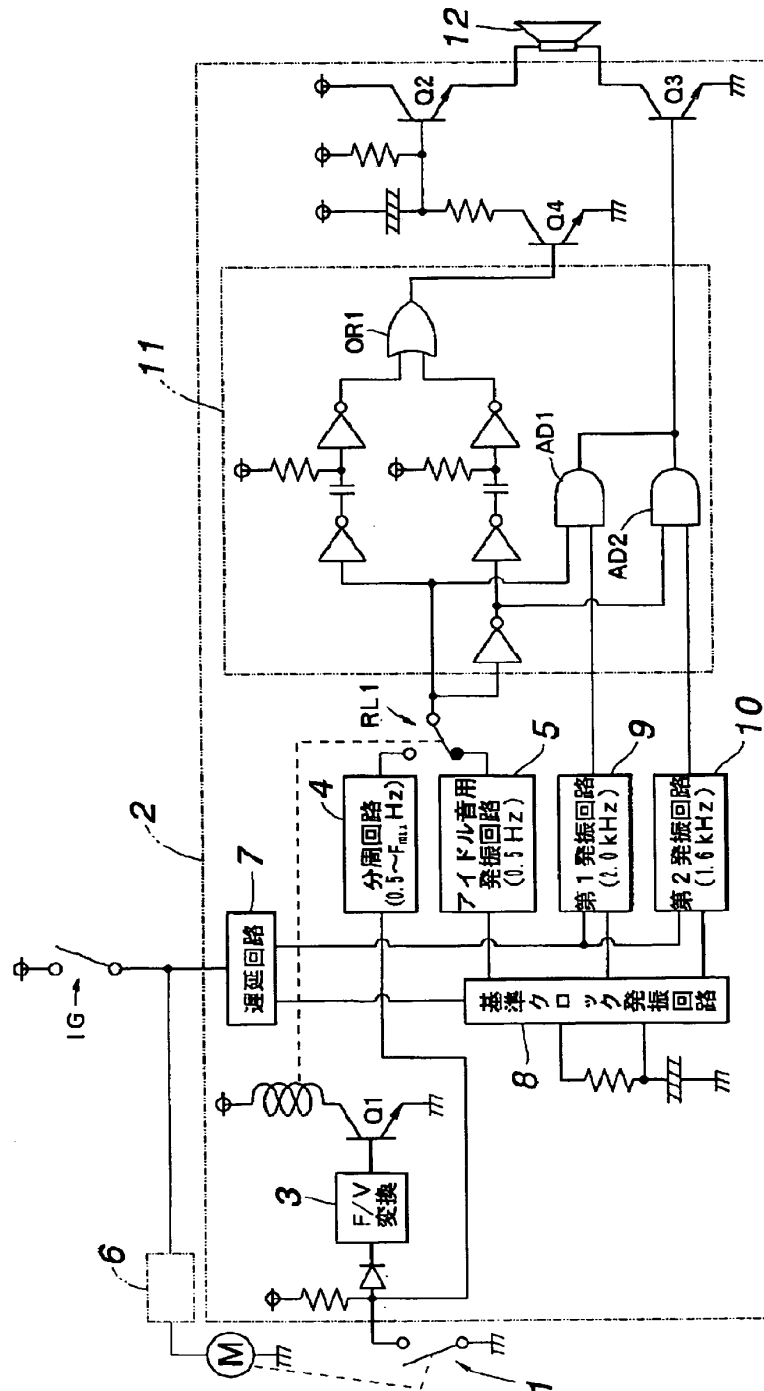
【符号の説明】

- 1 車速センサ
- 2 制御回路
- 3 F/V変換器
- 4 分周回路
- 5 アイドル音用発振回路
- 6 モータ制御回路
- 7 遅延回路
- 8 基準クロック発振回路
- 9 第1発振回路
- 10 第2発振回路
- 11 チャイム音生成回路
- 12 スピーカ

【図 2】



【図1】



【考案の詳細な説明】

【0001】

【産業上の利用分野】

本考案は、電気自動車に於ける疑似エンジン音を発生するための疑似エンジン音発生装置に関する。

【0002】

【従来の技術】

動力に電動モータを用いた電気自動車にあっては、内燃機関を用いた自動車に比べて振動が少なく、エンジン音も静かであるという利点がある。また、このような電気自動車にあっては、内燃機関を用いた自動車に於けるスロットル操作と同様のスロットル操作を行って、運転者の意志に基づいた運転を行うようにしたものがある。

【0003】

上記したように電気自動車にあってはモータ（エンジン）音が静かであることから、走行可能な状態（イグニッションスイッチのオン状態）であるのか、走行時のモータの回転がどのような状態になっているのか等、従来の内燃機関の自動車に於けるエンジン音による判断ができないという問題があった。また、歩行者などに対して注意を促す必要があり、従来の電気自動車に於いて走行中であることを知らせるための音を発するようにしたものがあった。

【0004】

上記の音を発するようにしたものとしては、イグニッションのオン状態と同様の状態で、ある程度の音圧（周波数）レベルの音を発生させ、走行可能な状態であることを認識させるようにしたものがある。しかしながら、従来の電気自動車では、停止時や走行時でも一定の音圧（周波数）の音を発生させるものであり、停止や車速の高低状態を含めた走行状態に対して不自然であるという問題があった。

【0005】

【考案が解決しようとする課題】

このような従来技術の問題点に鑑み、本考案の主な目的は、電気自動車の種々

の運転状態に応じた好適な疑似エンジン音を発生し得る疑似エンジン音発生装置を提供することにある。

【0006】

【課題を解決するための手段】

このような目的は、本考案によれば、電気自動車の駆動用モータを回転可能にするための準備スイッチと、車速を検出するための車速検出手段と、発音体と、前記発音体から疑似エンジン音を発生させるための発音体駆動制御手段とを有する疑似エンジン音発生装置であって、前記発音体駆動制御手段が、前記準備スイッチにより前記モータの回転可能状態を検出した場合に於いて、前記車速検出手段により前記電気自動車の停止状態を検出した場合には前記発音体から比較的小さい音圧または低い周波数の音を発生させ、前記車速検出手段により前記電気自動車の走行状態を検出した場合には車速の上昇に伴って前記音圧を増大しまたは前記周波数を高めるように制御することを特徴とする疑似エンジン音発生装置を提供することにより達成される。

【0007】

【作用】

このようにすれば、従来の内燃機関エンジン車のアイドリング状態に相当する状態を、モータの回転可能な状態であってかつ車両の停止状態であるという検出により判別でき、そのアイドリング状態では比較的小さい音圧または低い周波数の疑似音を発生し、車速に応じて音圧または周波数を変化させた音を発生することにより、従来の自動車のエンジン音と同様に、運転状態に応じて変化する音を発生することができる。

【0008】

【実施例】

以下、本考案の好適実施例を添付の図面を参照して詳しく説明する。

【0009】

図1は、本考案が適用された電気自動車（例えば電動2輪車）の疑似エンジン音を発生するための回路全体を示す図である。図1に於いて、例えば駆動用モータMの回転数に応じて周波数が増加するパルスを発することにより車速を検出し

得る車速センサ 1 から発せられる車速パルス信号が、発音体駆動制御手段としての制御回路 2 内で分岐され、一方が F/V 変換器 3 に入力し、他方が分周回路 4 に入力するようになっている。この F/V 変換器 3 は、本実施例では車速パルス信号の発生を検出したらトランジスタオン信号を出力し、そのトランジスタオン信号によりリレー駆動用トランジスタ Q 1 をオンするようになっている。

【0010】

上記分周回路 4 は、車速パルス信号が発生したら例えば 0.5 Hz の信号を出力し、車速パルス信号の増減に応じて 0.5 Hz ~ $F_{\max}$ (任意の最大周波数) の周波数を増減させることができるものである。分周回路 4 の上記出力信号は、前記リレー駆動用トランジスタ Q 1 により駆動されるリレー RL 1 の 2 位置選択式接点の常時開側に出力されるようになっている。そのリレー RL 1 の 2 位置選択式接点の常時閉側には、分周回路 4 と並列に設けられたアイドル音用発振回路 5 からの例えば 0.5 Hz の発振信号が出力されるようになっている。

【0011】

上記モータ M をモータ制御回路 6 を介して制御可能にする準備スイッチとしてのイグニッションスイッチ IG からのオン/オフ信号が、本制御回路 2 内の遅延回路 7 に入力し、その遅延回路 7 の出力信号が、基準クロック発振回路 8 と第 1 及び第 2 発振回路 9・10 に入力するようになっている。基準クロック発振回路 8 の出力信号はアイドル音用発振回路 5 と第 1 及び第 2 発振回路 9・10 に入力するようになっている。第 1 発振回路 9 は例えば 2.0 kHz (F 1) の信号を出力し、第 2 発振回路 10 は例えば 1.6 kHz (F 2) の信号を出力するものである。そして、分周回路 4 とアイドル音用発振回路 5 とからリレー RY 1 の切換接点を介して出力される信号と、前記第 1 及び第 2 発振回路 9・10 から出力される各信号とが、チャイム音生成回路 11 に入力するようになっている。

【0012】

また、発音体としてのスピーカ 12 は、電源側のトランジスタ Q 2 と接地側のトランジスタ Q 3 とが共にオン状態になったら発音するように接続されている。上記トランジスタ Q 2 は、前記チャイム音生成回路 11 の出力段のオア回路 OR 1 の出力信号によりオン状態になるトランジスタ Q 4 がオンした時にオンし、ト

ランジスタQ3は、チャイム音生成回路11の出力段の互いに並列な両アンド回路AD1・AD2の出力信号によりオンするようになっている。

【0013】

上記オア回路OR1の入力段には、前記分周回路4またはアイドル音用発振回路5の出力信号の立ち上がり・立ち下りのタイミング毎に、立ち上がりその後漸減する波形の信号を形成するCR時定数回路が設けられている。従って、トランジスタQ2の出力は、図2に示されるように連続的に、立ち上がった後漸減する波形となる。

【0014】

また、分周回路4またはアイドル音用発振回路5の出力信号は、上記両アンド回路AD1・AD2にも入力しており、上記立ち上がり・立ち下りのタイミングで2.0kHzの信号と1.6kHzの信号とがトランジスタQ3に出力されることになる。従って、トランジスタQ3の出力には、図2に示されるように2.0kHzの信号と1.6kHzの信号とが交互に生じる。

【0015】

このようにして構成された疑似エンジン音発生回路の信号発音要領を以下に示す。まず、内燃機関エンジン車のエンジンスターと同様にイグニッションスイッチIGをオンにすると、遅延回路7を介することにより0.2s後に、アイドル音用発振回路5からの0.5Hz信号が出力されると共に、第1及び第2発振回路9・10からそれぞれの周波数F1・F2の信号が出力される。なお、発進前の停止状態（内燃機関エンジン車のアイドリング状態に相当する）では、車速センサ1から車速パルス信号が発生されていないことからリレーRL1が非励磁状態であるため、アイドル音用発振回路5からの0.5Hz信号がチャイム音生成回路11に入力する。従って、この0.5Hz信号のタイミングにて、疑似エンジン音として2.0kHzの信号と1.6kHzの信号とが切替わる（図2参照）電子チャイム音がスピーカ12から発音されるため、運転者及び歩行者などは、車両がアイドル状態であることを認識することができる。

【0016】

次に、スロットルを操作して車両を発進させて車速パルスが生じると、ラン

ジスタQ 1がオンし、リレーL R 1が切替わるため、分周回路4の信号がチャイム音生成回路1 1に入力するようになる。そして、車速の上昇に伴って、分周回路4の信号の周波数が高まり、図2に示されるようにトランジスタQ 2・Q 3の周期が0. 5Hzより短くなっていくため、2. 0kHz (F 1)の信号と1. 6kHz (F 2)の信号との切替わりが車速に応じて早まる。従って、車速に応じて変化する周期にて2. 0kHzの信号と1. 6kHzの信号とが切替わるチャイム音が発生するため、運転者は、車速に応じて変化するチャイム音を認識しつつ運転することができる。また、歩行者なども、近づいてくる車両の速度を音によりある程度判別可能である。

【0017】

なお、本実施例ではチャイム音を、その周波数を変化させるようにしたが、周波数変化に限るものではなく、例えば音圧を変化させるようにしても良い。

【0018】

また、本考案に係る疑似エンジン音発生装置としては、本実施例に限定されず、例えば、イグニッションスイッチI Gのオン状態で比較的小さい音を発するスピーカやホーンなどの発音体をイグニッションスイッチI Gに接続すると共に、車速に連動して周期の変化する音を発生させるべく、モータまたは車軸に回転体を連結して回転体の回転に伴って発音体をたたく機構にしても良い。また、マイクロコンピュータなどを用いて、車速入力信号に応じて発音体の発する音の周期や音圧を変化させるようにプログラムを作成して、制御するようにしても良い。

【0019】

【考案の効果】

このように本考案によれば、電気自動車に於いて、内燃機関エンジン車のアイドリング時に相当する疑似音や、車速の高低に応じて変化する疑似音を発生させることにより、内燃機関エンジン車のエンジン音に相当する音の変化を得ることができ、内燃機関エンジン車から電気自動車に乗り換えても、何等不都合を生じることなく運転を行うことができると共に、歩行者などに対しても車両の状態を的確に知らせることができる。

CLAIMS

[Claims]

[Claim 1] A preparation switch for making a motor for driving of an electric vehicle pivotable.

A speed detecting means for detecting the vehicle speed.

A sounding body.

A sounding body drive control means for generating a false engine sound from the aforementioned sounding body.

In a false engine sound generator provided with the above,

In a case where the aforementioned sounding body drive control means detects a pivotable state of the aforementioned motor with the aforementioned preparation switch, When the aforementioned speed detecting means detects a halt condition of the aforementioned electric vehicle, a sound of comparatively small sound pressure or low frequency is generated from the aforementioned sounding body, A false engine sound generator controlling to increase the aforementioned sound pressure with a rise of the vehicle speed, or to raise the aforementioned frequency when the aforementioned speed detecting means detects a run state of the aforementioned electric vehicle.

DETAILED DESCRIPTION

[Detailed explanation of the device]

[0001]

[Industrial Application]

This design is related with the false engine sound generator for generating the false engine sound in an electric vehicle.

[0002]

[Description of the Prior Art]

If it is in the electric vehicle which used the electric motor for power, there is an advantage that there is little vibration compared with the automobile using an internal-combustion engine, and an engine sound is also quiet. If it is in such an electric vehicle, there are some which perform the throttle operations in the automobile using an internal-combustion engine and the same throttle operations, and were made to perform operation based on the driver's volition.

[0003]

From a motor (engine) sound being quiet, if it is in an electric vehicle as described above, There was a problem that judgment by the engine sound in the automobile of that rotation of the motor at the time of a run is in what kind of state about whether it is in the state (ON state of an ignition switch) which can run, etc. and the conventional internal-combustion engines could not be performed. Cautions needed to be demanded from the pedestrian etc. and there were some which

emitted the sound for telling that it is under run in the conventional electric vehicle.

[0004]

As what emitted the above-mentioned sound, it is in the ON state of ignition, and the same state, and the sound of a certain amount of sound pressure (frequency) level is generated, and there is a thing it was made to make it recognize that it is in the state which can run. However, in the conventional electric vehicle, the sound of fixed sound pressure (frequency) is generated also in the time of a stop and a run, and there was a problem of being unnatural, to a run state including the height state of a stop or the vehicle speed.

[0005]

[Problem(s) to be Solved by the Device]

In view of the problem of such a prior art, the main purposes of this design are to provide the false engine sound generator which may generate the preferable false engine sound according to various operational status of the electric vehicle.

[0006]

[Means for solving problem]

A preparation switch for such a purpose to make the motor for driving of an electric vehicle pivotable according to this design, It is a false engine sound generator which has a sounding body drive control means for generating a false engine sound from the speed detecting means, the sounding body, and the aforementioned sounding body for detecting the vehicle speed, In the case where the aforementioned sounding body drive control means detects the pivotable state of the aforementioned motor with the aforementioned preparation switch, When the aforementioned speed detecting means detects the halt condition of the aforementioned electric vehicle, the sound of comparatively small sound pressure or low frequency is generated from the aforementioned sounding body, It is attained by providing the false engine sound generator controlling to increase the aforementioned sound pressure with the rise of the vehicle speed, or to raise the aforementioned frequency when the aforementioned speed detecting means detects the run state of the aforementioned electric vehicle.

[0007]

[Function]

If it does in this way, the state of being equivalent to the idling condition of the conventional internal-combustion engine vehicle, It can distinguish by detection that are in the pivotable state of a motor and it is a halt condition of vehicles, In the idling condition, the sound which changes according to operational status can be generated like the engine sound of the conventional automobile by generating the false sound of comparatively small sound pressure or low frequency, and generating the sound to which sound pressure or frequency was changed according to the vehicle speed.

[0008]

[Working example]

Hereafter, the preferred embodiment of this design is described in detail with reference to attached Drawings.

[0009]

Fig.1 is a figure showing the whole circuit for generating the false engine sound of the electric vehicle (for example, electric two-wheeled vehicle) with which this design was applied. The vehicle speed pulse signal emitted from the speed sensor 1 which can detect the vehicle speed by emitting the pulse from which frequency changes according to the rotational speed of motor-for-driving M in Fig.1. It branches in the control circuit 2 as a sounding body drive control means, one side inputs into F/V converter 3, and another side inputs into the frequency divider 4. In this example, this F/V converter 3 will output a transistor ON signal, if generating of a vehicle speed pulse signal is detected, and it turns on the transistor Q1 for a relay drive with that transistor ON signal.

[0010]

The above-mentioned frequency divider 4 can output the signal which is 0.5 Hz, if a vehicle speed pulse signal occurs, and it can make the frequency of 0.5 Hz- $F_{\max}$ (any maximum frequency) fluctuate according to the change in a vehicle speed pulse signal. The above-mentioned output signal of the frequency divider 4 is outputted to the normally open side of 2 position case index contact of relay RL1 driven with the aforementioned transistor Q1 for a relay drive. The oscillation signal from the oscillating circuit 5 for idle sounds (for example, 0.5 Hz) provided in parallel with the frequency divider 4 is outputted to the normally closed side of 2 position case index contact of the relay RL1.

[0011]

The ON-and-OFF signal from ignition switch IG as a preparation switch which makes the above-mentioned motor M controllable via the motor control circuit 6, It inputs into the delay circuit 7 in this control circuit 2, and the output signal of the delay circuit 7 inputs into the reference clock oscillating circuit 8 and the 1st and 2nd oscillating circuits 9 and 10. The output signal of the reference clock oscillating circuit 8 is input into the oscillating circuit 5 for idle sounds, and the 1st and 2nd oscillating circuits 9 and 10. The 1st oscillating circuit 9 outputs the signal of 2.0 kHz (F1), and the 2nd oscillating circuit 10 outputs a 1.6 kHz (F2) signal. And the signal outputted via change-over contact of relay RY1 from the frequency divider 4 and the oscillating circuit 5 for idle sounds and each signal outputted from the 1st and 2nd above-mentioned oscillating circuits 9 and 10 input into the chime sound generating circuit 11.

[0012]

Both the loudspeakers 12 as a sounding body are connected so that it may pronounce, if the transistor Q2 by the side of a power supply and the transistor Q3 of the earth side are turned on. When the transistor Q4 turned on with the output signal of OR-circuit OR1 of the output stage of the aforementioned chime sound generating circuit 11 turns on, turn on the above-mentioned transistor Q2, and the transistor Q3, It turns on mutually [the output stage of the chime sound generating circuit 11] with the output signal of both parallel AND circuits AD1 and AD2.

[0013]

The CR time constant circuit which forms in the input stage of above-mentioned OR-circuit OR1 the wave-like signal dwindled after that [standup] for every timing of the standup and falling of

the output signal of the aforementioned frequency divider 4 or the oscillating circuit 5 for idle sounds is provided. Therefore, the output of the transistor Q2 serves as a waveform continuously dwindled after rising as shown in Fig.2.

[0014]

An output signal of the frequency divider 4 or the oscillating circuit 5 for idle sounds is input also into both above-mentioned AND circuits AD1 and AD2.

A 2.0 kHz signal and a 1.6-kHz signal will be outputted to the transistor Q3 in timing of above-mentioned standup and falling.

Therefore, in the output of the transistor Q3, as shown in Fig.2, a 2.0 kHz signal and a 1.6-kHz signal arise alternately.

[0015]

Thus, the signal pronunciation point of the constituted false engine sound generation circuit is shown below. First, if ignition switch IG is turned ON like the engine start of an internal-combustion engine vehicle, the 0.5 Hz signals from the oscillating circuit 5 for idle sounds will be outputted after 0.2s by passing the delay circuit 7, and. The signal of each frequency F1 and F2 is outputted from the 1st and 2nd oscillating circuits 9 and 10. In the halt condition (it is equivalent to the idling condition of an internal-combustion engine vehicle) before start, since the vehicle speed pulse signal is not generated from the speed sensor 1 and relay RL1 is a non-excited state, the 0.5 Hz signals from the oscillating circuit 5 for idle sounds input into the chime sound generating circuit 11. Therefore, since the electronic chime sound from which a 2.0 kHz signal and a 1.6-kHz signal change as a false engine sound in the timing of these 0.5 Hz signals (refer to Fig.2) is pronounced from the loudspeaker 12, A driver, the pedestrian, etc. can recognize that vehicles are idle states.

[0016]

Next, since the transistor Q1 will turn on and relay LR1 will change if a throttle is operated, vehicles are started and a vehicle speed pulse arises, the signal of the frequency divider 4 comes to input into the chime sound generating circuit 11. And the frequency of the signal of the frequency divider 4 increases with the rise of the vehicle speed, and since the cycle of the transistors Q2 and Q3 becomes shorter than 0.5 Hz as shown in Fig.2, the change rate of the signal of 2.0 kHz (F1) and a 1.6 kHz (F2) signal is rash according to the vehicle speed. Therefore, since the chime sound from which a 2.0 kHz signal and a 1.6-kHz signal change with the cycle which changes according to the vehicle speed occurs, the driver can operate, recognizing the chime sound which changes according to the vehicle speed. A pedestrian etc. can distinguish the speed of the vehicles which approach to some extent by a sound.

[0017]

A chime sound is not restricted to a frequency change, although it was made to change the frequency, and it may be made to change sound pressure in this example, for example.

[0018]

As a false engine sound generator concerning this design, Connect to ignition switch IG sounding bodies which are not limited to this example, for example, emit a comparatively small

sound by the ON state of ignition switch IG, such as a loudspeaker and a horn, and. It may be made the mechanism in which connect a solid of revolution with a motor or an axle, and a sounding body is struck with rotation of a solid of revolution in order to generate the sound from which the vehicle speed is interlocked with and a cycle changes. A program is created and it may be made to control to change the cycle and sound pressure of a sound which a sounding body emits according to a vehicle speed input signal using a microcomputer etc.

[0019]

[Effect of the Device]

Thus, by generating a false sound corresponding at the time of the idling of an internal-combustion engine vehicle, and the false sound which changes according to the height of the vehicle speed in an electric vehicle according to this design, Even if change of the sound equivalent to the engine sound of an internal-combustion engine vehicle can be obtained and it changes to an electric vehicle from an internal-combustion engine vehicle, it can operate, without producing inconvenience in any way, and the state of vehicles can be exactly told also to a pedestrian etc.

TECHNICAL FIELD

[Industrial Application]

This design is related with the false engine sound generator for generating the false engine sound in an electric vehicle.

[0002]

PRIOR ART

[Description of the Prior Art]

If it is in the electric vehicle which used the electric motor for power, there is an advantage that there is little vibration compared with the automobile using an internal-combustion engine, and an engine sound is also quiet. If it is in such an electric vehicle, there are some which perform the throttle operations in the automobile using an internal-combustion engine and the same throttle operations, and were made to perform operation based on the driver's volition.

[0003]

From a motor (engine) sound being quiet, if it is in an electric vehicle as described above, There was a problem that judgment by the engine sound in the automobile of that rotation of the motor at the time of a run is in what kind of state about whether it is in the state (ON state of an ignition switch) which can run, etc. and the conventional internal-combustion engines could not be performed. Cautions needed to be demanded from the pedestrian etc. and there were some which emitted the sound for telling that it is under run in the conventional electric vehicle.

[0004]

As what emitted the above-mentioned sound, it is in the ON state of ignition, and the same state, and the sound of a certain amount of sound pressure (frequency) level is generated, and there is a thing it was made to make it recognize that it is in the state which can run. However, in the conventional electric vehicle, the sound of fixed sound pressure (frequency) is generated also in the time of a stop and a run, and there was a problem of being unnatural, to a run state including the height state of a stop or the vehicle speed.

[0005]

EFFECT OF THE INVENTION

[Effect of the Device]

Thus, by generating a false sound corresponding at the time of the idling of an internal-combustion engine vehicle, and the false sound which changes according to the height of the vehicle speed in an electric vehicle according to this design, Even if change of the sound equivalent to the engine sound of an internal-combustion engine vehicle can be obtained and it changes to an electric vehicle from an internal-combustion engine vehicle, it can operate, without producing inconvenience in any way, and the state of vehicles can be exactly told also to a pedestrian etc.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Device]

In view of the problem of such a prior art, the main purposes of this design are to provide the false engine sound generator which may generate the preferable false engine sound according to various operational status of the electric vehicle.

[0006]

MEANS

[Means for solving problem]

A preparation switch for such a purpose to make the motor for driving of an electric vehicle pivotable according to this design, It is a false engine sound generator which has a sounding body drive control means for generating a false engine sound from the speed detecting means, the sounding body, and the aforementioned sounding body for detecting the vehicle speed, In the case where the aforementioned sounding body drive control means detects the pivotable state of the aforementioned motor with the aforementioned preparation switch, When the aforementioned speed detecting means detects the halt condition of the aforementioned electric vehicle, the sound of comparatively small sound pressure or low frequency is generated from the aforementioned sounding body, It is attained by providing the false engine sound generator controlling to increase the aforementioned sound pressure with the rise of the vehicle speed, or to

raise the aforementioned frequency when the aforementioned speed detecting means detects the run state of the aforementioned electric vehicle.

[0007]

OPERATION

[Function]

If it does in this way, the state of being equivalent to the idling condition of the conventional internal-combustion engine vehicle, It can distinguish by detection that are in the pivotable state of a motor and it is a halt condition of vehicles, In the idling condition, the sound which changes according to operational status can be generated like the engine sound of the conventional automobile by generating the false sound of comparatively small sound pressure or low frequency, and generating the sound to which sound pressure or frequency was changed according to the vehicle speed.

[0008]

EXAMPLE

[Working example]

Hereafter, the preferred embodiment of this design is described in detail with reference to attached Drawings.

[0009]

Fig.1 is a figure showing the whole circuit for generating the false engine sound of the electric vehicle (for example, electric two-wheeled vehicle) with which this design was applied. The vehicle speed pulse signal emitted from the speed sensor 1 which can detect the vehicle speed by emitting the pulse from which frequency changes according to the rotational speed of motor-for-driving M in Fig.1, It branches in the control circuit 2 as a sounding body drive control means, one side inputs into F/V converter 3, and another side inputs into the frequency divider 4. In this example, this F/V converter 3 will output a transistor ON signal, if generating of a vehicle speed pulse signal is detected, and it turns on the transistor Q1 for a relay drive with that transistor ON signal.

[0010]

The above-mentioned frequency divider 4 can output the signal which is 0.5 Hz, if a vehicle speed pulse signal occurs, and it can make the frequency of 0.5 Hz- $F_{\max}$ (any maximum frequency) fluctuate according to the change in a vehicle speed pulse signal. The above-mentioned output signal of the frequency divider 4 is outputted to the normally open side of 2 position case index contact of relay RL1 driven with the aforementioned transistor Q1 for a relay drive. The oscillation signal from the oscillating circuit 5 for idle sounds (for example, 0.5 Hz) provided in parallel with the frequency divider 4 is outputted to the normally closed side of 2 position case index contact of the relay RL1.

[0011]

The ON-and-OFF signal from ignition switch IG as a preparation switch which makes the above-mentioned motor M controllable via the motor control circuit 6, It inputs into the delay circuit 7 in this control circuit 2, and the output signal of the delay circuit 7 inputs into the reference clock oscillating circuit 8 and the 1st and 2nd oscillating circuits 9 and 10. The output signal of the reference clock oscillating circuit 8 is input into the oscillating circuit 5 for idle sounds, and the 1st and 2nd oscillating circuits 9 and 10. The 1st oscillating circuit 9 outputs the signal of 2.0 kHz (F1), and the 2nd oscillating circuit 10 outputs a 1.6 kHz (F2) signal. And the signal outputted via change-over contact of relay RY1 from the frequency divider 4 and the oscillating circuit 5 for idle sounds and each signal outputted from the 1st and 2nd above-mentioned oscillating circuits 9 and 10 input into the chime sound generating circuit 11.

[0012]

Both the loudspeakers 12 as a sounding body are connected so that it may pronounce, if the transistor Q2 by the side of a power supply and the transistor Q3 of the earth side are turned on. When the transistor Q4 turned on with the output signal of OR-circuit OR1 of the output stage of the aforementioned chime sound generating circuit 11 turns on, turn on the above-mentioned transistor Q2, and the transistor Q3, It turns on mutually [the output stage of the chime sound generating circuit 11] with the output signal of both parallel AND circuits AD1 and AD2.

[0013]

The CR time constant circuit which forms in the input stage of above-mentioned OR-circuit OR1 the wave-like signal dwindled after that [standup] for every timing of the standup and falling of the output signal of the aforementioned frequency divider 4 or the oscillating circuit 5 for idle sounds is provided. Therefore, the output of the transistor Q2 serves as a waveform continuously dwindled after rising as shown in Fig.2.

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sound generating circuit 11. Therefore, since the electronic chime sound from which a 2.0 kHz signal and a 1.6-kHz signal change as a false engine sound in the timing of these 0.5 Hz signals (refer to Fig.2) is pronounced from the loudspeaker 12, A driver, the pedestrian, etc. can recognize that vehicles are idle states.

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A chime sound is not restricted to a frequency change, although it was made to change the frequency, and it may be made to change sound pressure in this example, for example.

[0018]

As a false engine sound generator concerning this design, Connect to ignition switch IG sounding bodies which are not limited to this example, for example, emit a comparatively small sound by the ON state of ignition switch IG, such as a loudspeaker and a horn, and. It may be made the mechanism in which connect a solid of revolution with a motor or an axle, and a sounding body is struck with rotation of a solid of revolution in order to generate the sound from which the vehicle speed is interlocked with and a cycle changes. A program is created and it may be made to control to change the cycle and sound pressure of a sound which a sounding body emits according to a vehicle speed input signal using a microcomputer etc.

[0019]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The figure showing the whole false engine sound generation circuit of the electric vehicle with which this design was applied.

[Drawing 2]The time chart which shows the generating point of a false engine sound.

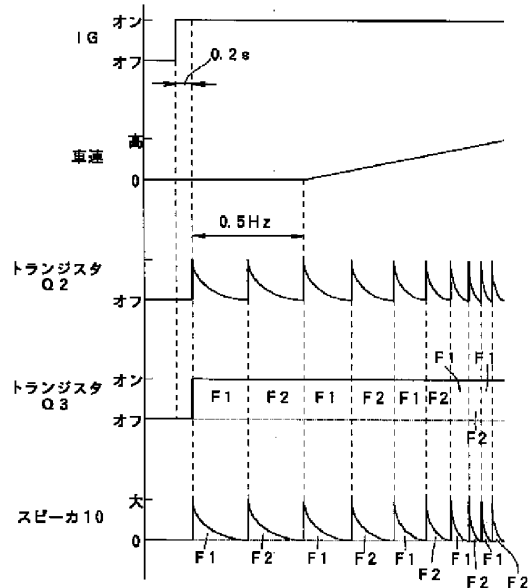
[Explanations of letters or numerals]

- 1 Speed sensor
- 2 Control circuit
- 3 F/V converter
- 4 Frequency divider

- 5 The oscillating circuit for idle sounds
- 6 Motor control circuit
- 7 Delay circuit
- 8 Reference clock oscillating circuit
- 9 The 1st oscillating circuit
- 10 The 2nd oscillating circuit
- 11 Chime sound generating circuit
- 12 Loudspeaker

DRAWINGS

[Drawing 2]



[Drawing 1]

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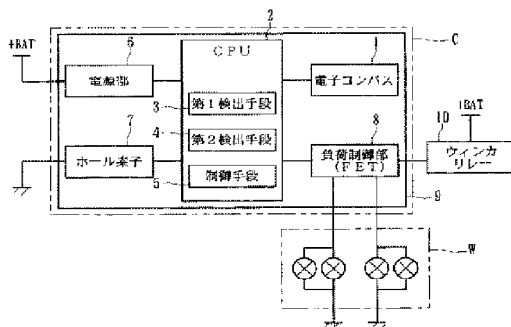
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F ターム(参考) 3K039 LA07 MB01 NA03 NB04 NB06

NB15

(54) 【発明の名称】 ターンシグナルスイッチ装置



[0001] 本発明は、二輪車に配設された所望の側のウィンカを点滅可能とされるとともに、当該ウィンカの点滅を自動的に停止してキャンセル可能とされたターンシグナルスイッチ装置に関するものである。

【0002】 一般に、二輪車には左右一対のウィンカが配設されており、方向転換時に運転者がターンシグナルスイッチの操作ノブを左右何れかに操作することにより、同方向に対応したウィンカを点滅させ方向指示し得よう構成されている。そして、方向転換を終えた後、ウィンカの点滅を停止してキャンセルとするには、例えばターンシグナルスイッチの操作ノブを押圧操作するよう構成されていた。

- [0003] 然るに、上記の如き操作ノブによる手動のキャンセル機構に加え、従来より、二輪車の方向転換終了後、自動的にウィンカの点滅を停止してキャンセルするためのターンシグナルスイッチ装置が種々提案されており、その一例として例えば特許文献 1 に開示されたものが挙げられる。かかる従来のターンシグナルスイッチ装置によれば、二輪車の車体に対する左右方向（横方向）の加速度を検出するセンサと、車速を検出する車速検出器とをそれぞれ具備することにより、ウィンカの点滅を適切なタイミングでキャンセルしていた。
- [0004] より具体的には、二輪車の方向転換時における車体の左右方向の傾斜に応じて動作するフロート式センサを具備し、該フロート式センサの振れにより車体の傾斜を検出（車体のバンク状態から起立状態への検出）し、且つ、車輪の回転と同期して車速を検出する検出手段が所定速度を検出したことを条件として、ウィンカの点滅をキャンセルするよう構成されていた。
- [0005] 【特許文献 1】 特開昭 5 7 - 8 7 7 3 5 号公報
- [0006] しかしながら、上記従来のターンシグナルスイッチ装置においては、左右方向の加速度の検出に加え、車速が一定以上となったことを自動キャンセルの条件としているため、低速走行での方向転換時には確実な自動キャンセルを行うことができない虞があった。また、フロート式センサにて機械的な傾斜角度の検出（フロートの振れの検出）を図っているため、当該センサの取付位置に制限があった。
- [0007] 本発明は、このような事情に鑑みてなされたもので、車両の進行方向の変化を精度よく検出することができるとともに、当該車両の方向転換後のウィンカのキャンセルを自動的に且つ確実に行わせることができるターンシグナルスイッチ装置を提供することを目的とする。
- [0008] 請求項 1 記載の発明は、車両に配設された所望の側のウィンカを点滅可能とされるとともに、当該ウィンカの点滅を自動的に停止してキャンセル可能とされたターンシグナルスイッチ装置であって、車両の進行方向に応じて出力電圧が変化する電子コンパスと、該電子コンパスの出力電圧の変化をリアルタイムに検知することにより、車両が所定角度以上方向転換したことを検出し得る第 1 検出手段と、該第 1 検出手段で車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを検出し得る第 2 検出手段と、該第 2 検出手段で所定時間の経過又は所定距離の移動を検出したことを条件として、前記ウィンカの点滅を自動的に停止させてキャンセルする制御手段とを具備したことを特徴とする。
- [0009] 請求項 2 記載の発明は、請求項 1 記載のターンシグナルスイッチ装置において、前記電子コンパスは、車両が具備するハンドルバーの把持グリップ近傍に固定されたハンドルスイッチケース内に配設されたことを特徴とする。
- [0010] 請求項 3 記載の発明は、請求項 2 記載のターンシグナルスイッチ装置において、前記電子コンパスは、所定の電気回路が形成された基板上に形成され、その同一基板上に前記第 1 検出手段、第 2 検出手段及び制御手段を有したマイコンが形成されるとともに、当該電子コンパス及びマイコンを具備した基板が前記ハンドルスイッチケース内に配設されたことを特徴とする。
- [0011] 請求項 4 記載の発明は、請求項 3 記載のターンシグナルスイッチ装置において、前記ハンドルスイッチケースには、所望の側のウィンカを点滅操作するための操作ノブと、該操作ノブの操作に連動するとともに磁気が発生する磁気発生手段と、該磁気発生手段からの磁気を検知することにより前記操作ノブの操作を非接触にて検知する磁気検知手段とを具備した操作手段が配設され、当該磁気検知手段による磁気の検知に基づき所望の側のウィンカを点滅させるよう構成されるとともに、当該磁気検知手段が前記基板に形成されたことを特徴とする。
- [0012] 請求項 1 の発明によれば、電子コンパスの出力電圧の変化をリアルタイムに検知することにより車両が所定角度以上方向転換したことを検出し、且つ、当該車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを条件として、ウィンカの点滅を自動的に停止させてキャンセルするので、車両の進行方向の変化を精度よく検出することができるとともに、当該車両の方向転換後のウィンカのキャンセルを自動的に且つ確実に行わせることができる。
- [0013] 請求項 2 の発明によれば、電子コンパスは、車両が具備するハンドルバーの把持グリップ近傍に固定されたハンドルスイッチケース内に配設されたので、車両の方向転換に伴う電子コンパスの出力電圧の変化をより正確に検出させることができる。
- [0014] 請求項 3 の発明によれば、電子コンパスと第 1 検出手段、第 2 検出手段及び制御手段を有したマイコンとを具備した基板がハンドルスイッチケース内に配設されたので、当該ハンドルスイッチケース内においてターンシグナルスイッチ装置の機能を完結させることができ、既存の車両に対する適用を容易とすることができる。

- [0015] 請求項４の発明によれば、操作手段を構成する磁気検知手段が基板に形成されたので、ターンシグナルスイッチ装置の構成要素と操作手段の一部の構成要素とを同一の基板に形成させることができ、当該基板を共用させることができる。
- [0017] 以下、本発明の実施形態について図面を参照しながら具体的に説明する。
- 本実施形態に係るターンシグナルスイッチ装置は、二輪車の側方にそれぞれ配設された左右何れかの一方のウィンカを点滅可能とされるとともに、当該ウィンカの点滅を自動的に停止してキャンセル可能とされたものであり、図４に示すように、二輪車が具備するハンドルバーＨの把持グリップＧ近傍に固定されたハンドルスイッチケースＣ内に形成されたものである。
- [0018] 当該ハンドルスイッチケースＣは、図２、３に示すように、本ターンシグナルスイッチ装置における操作ノブ１２の他、二輪車が搭載する前照灯のハイビームとロービームとの切り替え操作を行い得るデイマースイッチノブ１１、二輪車が搭載するホーンを作動し得るホーンスイッチノブ１３等が形成されており、把持グリップＧを把持した運転者がその指を伸ばして所望ノブを操作することにより二輪車における各種電装品の操作が可能とされている。
- [0019] 本実施形態におけるターンシグナルスイッチ装置は、図１に示すように、所定の電気回路が形成された基板９と、電子コンパス１（地磁気センサ）と、第１検出手段３、第２検出手段４及び制御手段５が形成されたマイコンを構成するＣＰＵ２と、バッテリーと接続された電源部６と、ホール素子７（磁気検知手段）と、ＦＥＴ（電界効果型トランジスタ）から成る負荷制御部８とから主に構成されている。尚、負荷制御部８は、バッテリーと接続されたウィンカリレー１０と電気的に接続されるとともに、車両が具備するウィンカＷと電気的に接続され、ウィンカＷのオン・オフを制御し得るよう構成されたものであり、例えばＩＰＤ（インテリジェントパワーデバイス）を用いることができる。
- [0020] 電子コンパス１は、車両の進行方向に応じて出力電圧が変化する地磁気センサと称されるチップ状のものから成り、基板９の所定部位に取り付けられている（図７参照）。即ち、車両の進行方向が変化すると、例えば内部ＭＩ素子が地磁気の変化でインピーダンス変化し、電子コンパス１の出力電圧もそれに依りて変化するので、当該出力電圧を検出すれば車両の向いている方位を検出し得るとともに、当該出力電圧の変化及び変化量をリアルタイムに検出すれば、車両の方向転換の有無及び方向転換の角度を検出することができるのである。
- [0021] ＣＰＵ２は、基板９に取り付けられて電源部６から供給される電力にて作動するとともに、電子コンパス１からの出力電圧やホール素子７からの検知信号等が送信され、当該信号に基づいて負荷制御部８を制御するためのもので、ウィンカの作動（点滅や点滅の停止）を制御し得るものである。かかるＣＰＵ２内には、第１検出手段３と、第２検出手段４と、制御手段５とが形成されている。
- [0022] 第１検出手段３は、電子コンパス１の出力電圧の変化（Ｘ軸方向及びＹ軸方向の方位情報）をリアルタイム（経時的）に検知することにより、車両が所定角度（例えば、約７０°）以上方向転換したことを検出し得るものである。より具体的には、第１検出手段３は、一定時間毎に電子コンパス１にて検出された出力電圧値を取り込むとともに、その出力電圧値をＡＤ変換し、当該ＡＤ変換値を蓄積し得るものとされている。そして、蓄積されたＡＤ変換値（Ｘ軸及びＹ軸）における最大値と最小値との差を演算し、当該差が予め定めた値以上である場合、車両が所定角度以上方向転換したと判定可能とされている。
- [0023] 即ち、電子コンパス１の出力電圧（ＡＤ変換値も同様）の変化量と車両の方向転換角度とは予め対応されているので、電子コンパス１における出力電圧（ＡＤ変換値）の変化を第１検出手段３が検出することにより、車両の方向転換を検出し得るのである。また、第１検出手段３は、電子コンパスの出力電圧の変化量を微分量として求め、一定以上出力電圧が変化したら車両が所定角度方向転換したと検知し得るよう構成することができる。
- [0024] 第２検出手段４は、第１検出手段３で車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを検出し得るものである。即ち、第２検出手段４は、所定角度以上方向転換した時点から所定時間経過したことを検出するためのタイマを備えたもの、或いは所定角度以上方向転換した時点から車両が所定距離移動したことを検出する距離検出手段を備えたものの何れであってよく、更にはこれらを併用したものであってもよい。
- [0025] 然るに、所定角度以上方向転換した時点から車両が所定距離移動したことを検出する第２検出手段４とした場合、当該所定距離の移動を検出するために以下の形態を採用することができる。例えば、車両が搭載する車速センサからの信号に基づいて所定距離の移動を検出するもの、或いはＧＰＳ（グローバル・ポジション・システム：全地球測位システム）等の衛星測位システムにおける現在位置データを取得するための受信手段（不図示）を備え、取

得した現在位置データから所定距離の移動を検出するもの等が挙げられる。

[0026] 制御手段5は、第2検出手段4で所定時間の経過又は所定距離の移動を検出したことを条件として、負荷制御部8を制御することによりウィンカWの点滅を自動的に停止させてキャンセルするためのものである。而して、二輪車の方向転換後のウィンカWのキャンセルを自動的に行わせることができるので、当該キャンセル操作を不要として操作性を向上させ得るとともに、運転者がウィンカWのキャンセルを忘れて当該ウィンカWを点滅させつつ走行してしまうのを確実に回避することができる。

[0027] 尚、本実施形態においては、後述するように、制御手段5にてウィンカWの点滅を自動的に停止させてキャンセルする機構に加え、運転者が手動で操作ノブ12を任意操作することにより、ウィンカWの点滅を停止させてキャンセルし得るよう構成されている。これにより、制御手段5による制御に関わらず、運転者が任意タイミングでウィンカWの点滅をキャンセルさせることができる。

[0028] 一方、ハンドルスイッチケースCには、所望の側のウィンカを点滅操作するための操作ノブ12と、該操作ノブ12の操作に連動するとともに操作ノブ12の基端側左右に取り付けられて磁気を発生する磁石12a、12b（磁気発生手段）と、これら磁石12a、12b（磁気発生手段）からの磁気をそれぞれ検知することにより操作ノブ12の左右方向の操作を非接触にて検知する左右一対のホール素子7（磁気検知手段）とを具備した操作手段が配設され、当該一対のホール素子7（磁気検知手段）による磁気を検知に基づき所望の側のウィンカWを点滅させるよう構成されているとともに、当該一対のホール素子7（磁気検知手段）が基板9に形成されている。

[0029] ここで、本実施形態においては、図3に示すように、ハンドルスイッチケースC内にターンユニット14が配設されている。かかるターンユニット14は、樹脂製のケース14aを筐体として成るもので、図5～7に示すように、操作ノブ12が揺動軸Lを中心として揺動自在に取り付けられるとともに、ケース14aの内部に電子コンパス1やCPU2等が形成された基板9が配設されている。

[0030] また、ケース14aには、図6に示すように、内部にスプリング16、18及びボール15、17が配設されており、操作ノブ12の揺動操作に対して付勢力を付与し得るよう構成されている。即ち、スプリング16で付勢されたボール15は、操作ノブ12の基端12cと当接し、当該操作ノブ12を常時中立位置（初期位置）に付勢し得るよう構成されているとともに、スプリング18で付勢されたボール17は、操作ノブ12の長孔12d内周縁部と当接し、当該操作ノブ12に対して節度を付与し得るよう構成されているのである。

[0031] 操作ノブ12は、ケース14aから突出形成されるとともに、既述したように、当該ケース14aに設けられた揺動軸Lを中心として中立位置から左右に（図5中a方向に）揺動操作可能とされ、且つ中立位置から同図中b方向に押し込み操作可能とされている。かかる操作ノブ12には、その長手方向に延びた長孔12dが形成されており、当該長孔12d内で揺動軸Lが突出形成されている。そして、操作ノブ12を押し込み操作すると、長孔12dが操作ノブ12全体のb方向への移動を許容することとなり、スプリング16の付勢力に抗して当該操作ノブ12が同方向へ移動することとなる。尚、押し込み操作後、当該操作ノブ12から指を離すと、スプリング16の付勢力により操作ノブ12が移動して中立位置（図5の状態）まで戻ることとなる。

[0032] また、操作ノブ12には、一対の磁石12a、12b（磁気発生手段）がそれぞれ設けられており、当該操作ノブ12の操作に伴って当該一対の磁石12a、12bが移動可能とされている。かかる一対の磁石12a、12bは、操作ノブ12の左右に一対形成されてそれぞれ磁気を発生すれば足り、例えば磁気を帯びた磁性体粉をプラスチックに混合して成形されたもの、或いは汎用的な永久磁石から成るものであってもよい。

[0033] 更に、基板9には、図7に示すように、磁気検出手段としての一対のホール素子7（ホールIC）が形成されており、磁石12a、12bの移動に伴う磁気の変化に応じて出力電圧を異ならせることが可能とされている。ここで、ホール素子とは、磁石から付与される磁力の強弱に応じて抵抗値が変化し出力電圧を異ならせるものであり、本実施形態においては、磁石12a又は磁石12bに近接すると出力電圧が低い値（L）となり、離間すると高い値（H）となる。尚、一対のホール素子7（磁気検知手段）は、CPU2と電気的に接続されており（図1参照）、各ホール素子7が検出した出力電圧の変化を電気信号として当該CPU2に送信し得るよう構成されている。

[0034] 然るに、操作ノブ12が中立位置にあるとき、磁石12a及び磁石12bはそれぞれ左右のホール素子7と対向して近接した状態とされるとき、操作ノブ12を右方向へ揺動させると、磁石12aがホール素子7との近接状態を維持しつつ磁石12bがホール素子7から離間し、当該操作ノブ12を左方向へ揺動させると、磁石12bがホール素子7との近接状態を維持しつつ磁石12aがホール素子7から離間するよう設定されている。更に、ウィンカの点滅をキャンセルすべく操作ノブ12を押し込み操作すると、磁石12a及び磁石12bは共にホール素子7から離間した状態とされる。これにより、各ホール素子7の出力電圧に応じたウィンカWの操作を行わせることができる。

[0035] 次に、本実施形態に係るターンシグナルスイッチ装置における制御内容について図8、9のフローチャートに基づいて説明する。

まず、図8に示すように、イグニッションスイッチをオン位置とすることで電子コンパス1を作動させ、CPU2内の初期化がなされる(S1)。そして、一定時間毎に電子コンパス1にて検出された出力電圧値を取得するとともに、その出力電圧値をAD変換し(S2)、当該AD変換値(X軸及びY軸)を平均化しつつCPU2内に記憶させて蓄積する(S3)。

[0036] その後、蓄積された全AD変換値における最大値(MAX)と最小値(MIN)とを検索し(S4)、当該最大値と最小値との差を演算する(S5)とともに、第1検出手段3により最大値と最小値との差が所定値以上か否か(即ち、車両が所定角度以上方向転換したか否か)が判定され(S6)る。S6にて差が所定値以上である場合、S7に進み、第2検出手段4により第1検出手段3で車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したか否かを判定する。車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したと判定されると、制御手段5による制御にてウィンカWを停止(S8)させ、S2に再び戻る。

[0037] 然るに、操作ノブ12に対する操作がなされ、その操作がホール素子7により検知されると、図9に示す割り込み処理に遷移する。かかる割り込み処理においては、まず、所定の待ち時間を経てチャタリングを除去(S9)した後、操作ノブ12が左右方向に操作がなされたか否か(左右のウィンカWの何れかが点滅操作されたか否か)が判定される(S10)。

[0038] 当該左右方向の操作がある場合、負荷制御部8によりウィンカWを点滅させ(S11)、再スタートのためのフラグを立てる(S12)一方、当該操作がない場合、割り込み処理が終了して図8のフローチャートに示すメインループに戻る。而して、S12においてフラグを立てた時点から蓄積されたAD変換値を対象としてS4の最大値及び最小値の検索、最大値と最小値との差の演算がなされることとなる。

[0039] 上記実施形態によれば、電子コンパス1の出力電圧の変化をリアルタイムに検知することにより車両が所定角度以上方向転換したことを検出し、且つ、当該車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを条件として、ウィンカWの点滅を自動的に停止させてキャンセルするので、車両の進行方向の変化を精度よく検出することができるとともに、当該車両の方向転換後のウィンカWのキャンセルを自動的に且つ確実にに行わせることができる。

[0040] また、電子コンパス1は、車両が具備するハンドルバーHの把持グリップG近傍に固定されたハンドルスイッチケースC内に配設されたので、車両の方向転換に伴う電子コンパス1の出力電圧の変化をより正確に検出させることができる。尚、ハンドルスイッチケースC内にGPS(グローバル・ポジション・システム：全地球測位システム)等の衛星測位システムにおける現在位置データを取得するアンテナ等の受信手段を配設させ、当該受信手段にて受信した位置データを参照して第2検出手段4による車両の移動距離を検出するようにしてもよい。

[0041] 更に、電子コンパス1と第1検出手段3、第2検出手段4及び制御手段5を有したマイコン(CPU2)とを具備した基板9がハンドルスイッチケースC内に配設されたので、当該ハンドルスイッチケースC内においてターンシグナルスイッチ装置の機能を完結させることができ、既存の車両に対する適用を容易とすることができる。尚、第1検出手段3、第2検出手段4及び制御手段5の全て或いは何れかを他のマイコン等に形成するようにしてもよい。

[0042] また更に、操作手段を構成するホール素子7(磁気検知手段)が基板9に形成されたので、ターンシグナルスイッチ装置の構成要素と操作手段の一部の構成要素(即ち、ホール素子7)とを同一の基板9に形成させることができ、当該基板9を共用させることができる。尚、操作手段を構成するホール素子7を基板9とは異なる別個の基板に形成するようにしてもよい。

[0043] 尚、本実施形態によれば、操作ノブ12の操作に基づいて移動可能な磁石12a、12bと、磁石(12a、12b)の移動に伴う磁気の変化に応じて出力電圧を異ならせる磁気検出部(ホール素子7)とを具備し、当該ホール素子7からの出力電圧に基づいて、二輪車が具備する左右何れのウィンカWを点滅又は消灯させる(ウィンカ表示機能)べきかを判定し、その判定結果に基づいて所定のウィンカWを点滅又は消灯させるので、従来の如く接点を用いず非接触にてウィンカの操作を行うことができる。従って、接点の磨耗に起因する寿命低下を回避することができる。尚、当該ホール素子に代えて、磁石から付与される磁力の変化に応じて抵抗値が変化し出力電圧を異ならせる他の形態の磁気検出部(例えば角度センサ等)としてもよい。

[0044] 以上、本実施形態について説明したが、本発明はこれに限定されるものではなく、例えば電子コンパス1をハンドルスイッチケースCとは異なる部位に配設するようにしてもよい。また、本実施形態においては、ホール素子7

を用いてスイッチング操作を検知しているが、従来の接点構造（操作ノブ側に可動接点、ケース側に固定接点をそれぞれ形成しておき、当該操作ノブの操作に伴って可動接点が固定接点と接触又は離間して所定の電気回路を形成するもの）にてスイッチング操作するようにしてもよい。尚、本実施形態においては二輪車のハンドルバーに取り付けられたターンシグナルスイッチに適用されているが、スノーモービルや三輪又は四輪バギーなどハンドルバーを具備した他の車両においても適用することができる。

[0045] 車両の進行方向に応じて出力電圧が変化する電子コンパスと、該電子コンパスの出力電圧の変化をリアルタイムに検知することにより、車両が所定角度以上方向転換したことを検出し得る第1検出手段と、該第1検出手段で車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを検出し得る第2検出手段と、該第2検出手段で所定時間の経過又は所定距離の移動を検出したことを条件として、ウィンカの点滅を自動的に停止させてキャンセルする制御手段とを具備したターンシグナルスイッチ装置であれば、外観形状が異なるもの或いは他の機能が付加されたもの等にも適用することができる。

[0046] 1 電子コンパス（地磁気センサ）
2 CPU（マイコン）
3 第1検出手段
4 第2検出手段
5 制御手段
6 電源部
7 ホール素子（磁気検知手段）
8 負荷制御部
9 基板
10 ウィンカリレー
11 ディマースイッチノブ
12 操作ノブ
12a、12b 磁石（磁気発生手段）
13 ホーンスイッチノブ
14 ターンユニット
15 ボール
16 スプリング
17 ボール
18 スプリング
C ハンドルスイッチケース
H ハンドルバー
G 把持グリップ

【請求項 1】

車両に配設された所望の側のウィンカを点滅可能とされるとともに、当該ウィンカの点滅を自動的に停止してキャンセル可能とされたターンシグナルスイッチ装置であって、

車両の進行方向に応じて出力電圧が変化する電子コンパスと、

該電子コンパスの出力電圧の変化をリアルタイムに検知することにより、車両が所定角度以上方向転換したこと

を検出し得る第 1 検出手段と、

該第 1 検出手段で車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを検出し得る第 2 検出手段と、

該第 2 検出手段で所定時間の経過又は所定距離の移動を検出したことを条件として、前記ウィンカの点滅を自動的に停止させてキャンセルする制御手段と、

を具備したことを特徴とするターンシグナルスイッチ装置。

【請求項 2】

前記電子コンパスは、車両が具備するハンドルバーの把持グリップ近傍に固定されたハンドルスイッチケース内に配設されたことを特徴とする請求項 1 記載のターンシグナルスイッチ装置。

【請求項 3】

前記電子コンパスは、所定の電気回路が形成された基板上に形成され、その同一基板上に前記第 1 検出手段、第 2 検出手段及び制御手段を有したマイコンが形成されるとともに、当該電子コンパス及びマイコンを具備した基板が前記ハンドルスイッチケース内に配設されたことを特徴とする請求項 2 記載のターンシグナルスイッチ装置。

【請求項 4】

前記ハンドルスイッチケースには、所望の側のウィンカを点滅操作するための操作ノブと、該操作ノブの操作に連動するとともに磁気を発生する磁気発生手段と、該磁気発生手段からの磁気を検知することにより前記操作ノブの操作を非接触にて検知する磁気検知手段とを具備した操作手段が配設され、当該磁気検知手段による磁気を検知に基づき所望の側のウィンカを点滅させるよう構成されるとともに、当該磁気検知手段が前記基板に形成されたことを特徴とする請求項 3 記載のターンシグナルスイッチ装置。

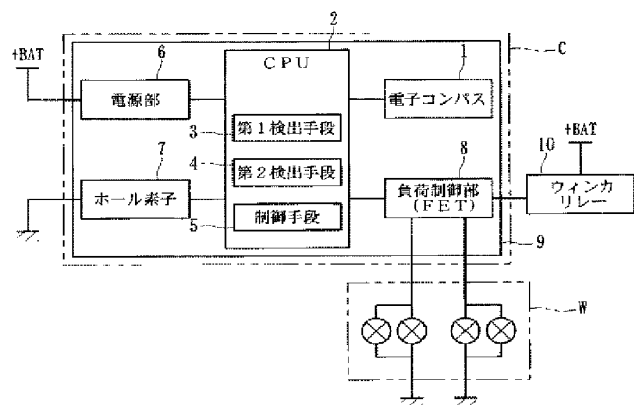
(57) 【要約】

【課題】車両の進行方向の変化を精度よく検出することができるとともに、当該車両の方向転換後のウィンカのキャンセルを自動的に且つ確実に行わせることができるターンシグナルスイッチ装置を提供する。

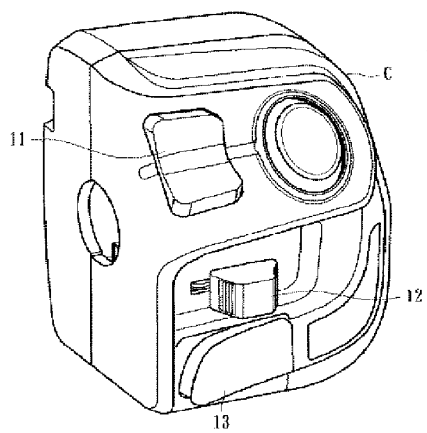
【解決手段】車両の進行方向に応じて出力電圧が変化する電子コンパス 1 と、電子コンパス 1 の出力電圧の変化をリアルタイムに検知することにより、車両が所定角度以上方向転換したことを検出し得る第 1 検出手段 3 と、第 1 検出手段 3 で車両が所定角度以上方向転換した時点から所定時間経過又は当該車両が所定距離移動したことを検出し得る第 2 検出手段 4 と、第 2 検出手段 4 で所定時間の経過又は所定距離の移動を検出したことを条件として、ウィンカの点滅を自動的に停止させてキャンセルする制御手段 5 とを具備したターンシグナルスイッチ装置である。

【選択図】 図 1

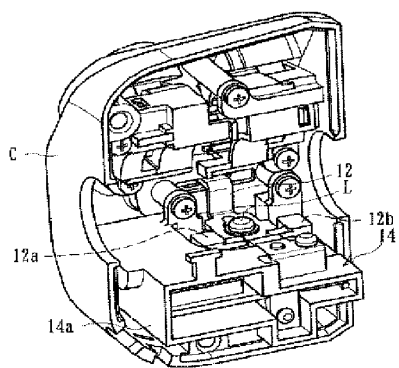
【図 1】



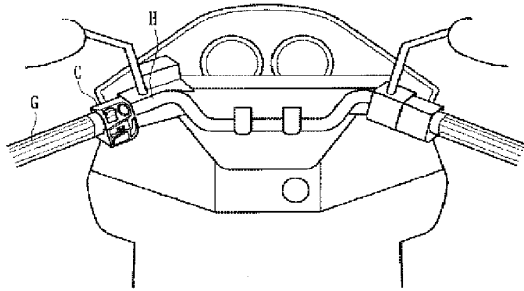
【図 2】



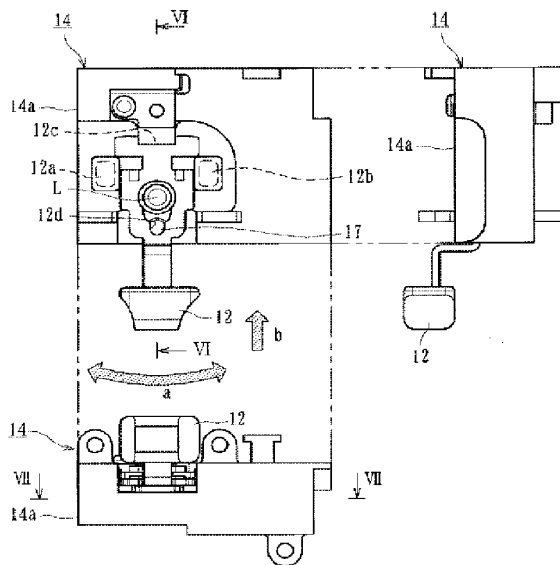
【図 3】



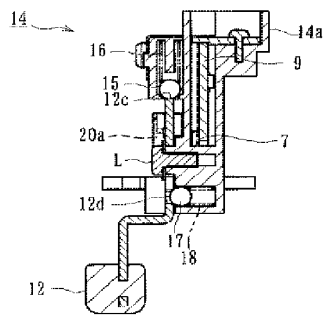
【圖 4】



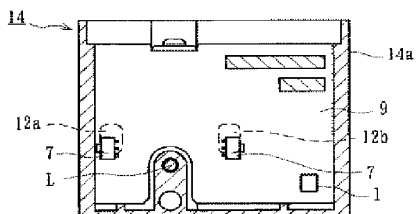
【圖 5】



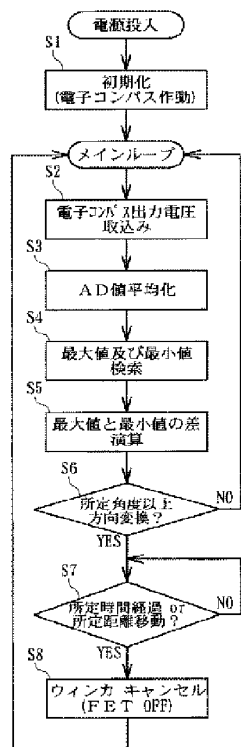
【圖 6】



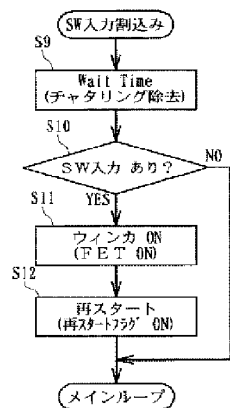
【図 7】



【図 8】



【図 9】



CLAIMS

[Claim(s)]

[Claim 1]

While blink of a near blinker of a request arranged by vehicles is enabled, it is the turn-signal-lamp-switch equipment which stopped blink of the blinker concerned automatically and whose cancellation was enabled,

Electronic compass from which output voltage changes according to a moving direction of vehicles,

A 1st detection means by which it can detect that vehicles changed the course by detecting change of output voltage of this electronic compass in real time in more than a predetermined angle,

A 2nd detection means by which it can detect that specified time elapse or the vehicles concerned carried out prescribed distance movement from a time of vehicles changing the course by this 1st detection means in more than a predetermined angle,

A control means which makes it stop automatically and cancels blink of the aforementioned blinker by this 2nd detection means on condition that a lapse of predetermined time or movement of prescribed distance was detected,

Providing turn-signal-lamp-switch equipment.

[Claim 2]

The turn-signal-lamp-switch equipment according to claim 1, wherein the aforementioned electronic compass is arranged in handle switch casing fixed near the grip grip of a handle bar which vehicles possess.

[Claim 3]

While the aforementioned electronic compass is formed on a substrate in which a predetermined electric circuit was formed and a microcomputer with said 1st detection means, the 2nd detection means, and a control means is formed on the same substrate, The turn-signal-lamp-switch equipment according to claim 2, wherein a substrate possessing electronic compass concerned and a microcomputer is arranged in the aforementioned handle switch casing.

[Claim 4]

The turn-signal-lamp-switch equipment according to claim 3 characterized by forming the magnetic detection means concerned in the aforementioned substrate while being constituted so that a desired near blinker may be blinked based on detection of magnetism a control means is arranged and according to the magnetic detection means concerned characterized by comprising the following.

An operating knob for carrying out blink operation of the desired near blinker at the aforementioned handle switch casing.

A magnetic generation means which generates magnetism while operation of this operating knob

is interlocked with.

A magnetic detection means which detects operation of the aforementioned operating knob in non-contact by detecting magnetism from this magnetic generation means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Field of the Invention]

[0001]

It relates to the turn-signal-lamp-switch equipment which stopped blink of the blinker concerned automatically and whose cancellation was enabled while blink of the near blinker of the request arranged by the two-wheeled vehicle of the present invention is enabled.

[Background of the Invention]

[0002]

Generally, the pair of right and left blinker is arranged by the two-wheeled vehicle, and when a driver operates the operating knob of a turn signal lamp switch at the time of a turn they to be [any on either side], it is constituted so that the blinker corresponding to the direction may be blinked and a direction instruction can be carried out. And after finishing a turn, in order to have stopped blink of the blinker and to have considered it as cancellation, it was constituted so that pressing operation of the operating knob of a turn signal lamp switch might be carried out, for example.

[0003]

conventionally in addition to the appropriate manual canceling mechanism it being alike and according to the operating knob like the above, The turn-signal-lamp-switch equipment for stopping and canceling blink of a blinker automatically is variously proposed after the end of a turn of a two-wheeled vehicle, and what was disclosed in the Patent document 1 as the example is mentioned. According to this conventional turn-signal-lamp-switch equipment, blink of the blinker was canceled to suitable timing by providing the sensor which detects the acceleration of the right and left directions (transverse direction) to the vehicle body of a two-wheeled vehicle, and the vehicle speed detector which detects the vehicle speed, respectively.

[0004]

The float type sensor which operates according to the inclination of the right and left directions of the vehicle body at the time of the turn of a two-wheeled vehicle is provided more specifically, It was constituted so that blink of a blinker might be canceled, on condition that a detection means for the deflection of this float type sensor to detect the inclination of a vehicle body (detection to a standing state from the bank state of a vehicle body), and to detect the vehicle speed synchronizing with rotation of a wheel was detected [predetermined speed].

[Citation list]

[Patent literature]

[0005]

[Patent document 1] JP,S57-87735,A

[Summary of Invention]

[Problem to be solved by the invention]

[0006]

However, in the above-mentioned conventional turn-signal-lamp-switch equipment, since it was making for the vehicle speed to have become more than fixed level into the conditions of automatic cancellation in addition to detection of the acceleration of right and left directions, there was a possibility that positive automatic cancellation could not be performed at the time of the turn by low speed running. Since detection (detection of the deflection of float) of the mechanical angle of gradient was aimed at by the float type sensor, the attaching position of the sensor concerned had restriction.

[0007]

The the object of this invention is as follows.

It was made in view of such a situation, and change of a moving direction of vehicles can be detected precisely.

Provide turn-signal-lamp-switch equipment which can make a blinker after a turn of the vehicles concerned cancel automatically and reliably.

[Means for solving problem]

[0008]

While blink of the near blinker of the request arranged by vehicles of the invention according to claim 1 is enabled, The electronic compass from which it is the turn-signal-lamp-switch equipment which stopped blink of the blinker concerned automatically, and whose cancellation was enabled, and output voltage changes according to the moving direction of vehicles, By detecting change of the output voltage of this electronic compass in real time, A 1st detection means by which it can detect that vehicles changed the course in more than the predetermined angle, A 2nd detection means by which it can detect that specified time elapse or the vehicles concerned carried out prescribed distance movement from the time of vehicles changing the course by this 1st detection means in more than a predetermined angle, The control means which makes it stop automatically and cancels blink of the aforementioned blinker by this 2nd detection means on condition that a lapse of predetermined time or movement of prescribed distance was detected was provided.

[0009]

The invention according to claim 2 was arranged in the turn-signal-lamp-switch equipment according to claim 1 in the handle switch casing fixed near the grip grip of the handle bar in which vehicles possess the aforementioned electronic compass.

[0010]

In the turn-signal-lamp-switch equipment according to claim 2, the invention according to claim 3 the aforementioned electronic compass, While being formed on the substrate in which the predetermined electric circuit was formed and forming the microcomputer with the above-

mentioned 1st detection means, the 2nd detection means, and a control means on the same substrate, the substrate possessing the electronic compass concerned and microcomputer was arranged in the aforementioned handle switch casing.

[0011]

In the turn-signal-lamp-switch equipment according to claim 3, the invention according to claim 4 to the aforementioned handle switch casing, The operating knob for carrying out blink operation of the desired near blinker, and the magnetic generation means which generates magnetism while operation of this operating knob is interlocked with, The control means possessing the magnetic detection means which detects operation of the aforementioned operating knob in non-contact by detecting the magnetism from this magnetic generation means is arranged, While being constituted so that a desired near blinker might be blinked based on detection of the magnetism by the magnetic detection means concerned, the magnetic detection means concerned was formed in the aforementioned substrate.

[Effect of the Invention]

[0012]

It detects that vehicles changed [according to invention of Claim 1] the course by detecting change of the output voltage of electronic compass in real time in more than the predetermined angle, And since it is made to stop automatically and blink of a blinker is canceled from the time of the vehicles concerned changing the course in more than a predetermined angle on condition that specified time elapse or the vehicles concerned carried out prescribed distance movement, While change of the moving direction of vehicles is precisely detectable, the blinker after the turn of the vehicles concerned can be made to cancel automatically and reliably.

[0013]

Since electronic compass was arranged in the handle switch casing fixed near the grip of the handle bar which vehicles possess, it can make change of the output voltage of the electronic compass accompanying the turn of vehicles detect more correctly according to invention of Claim 2.

[0014]

Since the substrate possessing a microcomputer with electronic compass, the 1st detection means, the 2nd detection means, and a control means was arranged in handle switch casing according to invention of Claim 3, In the handle switch casing concerned, the function of turn-signal-lamp-switch equipment can be completed, and application to the existing vehicles can be made easy.

[0015]

Since the magnetic detection means which constitutes a control means was formed in the substrate, the component of turn-signal-lamp-switch equipment and the component of a part of control means can be made to be able to form in the same substrate, and the substrate concerned can be made to share according to invention of Claim 4.

[Brief Description of the Drawings]

[0016]

[Drawing 1]The block diagram showing the whole turn-signal-lamp-switch equipment outline concerning the embodiment of the present invention

[Drawing 2]The perspective view showing the handle switch casing in the turn-signal-lamp-switch equipment

[Drawing 3]The perspective view showing the state where the turn unit in the turn-signal-lamp-switch equipment was attached in handle switch casing

[Drawing 4]The mimetic diagram showing the state where the handle switch casing to which the turn-signal-lamp-switch equipment was attached was attached to the handle bar

[Drawing 5]The 3rd page figure showing the turn unit

[Drawing 6]The VI-VI line cross sectional view in Fig.5

[Drawing 7]The VII-VII line cross sectional view in Fig.5

[Drawing 8]The flow chart which shows the control content in the turn-signal-lamp-switch equipment concerning the embodiment of the present invention

[Drawing 9]The flow chart which shows the control content in the turn-signal-lamp-switch equipment concerning the embodiment of the present invention

[Description of Embodiments]

[0017]

Hereafter, it describes specifically, referring to Drawings for the embodiment of the present invention.

The turn-signal-lamp-switch equipment concerning this embodiment, While blink of which one [of the right and left arranged by the side of the two-wheeled vehicle respectively] blinker is enabled, Blink of the blinker concerned is stopped automatically and cancellation is made possible, and as shown in Fig.4, it is formed in the handle switch casing C fixed near the grip grip G of the handle bar H which a two-wheeled vehicle possesses.

[0018]

The operating knob [in / as the handle switch casing C concerned is shown in Fig.2 and 3 / this turn-signal-lamp-switch equipment] 12 etc. The dimmer switch knob 11 which can perform change operation with the high beam of a headlight and low beam which a two-wheeled vehicle mounts, the horn switch knob 13 which can operate the horn which a two-wheeled vehicle mounts, etc. are formed, When the driver who gripped the grip grip G lengthens the finger and operates a request knob, operation of the various electrical equipment in a two-wheeled vehicle is enabled.

[0019]

The turn-signal-lamp-switch equipment in this embodiment, The substrate 9 in which the predetermined electric circuit was formed as shown in Fig.1, and the electronic compass 1 (geomagnetism sensor), It mainly comprises CPU2 which constitutes the microcomputer with which the 1st detection means 3, the 2nd detection means 4, and the control means 5 were formed, the power supply section 6 connected with the battery, Hall device 7 (magnetic detection means), and the load control section 8 which comprises FET (field effect transistor). While electrically being connected with the blinker relay 10 connected with the battery, the load control

section 8, It is electrically connected with the blinker W which vehicles possess, it is constituted so that ON/OFF of the blinker W can be controlled, for example, IPD (intelligent power device) can be used.

[0020]

The electronic compass 1 comprises the chip shape thing called the geomagnetism sensor from which output voltage changes according to the moving direction of vehicles, and is attached to the predetermined region of the substrate 9 (refer to Fig.7). Namely, since an internal MI element will carry out an impedance change by change of geomagnetism, for example and the output voltage of the electronic compass 1 will also change according to it if the moving direction of vehicles changes, If change and variation of the output voltage concerned are detected in real time while being able to detect the direction which vehicles have turned to, if the output voltage concerned is detected, the existence of a turn of vehicles and the angle of the turn are detectable.

[0021]

While operating with the electric power which is attached to the substrate 9 and supplied from the power supply section 6, CPU2, It is for transmitting the output voltage from the electronic compass 1, the detection signal from Hall device 7, etc., and controlling the load control section 8 based on the signal concerned, and the operation (stop of blink or blink) of a blinker can be controlled. In this CPU2, the 1st detection means 3, the 2nd detection means 4, and the control means 5 are formed.

[0022]

The 1st detection means 3 can detect that vehicles changed the course in more than the predetermined angle (for example, about 70 degrees) by detecting change (azimuth information of an X axial direction and Y axial direction) of the output voltage of the electronic compass 1 in real time (temporal). The 1st detection means 3 carries out the AD translation of the output voltage value, and is having the AD translation value concerned accumulated more specifically while it incorporates the output voltage value detected with the electronic compass 1 for every fixed time. And the difference of the maximum and the minimum in the accumulated AD translation value (the X-axis and Y-axis) is calculated, and when it is more than the value which the difference concerned defined previously, the judgment that vehicles changed the course in more than the predetermined angle is enabled.

[0023]

That is, since the variation of the output voltage (AD translation value is also the same) of the electronic compass 1 and the turn angle of vehicles correspond previously, when the 1st detection means 3 detects change of the output voltage (AD translation value) in the electronic compass 1, they can detect the turn of vehicles. The 1st detection means 3 calculates the variation of the output voltage of electronic compass as a differential quantity, and if output voltage more than fixed level changes, it can constitute it so that it can be detected as vehicles having carried out the predetermined angle turn.

[0024]

The 2nd detection means 4 can detect that specified time elapse or the vehicles concerned carried

out prescribed distance movement from the time of vehicles changing the course by the 1st detection means 3 in more than a predetermined angle. Namely, the thing provided with the timer for detecting having carried out specified time elapse of the 2nd detection means 4 from the time of more than a predetermined angle changing the course, Or although it had the distance detecting means which detects that vehicles carried out prescribed distance movement from the time of more than a predetermined angle changing the course, it may be any, and also these may be used together.

[0025]

when it is made into the 2nd detection means 4 to detect for the time of it being alike and more than a predetermined angle changing the course to appropriate vehicles to have carried out prescribed distance movement, the following forms can be adopted in order to detect movement of the prescribed distance concerned. For example, the thing which detects movement of prescribed distance based on the signal from the speed sensor which vehicles mount, Or what is provided with receiving means (not shown) for acquiring the present position data in global positioning systems, such as GPS (global position system: Global Positioning System), and detects movement of prescribed distance from the acquired present position data is mentioned.

[0026]

The control means 5 is for making it stop automatically and canceling blink of the blinker W by controlling the load control section 8 by the 2nd detection means 4, on condition that a lapse of predetermined time or movement of prescribed distance was detected. Since it can ** and the blinker W after the turn of a two-wheeled vehicle can be made to cancel automatically, While being able to improve operativity, using the cancellation operation concerned as unnecessary, it is reliably avoidable to run a driver forgetting cancellation of the blinker W and blinking the blinker W concerned.

[0027]

In this embodiment, when a driver does arbitrary operation of the operating knob 12 manually, in addition to the mechanism which makes it stop automatically and cancels blink of the blinker W by the control means 5, it is constituted so that blink of the blinker W may be stopped and it can cancel, so that it may mention later. Thereby, it cannot be concerned with control by the control means 5, but a driver can make blink of the blinker W cancel to arbitrary timing.

[0028]

The operating knob 12 for on the other hand carrying out blink operation of the desired near blinker at the handle switch casing C, The magnets 12a and 12b (magnetic generation means) which are attached to the end face side right and left of the operating knob 12, and generate magnetism while operation of this operating knob 12 is interlocked with, The control means possessing pair of right and left Hall device 7 (magnetic detection means) which detects operation of the right and left directions of the operating knob 12 in non-contact by detecting the magnetism from these magnets 12a and 12b (magnetic generation means), respectively is arranged, While being constituted so that the desired near blinker W may be blinked based on detection of the magnetism by pair of Hall device 7 (magnetic detection means) concerned, pair

of Hall device 7 (magnetic detection means) concerned is formed in the substrate 9.

[0029]

Here, in this embodiment, as shown in Fig.3, the turn unit 14 is arranged in the handle switch casing C. As this turn unit 14 changes as a housing and shows the case 14a made of resin to Fig.5 - 7, while the operating knob 12 is pivotably attached around the center of the swing axis L, the substrate 9 by which the electronic compass 1, CPU2, etc. were formed in the inside of the case 14a is arranged.

[0030]

As shown in Fig.6, the springs 16 and 18 and the balls 15 and 17 are arranged inside, and it is constituted by the case 14a so that energization force can be given to the swing operation of the operating knob 12. Namely, the ball 15 energized by the spring 16, While being constituted so that it may abut with the end face 12c of the operating knob 12 and the operating knob 12 concerned can always be energized in a center valve position (initial position), the ball 17 energized by the spring 18, It abuts with 12d of long hole inner periphery edge of the operating knob 12, and it is constituted so that moderation can be given to the operating knob 12 concerned.

[0031]

While formed protruding of the operating knob 12 is carried out from the case 14a, as mentioned already, the swing operation of it is made possible (in the direction of a in Fig.5) from a center valve position at right and left around the center of the swing axis L provided by the case 14a concerned, and pushing operation of it is made possible in the direction of b in the said figure from the center valve position. 12 d of long holes extended to the longitudinal direction are formed in this operating knob 12, and formed protruding of the swing axis L is carried out within the long hole 12d concerned. And when pushing operation of the operating knob 12 is carried out, 12 d of long holes will permit movement in the direction of b of the operating-knob 12 whole, the energization force of the spring 16 will be resisted, and the operating knob 12 concerned will move in the direction. After pushing operation, when a finger is lifted from the operating knob 12 concerned, the operating knob 12 will move according to the energization force of the spring 16, and it will return to a center valve position (state of Fig.5).

[0032]

The pair of magnets 12a and 12b (magnetic generation means) are provided by the operating knob 12, respectively, and the pair of magnets 12a and 12b concerned are made movable with operation of the operating knob 12 concerned at it. These pair of magnets 12a and 12b may comprise the thing which mixed to the plastic the magnetic substance powder which it was sufficient for when couple formation was carried out at the right and left of the operating knob 12 and magnetism was generated, respectively, for example, is tinged with magnetism, and was molded, or a general-purpose permanent magnet.

[0033]

As shown in Fig.7, pair of Hall device 7 (hole IC) as a magnetism detecting means is formed in the substrate 9, and it is made possible at it to change output voltage according to change of the

magnetism accompanying movement of the magnets 12a and 12b. Here, resistance changes according to the strength of the magnetism given from a magnet, output voltage is changed, and in this embodiment, if a Hall device approaches the magnet 12a or the magnet 12b, output voltage serves as a low value (L), and if it separates, it will serve as a high value (H). It is electrically connected with CPU2 (refer to Fig.1), and pair of Hall device 7 (magnetic detection means) is constituted so that it can transmit to the CPU2 concerned by making into an electrical signal change of the output voltage which each Hall device 7 detected.

[0034]

the magnet 12a and the magnet 12b, while changing into the state where opposed with right and left Hall device 7, respectively, and it approached when [appropriate] it is alike and the operating knob 12 is in a center valve position, If the magnet 12b separates from Hall device 7 and the magnet 12a makes the operating knob 12 concerned swing leftward, maintaining a proximity state with Hall device 7 if the operating knob 12 is made to swing rightward, The magnet 12b maintaining a proximity state with Hall device 7, it is set up so that the magnet 12a may separate from Hall device 7. If pushing operation of the operating knob 12 is carried out that blink of a blinker should be canceled, it will change both the magnet 12a and the magnet 12b into the state where it separated from Hall device 7. Thereby, the blinker W according to the output voltage of each Hall device 7 can be made to operate it.

[0035]

Next, based on Fig.8 and the flow chart of 9, it describes about the control content in the turn-signal-lamp-switch equipment concerning this embodiment.

First, as shown in Fig.8, the electronic compass 1 is operated by making an ignition switch into on position, and initialization in CPU2 is made (S1). And while acquiring the output voltage value detected with the electronic compass 1 for every fixed time, carrying out the AD translation of the output voltage value (S2), and equalizing the AD translation value (the X-axis and Y-axis) concerned, it is made to memorize in CPU2 and accumulates (S3).

[0036]

then -- searching the maximum (MAX) and the minimum (MIN) in the accumulated total AD translation value -- the difference of (S4), and the maximum concerned and minimum -- calculating (S5) -- It is judged by the 1st detection means 3 whether the difference of the maximum and the minimum is beyond a specified value (that is, did vehicles change the course in more than the predetermined angle or not?) (S6), and it is **. When a difference is beyond a specified value in S6, it proceeds to S7 and it is judged whether specified time elapse or the vehicles concerned carried out prescribed distance movement from the time of vehicles changing the course by the 1st detection means 3 by the 2nd detection means 4 in more than a predetermined angle. If judged with specified time elapse or the vehicles concerned having carried out prescribed distance movement from the time of vehicles changing the course in more than a predetermined angle, the blinker W will be stopped by control by the control means 5 (S8), and it will return to S2 again.

[0037]

appropriate operation of as opposed to [it is alike and] the operating knob 12 should do -- if the operation is detected by Hall device 7, it will change to the interruption processing shown in Fig.9. In this interruption processing, first, after removing chattering through predetermined waiting time (S9), it is judged whether operation was made for the operating knob 12 in right and left directions (S10). (was blink operation of any of the right and left blinker W they are carried out or not?)

[0038]

When there is operation of the right and left directions concerned, the blinker W is blinked by the load control section 8 (S11), and when [which sets the flag for a new start (S12)] there is no operation concerned on the other hand, it returns to the main loop which interruption processing ends and is shown in the flow chart of Fig.8. It will ** and search of the maximum of S4 and the minimum and the operation of the difference of the maximum and the minimum will be made for the AD translation value accumulated from the time of setting a flag in S12.

[0039]

It detects that vehicles changed [according to the above-mentioned embodiment] the course by detecting change of the output voltage of the electronic compass 1 in real time in more than the predetermined angle, And since it is made to stop automatically and blink of the blinker W is canceled from the time of the vehicles concerned changing the course in more than a predetermined angle on condition that specified time elapse or the vehicles concerned carried out prescribed distance movement, While change of the moving direction of vehicles is precisely detectable, the blinker W after the turn of the vehicles concerned can be made to cancel automatically and reliably.

[0040]

Since the electronic compass 1 was arranged in the handle switch casing C fixed near the grip G of the handle bar H which vehicles possess, it can make change of the output voltage of the electronic compass 1 accompanying the turn of vehicles detect more correctly. The receiving means of the antenna etc. which acquire the present position data in global positioning systems, such as GPS (global position system: Global Positioning System), in the handle switch casing C is made to arrange. It may be made to detect the migration length of the vehicles by the 2nd detection means 4 in consideration of the position data received in the receiving means concerned.

[0041]

Since the substrate 9 possessing a microcomputer (CPU2) with the electronic compass 1, the 1st detection means 3, the 2nd detection means 4, and the control means 5 was arranged in the handle switch casing C, In the handle switch casing C concerned, the function of turn-signal-lamp-switch equipment can be completed, and application to the existing vehicles can be made easy. It may be made to form in the microcomputer of others [be / they / all the 1st detection means 3, the 2nd detection means 4 and control means 5 or any], etc.

[0042]

Since Hall device 7 (magnetic detection means) which constitutes a control means was formed in

the substrate 9, the component of turn-signal-lamp-switch equipment and the component (namely, Hall device 7) of a part of control means can be made to be able to form in the same substrate 9, and the substrate 9 concerned can be made to share. It may be made to form Hall device 7 which constitutes a control means in a separate substrate which is different in the substrate 9.

[0043]

According to this embodiment, based on operation of the operating knob 12 The movable magnets 12a and 12b, The magnetic detecting element (Hall device 7) which changes output voltage according to change of the magnetism accompanying movement of a magnet (12a, 12b) is provided, Since it judges whether it is **** which makes which blinker W of the right and left which a two-wheeled vehicle possesses blink or switch off (blinker display function) based on the output voltage from Hall device 7 concerned, it is based on the decided result and the predetermined blinker W is made to blink or switch off, Not using contact, a blinker can be operated in non-contact like the former. Therefore, the life decline resulting from wear of contact is avoidable. It is good also as magnetic detecting elements (for example, angle sensor etc.) of other forms which replace with the Hall device concerned, and resistance changes [magnetic detecting elements] according to change of the magnetism given from a magnet, and change output voltage.

[0044]

As mentioned above, although described about this actual form, the present invention is not limited to this and it may be made to arrange the electronic compass 1 to a different part from the handle switch casing C, for example. In this embodiment, although switching operation is detected using Hall device 7, It may be made to carry out switching operation in the conventional contact structure (what movable contact is carried out at the operating-knob side, ***** formation of the stationary contact is carried out at the case side, it follows on operation of the operating knob concerned, and movable contact contacts or separates with a stationary contact, and forms a predetermined electric circuit). Although applied to the turn signal lamp switch attached to the handle bar of a two-wheeled vehicle in this embodiment, also in other vehicles possessing handle bars, such as a snowmobile, three flowers or a four-wheel buggy, it is applicable.

[Industrial applicability]

[0045]

By detecting change of the output voltage of the electronic compass from which output voltage changes according to the moving direction of vehicles, and this electronic compass in real time, A 1st detection means by which it can detect that vehicles changed the course in more than the predetermined angle, A 2nd detection means by which it can detect that specified time elapse or the vehicles concerned carried out prescribed distance movement from the time of vehicles changing the course by this 1st detection means in more than a predetermined angle, If it is turn-signal-lamp-switch equipment possessing the control means which makes it stop automatically and cancels blink of a blinker by this 2nd detection means on condition that a lapse of

predetermined time or movement of prescribed distance was detected, It is applicable to that etc. to which the thing from which appearance shape differs, or other functions were added.

[Explanations of letters or numerals]

[0046]

- 1 Electronic compass (geomagnetism sensor)
- 2 CPU (microcomputer)
- 3 The 1st detection means
- 4 The 2nd detection means
- 5 Control means
- 6 Power supply section
- 7 Hall device (magnetic detection means)
- 8 Load control section
- 9 Substrate
- 10 Blinker relay
- 11 Dimmer switch knob
- 12 Operating knob
- 12a and 12b Magnet (magnetic generation means)
- 13 Horn switch knob
- 14 Turn unit
- 15 Ball
- 16 Spring
- 17 Ball
- 18 Spring
- C Handle switch casing
- H Handle bar
- G Grip grip

TECHNICAL FIELD

[Field of the Invention]

[0001]

It relates to the turn-signal-lamp-switch equipment which stopped blink of the blinker concerned automatically and whose cancellation was enabled while blink of the near blinker of the request arranged by the two-wheeled vehicle of the present invention is enabled.

PRIOR ART

[Background of the Invention]

[0002]

Generally, the pair of right and left blinker is arranged by the two-wheeled vehicle, and when a

driver operates the operating knob of a turn signal lamp switch at the time of a turn they to be [any on either side], it is constituted so that the blinker corresponding to the direction may be blinked and a direction instruction can be carried out. And after finishing a turn, in order to have stopped blink of the blinker and to have considered it as cancellation, it was constituted so that pressing operation of the operating knob of a turn signal lamp switch might be carried out, for example.

[0003]

conventionally in addition to the appropriate manual canceling mechanism it being alike and according to the operating knob like the above, The turn-signal-lamp-switch equipment for stopping and canceling blink of a blinker automatically is variously proposed after the end of a turn of a two-wheeled vehicle, and what was disclosed in the Patent document 1 as the example is mentioned. According to this conventional turn-signal-lamp-switch equipment, blink of the blinker was canceled to suitable timing by providing the sensor which detects the acceleration of the right and left directions (transverse direction) to the vehicle body of a two-wheeled vehicle, and the vehicle speed detector which detects the vehicle speed, respectively.

[0004]

The float type sensor which operates according to the inclination of the right and left directions of the vehicle body at the time of the turn of a two-wheeled vehicle is provided more specifically, It was constituted so that blink of a blinker might be canceled, on condition that a detection means for the deflection of this float type sensor to detect the inclination of a vehicle body (detection to a standing state from the bank state of a vehicle body), and to detect the vehicle speed synchronizing with rotation of a wheel was detected [predetermined speed].

EFFECT OF THE INVENTION

[Effect of the Invention]

[0012]

It detects that vehicles changed the course by detecting change of the output voltage of electronic compass in real time in invention of Claim 1 in more than the predetermined angle, And from a time of the vehicles concerned changing the course in more than a predetermined angle, on condition that specified time elapse or the vehicles concerned carried out prescribed distance movement, it is made to stop automatically and blink of a blinker is canceled.

Therefore, while change of a moving direction of vehicles is precisely detectable, a blinker after a turn of the vehicles concerned can be made to cancel automatically and reliably.

[0013]

In invention of Claim 2, electronic compass was arranged in handle switch casing fixed near the grip grip of a handle bar which vehicles possess.

Therefore, change of output voltage of electronic compass accompanying a turn of vehicles can be made to detect more correctly.

[0014]

In invention of Claim 3, a substrate possessing a microcomputer with electronic compass, the 1st detection means, the 2nd detection means, and a control means was arranged in handle switch casing.

Therefore, in the handle switch casing concerned, a function of turn-signal-lamp-switch equipment can be completed, and application to the existing vehicles can be made easy.

[0015]

In invention of Claim 4, a magnetic detection means which constitutes a control means was formed in a substrate.

Therefore, a component of turn-signal-lamp-switch equipment and a component of a part of control means can be made to be able to form in the same substrate, and the substrate concerned can be made to share.

TECHNICAL PROBLEM

[Problem to be solved by the invention]

[0006]

However, in the above-mentioned conventional turn-signal-lamp-switch equipment, since it was making for the vehicle speed to have become more than fixed level into the conditions of automatic cancellation in addition to detection of the acceleration of right and left directions, there was a possibility that positive automatic cancellation could not be performed at the time of the turn by low speed running. Since detection (detection of the deflection of float) of the mechanical angle of gradient was aimed at by the float type sensor, the attaching position of the sensor concerned had restriction.

[0007]

The the object of this invention is as follows.

It was made in view of such a situation, and change of a moving direction of vehicles can be detected precisely.

Provide turn-signal-lamp-switch equipment which can make a blinker after a turn of the vehicles concerned cancel automatically and reliably.

MEANS

[Means for solving problem]

[0008]

While blink of the near blinker of the request arranged by vehicles of the invention according to claim 1 is enabled, The electronic compass from which it is the turn-signal-lamp-switch equipment which stopped blink of the blinker concerned automatically, and whose cancellation

was enabled, and output voltage changes according to the moving direction of vehicles, By detecting change of the output voltage of this electronic compass in real time, A 1st detection means by which it can detect that vehicles changed the course in more than the predetermined angle, A 2nd detection means by which it can detect that specified time elapse or the vehicles concerned carried out prescribed distance movement from the time of vehicles changing the course by this 1st detection means in more than a predetermined angle, The control means which makes it stop automatically and cancels blink of the aforementioned blinker by this 2nd detection means on condition that a lapse of predetermined time or movement of prescribed distance was detected was provided.

[0009]

The invention according to claim 2 was arranged in the turn-signal-lamp-switch equipment according to claim 1 in the handle switch casing fixed near the grip of the handle bar in which vehicles possess the aforementioned electronic compass.

[0010]

In the turn-signal-lamp-switch equipment according to claim 2, the invention according to claim 3 the aforementioned electronic compass, While being formed on the substrate in which the predetermined electric circuit was formed and forming the microcomputer with the above-mentioned 1st detection means, the 2nd detection means, and a control means on the same substrate, the substrate possessing the electronic compass concerned and microcomputer was arranged in the aforementioned handle switch casing.

[0011]

In the turn-signal-lamp-switch equipment according to claim 3, the invention according to claim 4 to the aforementioned handle switch casing, The operating knob for carrying out blink operation of the desired near blinker, and the magnetic generation means which generates magnetism while operation of this operating knob is interlocked with, The control means possessing the magnetic detection means which detects operation of the aforementioned operating knob in non-contact by detecting the magnetism from this magnetic generation means is arranged, While being constituted so that a desired near blinker might be blinked based on detection of the magnetism by the magnetic detection means concerned, the magnetic detection means concerned was formed in the aforementioned substrate.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[0016]

[Drawing 1] The block diagram showing the whole turn-signal-lamp-switch equipment outline concerning the embodiment of the present invention

[Drawing 2] The perspective view showing the handle switch casing in the turn-signal-lamp-switch equipment

[Drawing 3] The perspective view showing the state where the turn unit in the turn-signal-lamp-

switch equipment was attached in handle switch casing

[Drawing 4] The mimetic diagram showing the state where the handle switch casing to which the turn-signal-lamp-switch equipment was attached was attached to the handle bar

[Drawing 5] The 3rd page figure showing the turn unit

[Drawing 6] The VI-VI line cross sectional view in Fig.5

[Drawing 7] The VII-VII line cross sectional view in Fig.5

[Drawing 8] The flow chart which shows the control content in the turn-signal-lamp-switch equipment concerning the embodiment of the present invention

[Drawing 9] The flow chart which shows the control content in the turn-signal-lamp-switch equipment concerning the embodiment of the present invention

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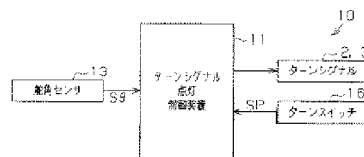
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(54) 【発明の名称】 ターンシグナル点灯制御装置



[0001] 本発明は、車両のターンシグナルの点灯制御に係り、詳しくは点灯しているターンシグナルを自動消灯させるターンシグナル点灯制御装置に関する。

[0008] 車両には、右左折や進路変更の方向を周囲に示すターンシグナルが備えられている。運転席のステアリング近傍に備えられるターンレバーの操作に応じて、ターンシグナル点灯制御装置はターンシグナルの点灯及び消灯の制御を行う。そして、ターンシグナル点灯制御装置は、車両の右左折又は車線変更の際に適切なタイミングでターンシグナルを消灯させる制御を行う。例えば、特許文献1に記載のターンシグナル点灯制御装置は、ステアリングの舵角量を検出する舵角センサの検出結果に基づき、消灯条件が成立したか否かを判断する。そして、ターンシグナル点灯制御装置は、消灯条件が成立した旨判断したとき、ターンシグナルを消灯させる。

[0003] まず、右左折時におけるターンシグナルの自動消灯に係る判断手法について説明する。

右折する場合には、ステアリングが中立位置から時計回りに回動操作された後に、反時計回りに戻し操作される。従って、右折の際には、図7に示すように、舵角センサを通じて検出される操舵角 θ は正弦波状に半周期分だけ

推移する。ステアリングの中立位置を基準として、キャンセル準備角 θ_1 及び同キャンセル準備角 θ_1 より小さい角度であるキャンセル角 θ_2 が設定されている。例えば、右折に際して、時計回りにステアリングが回動操作され、操舵角 θ がキャンセル準備角 θ_1 に達した後に、ステアリングが反時計回りに戻し操作されてキャンセル角 θ_2 以下となったときに、右折に係る消灯条件が成立した旨判断される。そして、ターンシグナルが消灯される。左折の際も同様に、ステアリングが反時計回りに回動操作されて操舵角 θ がキャンセル準備角 θ_1 に達した後、時計回りに戻し操作されてキャンセル角 θ_2 以下となったときに消灯される。

[0004] 次に、車線変更時におけるターンシグナルの自動消灯に係る判断手法について説明する。

右車線に車線変更する場合には、ステアリングが中立位置から時計回りに回動操作された後に、反時計回りに戻し操作される。従って、図8に示すように、舵角センサを通じて検出される操舵角 θ は正弦波状に一周分だけ推移する。ここで、上記右折の場合に比べて、車線変更が完了するまでに半周期分だけ余計にステアリングの操作が必要となっている。この半周期分の操作により、車両は車線変更前の進路方向に戻される。

[0005] 従って、車線変更において、操舵角 θ はステアリングの回動操作に伴う第1ピーク P_1 と、戻し操作に伴う第2ピーク P_2 とが検出される。両ピーク P_1 、 P_2 は、例えば、波形の傾きがゼロ、すなわち操舵角 θ の増減がゼロとなったことを条件として判断される。両ピーク P_1 、 P_2 が検出されたとき、車線変更に係る消灯条件が成立した旨判断され、ターンシグナルが消灯される。左車線に車線変更する場合も、上記同様に両ピーク P_1 、 P_2 が検出されたときにターンシグナルが消灯される。

[0006] 以上のように、車線変更及び右左折の何れの場合であってもターンシグナルが自動消灯される。

[0007] 【特許文獻 1】 特開平11-70833号公報

[0012]

[0008] ところで、上記ターンシグナル点灯制御装置においては、右左折時に車線変更に係る消灯条件が成立してしまうおそれがある。具体的には、右左折時において、運転者によって必ずしもステアリングがスムーズに回動操作されるわけではなく、そのときの状況に応じてステアリングが操作される。例えば、右左折にあたって車両の進路方向を修正する場合もあるし、運転者が意図せずステアリングを僅かに回動操作してしまう場合もある。これらの場合には、図9に示すように、車両は先の図7に示されるような回動操作による円弧状の軌跡80ではなく、蛇行した軌跡81を経て右折する。よって、図10に示すように、軌跡81に対応するステアリングの回動操作時に操舵角 θ の第1ピーク P_1 及び第2ピーク P_2 が検出されるおそれがある。この場合には、右左折中にも関わらず、車線変更に係る消灯条件が成立した旨の判断がされて、ターンシグナルが消灯される。このように、右左折時に適切なタイミングでターンシグナルが消灯されないおそれがあった。

[0009] 本発明の目的は、右左折時において、ターンシグナルの誤消灯を防止することができるターンシグナル点灯制御装置を提供することにある。

[0010] 以下、上記目的を達成するための手段及びその作用効果について説明する。

[0015] 請求項1に記載の発明は、車両の運転席近傍に設けられる操作手段が操作された際、ターンシグナルをそれまでの消灯状態から点灯状態に切り換え、回動態様検出手段により車両の回動態様に応じて検出される所定の検出値に基づき前記車両の回動態様を検知し、前記検出値が、予め右左折時に検出が想定される検出値を基準に設定される第1の値に達した後、前記第1の値より小さい第2の値となったとき消灯条件が成立した旨判断し、前記ターンシグナルを自動消灯させるターンシグナル点灯制御装置において、前記検出値が前記第1の値未満の場合、ステアリングが第1の方向に回動操作された後に、前記第1の方向と逆方向である第2の方向に回動操作が開始された際に検出される前記検出値の第1のピークと、同第1のピークが検出された後、再び前記第1の方向に回動操作が開始された際に検出される前記検出値の第2のピークと、を検出したとき、消灯条件が成立した旨の判断をして、前記ターンシグナルを消灯させることをその要旨としている。

同構成によれば、回動態様検出手段の検出値が第1の値に達するか否かに基づき消灯条件が変わる。すなわち、検出値が第1の値に達したときには、右左折であるとして、検出値が第2の値となったときに消灯条件が成立した旨判断され、ターンシグナルが消灯される。一方、検出値が第1の値未満のときには、車線変更であるとして、検出値が第1ピーク及び第2ピークを検出したとき、消灯条件が成立した旨判断され、ターンシグナルが自動消灯される。ここで、右左折中に、例えば、車両の進路方向を再調整する場合や、運転者が意図せずステアリングを回動操作してしまう場合がある。こういった場合に、検出値が第1ピーク及び第2ピークを検出したとしても、検出値が第1の値に達した以降は、両ピークの検出を行わないためターンシグナルが自動消灯されることはない。これにより、右左折時におけるターンシグナルの誤消灯を防止することができる。

[0012] 請求項 2 に記載の発明は、請求項 1 に記載のターンシグナル点灯制御装置において、前記第 1 のピークにおける検出値が前記第 1 の値未満の場合に、前記第 2 のピークを検出したとき、消灯条件が成立した旨の判断をして前記ターンシグナルを消灯させることをその要旨としている。

[0013] 同構成によれば、第 1 のピークにおける検出値が前記第 1 の値未満の場合には、車線変更であるとして、その後、第 2 のピークが検出されたとき、消灯条件が成立した旨の判断がされ、ターンシグナルが消灯される。これにより、ターンシグナル点灯制御装置は、第 1 のピークが検出されたとき、検出値と第 1 の値との比較を行えばよい。よって、より容易に右左折時におけるターンシグナルの誤消灯を防止することができる。

[0014] 請求項 3 に記載の発明は、車両の運転席近傍に設けられる操作手段が操作された際、ターンシグナルをそれまでの消灯状態から点灯状態に切り換えるとともに、前記舵角センサの検出結果に基づき、右左折又は車線変更に係る消灯条件が成立した旨判定されたとき前記ターンシグナルの自動消灯が実行されるターンシグナル点灯制御装置において、前記舵角センサにより検出されるステアリングの操舵角が、予め右左折時に検出が想定される操舵角を基準に設定されるしきい値に達した場合には右左折に係る消灯条件が成立するか否か判定を行い、前記しきい値未満の場合には車線変更に係る消灯条件が成立するか否か判定を行うことをその要旨としている。

[0015] 同構成によれば、舵角センサにより検出される操舵角がしきい値に達するか否かに基づき、右左折及び車線変更の何れかに係る消灯条件にて判定が行われる。しきい値は右左折時に検出が想定される操舵角を基準に設定されている。これにより、右左折時には右左折に係る消灯条件にて適切に判定され、車線変更時には車線変更に係る消灯条件にて適切に判定される。ここで、右左折中に、例えば、車両の進路方向を再調整する場合や、運転者が意図せずステアリングを回動操作してしまう場合がある。こういった場合に、操舵角が車線変更の消灯条件が成立する状態で検出されたとしても、操舵角がしきい値に達している場合には、車線変更の消灯条件が成立するか否かの判定は行われないためターンシグナルが自動消灯されることはない。これにより、右左折時におけるターンシグナルの誤消灯を防止することができる。

[0016] 本発明によれば、ターンシグナル点灯制御装置において、右左折時において、ターンシグナルの誤消灯を防止することができる。

[0018] (第 1 の実施形態)

以下、本発明に係るターンシグナル点灯制御装置を車両の方向指示装置に具体化した第 1 の実施形態を図面に従って説明する。

[0019] 図 1 (a) に示すように、方向指示装置は、車両 1 の前後にそれぞれ設けられる左右一対のターンシグナル 2、3 を点灯させることにより自車両の進行方向を他車両の運転者等に知らせる方向指示動作を行うものである。図 1 (b) に示すように、車両 1 のステアリングコラム 5 にターンレバー 4 の基端部が片持ち支持されており、同ターンレバー 4 の先端部は、ステアリングコラム 5 の外側に突出している。ターンレバー 4 の基端部は、ステアリングコラム 5 に対して、同ステアリングコラム 5 の内部に配置された回転軸を中心として、ステアリング 6 の回転方向に沿った方向へ所定角度だけ傾動可能に支持されている。ターンレバー 4 の傾動操作を通じて、前記方向指示動作が実行される。

[0023] 具体的には、ターンレバー 4 は、図 1 (b) に一点鎖線で示される操作中立位置 P に保持されている。そして、ターンレバー 4 は、操作中立位置 P から上方向に傾動操作されると、左折操作位置 P L まで傾動する。これにより、左側のターンシグナル 2 が点灯を開始する。また、ターンレバー 4 は、操作中立位置 P から下方向に傾動操作されると、右折操作位置 P R まで傾動する。これにより、右側のターンシグナル 3 が点灯を開始する。ターンレバー 4 への操作力が解除されると、図示しない復帰機構の作用により、ターンレバー 4 は操作中立位置 P へ復帰する。すなわち、本例においては、モーメンタリ式のターンレバーが採用されている。なお、ターンレバー 4 が操作中立位置 P に復帰しても、後述する消灯条件が成立しない限り、ターンシグナル 2、3 の点灯は継続される。

[0021] 次に、方向指示装置の電氣的構成について説明する。

図 2 に示されるように、方向指示装置 10 は、図示しない CPU、ROM 及び RAM 等から構成されたターンシグナル点灯制御装置 11 を備えている。ターンシグナル点灯制御装置 11 の ROM には、ターンシグナル 2、3 の点灯及び消灯を制御するための点灯制御プログラム等が格納されている。RAM は ROM に格納された点灯制御プログラムを展開して CPU が各種の処理を実行するための作業領域である。

[0024] ターンシグナル点灯制御装置 11 には、舵角センサ 13 が接続されている。舵角センサ 13 は、運転者によってステアリング 6 が回転操作された際に、その回転角度である操舵角 θ を検出し、その検出された操舵角 θ に応じて

舵角検出信号 S_θ をターンシグナル点灯制御装置11へ出力する。なお、舵角センサ13は車両の進行方向に対する回動態様を示す情報である操舵角 θ を検出する回動態様検出手段として機能する。

[0025] また、ターンシグナル点灯制御装置11には、ターンレバー4の操作に連動してオンオフするターンスイッチ16が接続されている。ターンスイッチ16は、ターンレバー4が操作中立位置Pから左折操作位置PLへ傾動操作されたことを検出すると、その旨を示す操作位置検出信号SPをターンシグナル点灯制御装置11に出力する。また、ターンスイッチ16は、ターンレバー4が右折操作位置PRに回動操作されたことを検出すると、その旨を示す操作位置検出信号SPをターンシグナル点灯制御装置11に出力する。

[0024] ターンシグナル点灯制御装置11には、ターンシグナル2、3が接続されている。ターンシグナル点灯制御装置11は、前記操作位置検出信号SPに基づいてターンレバー4の各操作位置PL、PRへの操作を検出すると、この検出結果に応じてターンシグナル2、3を点灯させる。

[0025] また、ターンシグナル点灯制御装置11は、ターンシグナル2、3の点灯を開始したとき、舵角センサ13からの検出信号 S_θ に基づいて、消灯条件が成立したか否かの判断を行う。そして、ターンシグナル点灯制御装置11は、消灯条件が成立した旨の判断をしたとき、ターンシグナル2、3を消灯させる。

[0026] ターンシグナル点灯制御装置11のROMには、図1(b)及び図3に示されるように、ステアリング6の中立位置(操舵角 0°)を基準としてキャンセル準備角 θ_1 及び同キャンセル準備角 θ_1 より小さいキャンセル角 θ_2 が記憶されている。ターンシグナル点灯制御装置11は、舵角センサ13からの舵角検出信号 S_θ に基づき、操舵角 θ の変化の有無を判断する。そして、ターンシグナル点灯制御装置11は、操舵角 θ がキャンセル準備角 θ_1 に達した後に、キャンセル角 θ_2 以下となったときに、消灯条件が成立したとして、ターンシグナル2、3を消灯する。なお、キャンセル準備角 θ_1 は第1の値及びしきい値に相当し、キャンセル角 θ_2 は第2の値に相当する。

[0027] 具体的には、ターンシグナル点灯制御装置11は、前記方向指示動作によりターンシグナル2、3の点灯が開始された時点からステアリング6の操舵角 θ の検出を開始する。車両1が直進する際のステアリング6の位置を中立位置として、そのときの操舵角 θ がゼロに設定される。本例では、舵角センサ13は、中立位置から時計回りへステアリング6が回動操作されたとき 0° を基準とする正の値の操舵角 θ を出力し、同じくステアリング6が反時計回りへ回動操作されたときには、負の値の操舵角 θ を出力する。従って、当該中立位置からステアリング6が時計回りに回転されると操舵角 θ の値が増大するとともに、車両1の進路が直進から右方向に変化する。また、中立位置からステアリング6が反時計回りに回転されると操舵角 θ の値が減少するとともに、車両1の進路が直進から左方向に変化する。

[0028] 右左折の際には、図3に示すように、正弦波状に半周期分だけ操舵角 θ が推移する。これは、右左折するべくステアリング6を回動操作し、車両1が右左折後の進路をとったときにステアリング6が戻し操作されることで、車両1が右左折後の進路にて直進するからである。右折時において、ターンシグナル点灯制御装置11は、操舵角 θ がキャンセル準備角 θ_1 に達した(時刻 t_1)後にキャンセル角 θ_2 以下となったとき(時刻 t_2)、消灯条件が成立したとして、右側のターンシグナル3を消灯する。左折時も同様に左側のターンシグナル2が消灯される。ここで、キャンセル準備角 θ_1 は、右左折時に検出が想定される操舵角 θ に設定される。換言すれば、キャンセル準備角 θ_1 は、車線変更時に検出が想定し難い操舵角 θ に設定される。よって、操舵角 θ がキャンセル準備角 θ_1 に達したときには、右左折に係るステアリング6の操作であると推定できる。

[0029] また、車線変更がされる際には、図4に示すように、正弦波状に一周分だけ操舵角 θ が推移する。例えば、右車線に車線変更する場合、操舵角 θ がステアリング6の回動操作に伴い増大していき、車両1が車線変更するのに必要な進路をとったとき、ステアリング6の戻し操作が開始される。このとき、操舵角 θ は増大から減少に切り替わる第1ピークP1をとる(時刻 t_3)。第1ピークP1をとった後は、ステアリング6の戻し操作により操舵角 θ が中立位置(操舵角 0°)に向かって減少していく。この戻し操作は、中立位置を超えて、すなわち操舵角 θ が負の値となる位置まで行われる。これは、車両1の進行方向を車線変更前と同じ方向に戻すためである。車両1の進行方向が戻ったときには、ステアリング6の中立位置への戻し操作が開始される。このとき、操舵角 θ は減少から増大に切り替わる第2ピークP2をとる(時刻 t_4)。

[0030] ターンシグナル点灯制御装置11は、第1ピークP1及び第2ピークP2を検出する。具体的には、両ピークP1、P2は、例えば、操舵角 θ の変化を示す正弦波状の曲線の傾きがゼロ、すなわち操舵角 θ の増減がゼロとなったことを条件として検出される。

[0031] ターンシグナル点灯制御装置11は、両ピークP1、P2を検出し、第2ピークP2からステアリング6が所定量 $\Delta\theta$ だけ戻し操作がされたとき(時刻 t_5)、消灯条件が成立した旨判断する。ターンシグナル点灯制御装置は、車線変更に係る消灯条件が成立した旨判断したとき、右側のターンシグナル3を消灯する。このように、第2ピークP2の検出から所定量 $\Delta\theta$ だけステアリング6の戻し操作を待つことで、より適切なタイミングでターンシグ

ナル2、3が消灯される。左車線に車線変更する場合も、上記同様に両ピークP1、P2が検出されて所定量 $\Delta\theta$ だけ戻し操作がされたときに左側のターンシグナル2が消灯される。

[0032] このように、車線変更と右左折とは異なる判断基準にてターンシグナルの自動消灯が実行される。具体的には、ターンシグナル点灯制御装置11は、操舵角 θ がキャンセル準備角 θ_1 に達するか否かで自動消灯の判断基準を変更している。

[0033] ここで、車線変更と右左折とはステアリング6の回動操作量が異なる。すなわち、右左折に係るステアリング6の回動操作量は、車線変更に係るステアリング6の回動操作量に比べて大きい。よって、上述のように、キャンセル準備角 θ_1 を右左折時に検出が想定さ、車線変更時に検出が想定し難い操舵角 θ とすることで、ステアリング6の操作が車線変更及び右左折の何れに関するものであるかを推定できる。

[0034] 詳しくは、図3に示すように、操舵角 θ がキャンセル準備角 θ_1 に達したときには、右左折であるとして、その後、操舵角 θ がキャンセル角 θ_2 となったとき、消灯条件が成立した旨判断され、ターンシグナルが消灯される。すなわち、操舵角 θ がキャンセル準備角 θ_1 に達したときには、以後、両ピークP1、P2の検出は行わない。よって、操舵角 θ がキャンセル準備角 θ_1 に達した後に、たとえ、図3の一点鎖線で示すように、両ピークP1、P2がみられても、ターンシグナル2、3が自動消灯されることはない。ここで、操舵角 θ がキャンセル準備角 θ_1 に達した後、両ピークP1、P2がみられる場合としては、例えば、車両の進路方向を修正する場合や、運転者が意図せずステアリングを回動操作してしまう場合が考えられる。このような状況が発生した場合であれ、車線変更と誤判定されることはない。このため、右左折時におけるターンシグナル2、3の誤消灯を防止することができる。

また、操舵角 θ とキャンセル準備角 θ_1 との比較により車速等の情報によらず容易に車線変更及び右左折の判断が可能となる。

次に、前述のように構成したターンシグナル点灯制御装置11の動作を図5に示すフローチャートに従って説明する。このフローチャートは、ターンシグナル点灯制御装置11により自身のROMに格納された点灯制御プログラムに従い実行される。

[0036] まず、操作位置検出信号SPに基づき、ターンシグナル2、3を点灯させる(S101)。そして、操舵角 θ がキャンセル準備角 θ_1 以上であるか否かが判断される(S102)。操舵角 θ がキャンセル準備角 θ_1 以上である旨判断される場合(S102でYES)、右左折に伴うステアリング6の操作であるとして、操舵角 θ がキャンセル角 θ_2 以下であるか否かが判断される(S103)。操舵角 θ がキャンセル角 θ_2 以下となるのを待って(S103でNO)、操舵角 θ がキャンセル角 θ_2 以下となったとき(S103でYES)、消灯条件が成立した旨判断される(S104)。そして、ターンシグナル2、3が消灯される(S105)。

[0037] 一方、操舵角 θ がキャンセル準備角 θ_1 未満である旨判断された場合(S102でNO)、第1ピークP1が検出されたか否かが判断される(S106)。第1ピークP1が検出されない場合(S106でNO)、ステップS102へ処理が移行され、再び、操舵角 θ がキャンセル準備角 θ_1 以上であるか否かが判断され、キャンセル準備角 θ_1 以上である旨判断されれば、ステップS103へ処理が移行される。すなわち、ターンシグナル2、3の点灯後は操舵角 θ がキャンセル準備角 θ_1 以上となる、若しくは第1ピークP1が検出されるまで、常時、操舵角 θ 及びキャンセル準備角 θ_1 は比較されている。

[0038] 第1ピークP1が検出された場合(S106でYES)、車線変更に伴うステアリング6の操作であるとして、第2ピークP2が検出されたか否かが判断される(S107)。そして、第2ピークP2が検出されるのを待って(S107でNO)、第2ピークP2が検出されたとき(S107でYES)、ステアリング6が所定量 $\Delta\theta$ だけ戻し操作されたか否かが判断される(S108)。ステアリング6が所定量 $\Delta\theta$ だけ戻し操作されるのを待って(S108でNO)、所定量 $\Delta\theta$ だけ戻し操作されたとき(S108でYES)、消灯条件が成立した旨判断される(S104)。そして、ターンシグナル2、3が消灯される(S105)。以上で、ターンシグナル2、3の点灯から消灯までの一連の処理が完了となる。

[0039] なお、上記処理手順において、キャンセル準備角 θ_1 及びキャンセル角 θ_2 と比較される操舵角 θ は絶対値で判断される。これにより、ステアリング6が反時計回りへ回動操作されることで負の値の操舵角 θ を出力した場合でも正しく判断される。

[0040] 以上、説明した実施形態によれば、以下の作用効果を奏することができる。

(1) 舵角センサ13の操舵角 θ がキャンセル準備角 θ_1 に達するか否かに基づき消灯条件が変わる。すなわち、操舵角 θ がキャンセル準備角 θ_1 に達したときには、右左折であるとして、操舵角 θ がキャンセル角 θ_2 となったときに消灯条件が成立した旨判断され、ターンシグナル2、3が消灯される。一方、操舵角 θ がキャンセル準備角 θ_1 未満のときには、車線変更であるとして、操舵角 θ が第1ピーク及び第2ピークを検出したとき、消灯条件

が成立した旨判断され、ターンシグナル 2, 3 が自動消灯される。ここで、右左折中に、例えば、車両の進路方向を再調整する場合や、運転者が意図せずステアリングを回動操作してしまう場合がある。こういった場合に、操舵角 θ が第 1 ピーク及び第 2 ピークを検出したとしても、操舵角 θ がキャンセル準備角 θ_1 に達した以降は、両ピーク P 1, P 2 の検出を行わないためターンシグナル 2, 3 が自動消灯されることはない。これにより、右左折時におけるターンシグナル 2, 3 の誤消灯を防止することができる。

[0041] (第 2 の実施形態)

以下、本発明の第 2 の実施形態について、図 6 を参照して説明する。この実施形態は、点灯制御プログラムが上記第 1 の実施形態と異なっている。以下、第 1 の実施形態との相違点を中心に説明する。なお、この実施形態の方向指示装置は、図 2 に示す第 1 の実施形態の方向指示装置と同様の構成を備えている。

[0042] 本実施形態におけるターンシグナル点灯制御装置 11 の動作を図 6 に示すフローチャートに従って説明する。

まず、操作位置検出信号 SP に基づき、ターンシグナル 2, 3 を点灯させる (S151)。そして、第 1 ピーク P 1 が検出されたか否かが判断される (S152)。第 1 ピーク P 1 が検出されるのを待って (S152 で NO)、第 1 ピーク P 1 が検出されたときの操舵角 θ がキャンセル準備角 θ_1 以上であるか否かが判断される (S153)。操舵角 θ がキャンセル準備角 θ_1 以上である旨判断される場合 (S153 で YES)、右左折に伴うステアリング 6 の操作であるとして、操舵角 θ がキャンセル角 θ_2 以下であるか否かが判断される (S154)。操舵角 θ がキャンセル角 θ_2 以下となるのを待って (S154 で NO)、操舵角 θ がキャンセル角 θ_2 以下となったとき (S154 で YES)、消灯条件が成立した旨判断される (S155)。そして、ターンシグナル 2, 3 が消灯される (S156)。

[0043] 一方、操舵角 θ がキャンセル準備角 θ_1 未満である旨判断された場合 (S153 で NO)、車線変更に伴うステアリング 6 の操作であるとして、第 2 ピーク P 2 が検出されるか否かが判断される (S157)。第 2 ピーク P 2 が検出されるのを待って (S157 で NO)、第 2 ピーク P 2 が検出されたとき (S157 で YES)、ステアリング 6 が所定量 $\Delta\theta$ だけ戻し操作されたか否か判断される (S158)。ステアリング 6 が所定量 $\Delta\theta$ だけ戻し操作されるのを待って (S158 で NO)、所定量 $\Delta\theta$ だけ戻し操作されたとき (S158 で YES)、消灯条件が成立した旨判断される (S154)。そして、ターンシグナル 2, 3 が消灯される (S155)。

[0044] 以上のように、第 1 ピーク P 1 が検出されたときに、操舵角 θ とキャンセル準備角 θ_1 との比較を行えばよい。よって、第 1 の実施形態と異なり、ターンシグナル 2, 3 の点灯後において、常時、操舵角 θ とキャンセル準備角 θ_1 との比較を行う必要がない。このため、より容易な制御で、右左折時におけるターンシグナル 2, 3 の誤消灯を防止することができる。

[0045] 以上、説明した実施形態によれば、第 1 の実施形態の (1) の作用効果に加え、以下の作用効果を奏することができる。

(2) 第 1 ピーク P 1 における操舵角 θ がキャンセル準備角 θ_1 未満の場合には、車線変更であるとして、その後、第 2 ピーク P 2 が検出されたとき、消灯条件が成立した旨の判断がされ、ターンシグナル 2, 3 が消灯される。これにより、ターンシグナル点灯制御装置 11 は、第 1 ピーク P 1 が検出されたとき、操舵角 θ とキャンセル準備角 θ_1 との比較を行えばよい。よって、より容易に右左折時におけるターンシグナル 2, 3 の誤消灯を防止することができる。

[0046] なお、上記実施形態は、これを適宜変更した以下の形態にて実施することができる。

[0047] ・上記実施形態においては、キャンセル準備角 θ_1 及びキャンセル角 θ_2 は一定であったが、キャンセル準備角 θ_1 及びキャンセル角 θ_2 を車速に応じて可変としてもよい。この場合、車両 1 に車速センサを備える必要がある。

[0047] 一般的に、車両が低速で走行しているときにはステアリングを大きく回動操作することが可能であるものの、高速で走行しているときには運転者等に過度の横方向の加速度が加わるため、低速走行中と同様にステアリングを大きく回動操作することはできない。従って、右左折時においても、高速になるにつれて、ステアリング 6 の回動操作及び戻し操作量は小さくなる。よって、例えば、キャンセル角 θ_2 及びキャンセル準備角 θ_1 が画一的に設定される場合、右左折時にステアリング 6 の操舵角 θ がキャンセル準備角 θ_1 に達しなかったり、キャンセル角 θ_2 以下となるタイミングが遅れたりすることが想定される。車速に応じてキャンセル角 θ_2 及びキャンセル準備角 θ_1 を変更することで、上記問題を解決し、適切なタイミングでターンシグナル 2, 3 を消灯させることができる。具体的には、車速が大きくなるにつれ、キャンセル準備角 θ_1 及びキャンセル角 θ_2 は小さく設定される。

[0048] ・上記両実施形態においては、両ピーク P 1, P 2 は、操舵角 θ の変化を示す正弦波状曲線の傾きがゼロ、すなわち操舵角 θ の増減がゼロとなったことを条件として検出されていた。しかし、両ピーク P 1, P 2 の検出手法は

これに限らず、例えば、操舵角 θ の極大値を第1ピークP1とし、極小値を第2ピークP2と判断してもよい。

[0049] ・上記両実施形態においては、車線変更において、第2ピークP2からステアリング6が所定量 $\Delta\theta$ だけ戻し操作がされたときに消灯条件が成立した旨判断されていた。しかし、第2ピークP2が検出されたとき、消灯条件が成立した旨判断されてもよい。

[0050] ・上記両実施形態においては、回動態様検出手段として舵角センサ13が設けられていたが、舵角センサ13に限らず、例えば、回動態様検出手段として車両の進路変更に伴う回転を検出するヨーレートセンサを設けても良い。本構成において、ステアリング6の回動操作に伴い、ヨーレートセンサを通じてヨーレートが検出され、その検出値の変化は図3及び図4等と同様に、正弦波状の波形として検出される。このとき、キャンセル準備角 θ_1 及びキャンセル角 θ_2 に変えて第1のヨーレート値及び第2のヨーレート値を設定することで、上記両実施形態と同様の効果が得られる。

[0051] 次に、前記実施形態から把握できる技術的思想をその効果と共に記載する。

(イ) 請求項1又は2に記載のターニングナル点灯制御装置において、前記回動態様検出手段は車両の進路変更に伴う回転を検出するヨーレートセンサであって、前記検出値は前記ヨーレートセンサが検出するヨーレートであるターニングナル点灯制御装置。

[0053] 同構成によれば、ヨーレートセンサが検出するヨーレートを通じて、車両の回動態様を判断することができ、右左折時におけるターニングナルの誤消灯を防止することができる。

[0053] (ロ) 請求項1～3、(イ)の何れか一項に記載のターニングナル点灯制御装置において、車両の速度を検出する車速センサの検出結果に基づき、車速が大きくなるにつれて前記第1の値及び前記第2の値を小さく設定するターニングナル点灯制御装置。

[0054] 一般的に、車両が低速で走行しているときにはステアリングを大きく回動操作することが可能であるものの、高速で走行しているときには運転者等に過度の横方向の加速度が加わるため、低速走行中と同様にステアリングを大きく回動操作することはできない。従って、右左折時においても、高速になるにつれて、ステアリングの回動操作及び戻し操作量は小さくなる。よって、例えば、第1の値及び第2の値が画的に設定される場合、右左折時に検出値が第1の値に達しなかったり、第2の値以下となるタイミングが遅れたりすることが想定される。車速に応じて第1の値及び第2の値を変更することで、上記問題を解決し、ターニングナルの消灯タイミングをより適切にすることができる。

2、3…ターニングナル、4…ターンレバー（操作手段）、10…方向指示装置、11…ターニングナル点灯制御装置、13…舵角センサ。

【請求項 1】

車両の運転席近傍に設けられる操作手段が操作された際、ターニングナルをそれまでの消灯状態から点灯状態に切り換え、回動態様検出手段により車両の回動態様に応じて検出される所定の検出値に基づき前記車両の回動態様を検知し、前記検出値が、予め右左折時に検出が想定される検出値を基準に設定される第1の値に達した後、前記第1の値より小さい第2の値となったとき消灯条件が成立した旨判断し、前記ターニングナルを自動消灯させるターニングナル点灯制御装置において、

前記検出値が前記第1の値未満の場合、ステアリングが第1の方向に回動操作された後に、前記第1の方向と逆方向である第2の方向に回動操作が開始された際に検出される前記検出値の第1のピークと、同第1のピークが検出された後、再び前記第1の方向に回動操作が開始された際に検出される前記検出値の第2のピークと、を検出したとき、消灯条件が成立した旨の判断をして、前記ターニングナルを消灯させるターニングナル点灯制御装置。

【請求項 2】

請求項1に記載のターニングナル点灯制御装置において、

前記第1のピークにおける検出値が前記第1の値未満の場合に、前記第2のピークを検出したとき、消灯条件が成立した旨の判断をして前記ターニングナルを消灯させるターニングナル点灯制御装置。

【請求項 3】

車両の運転席近傍に設けられる操作手段が操作された際、ターニングナルをそれまでの消灯状態から点灯状態に

切り換えるとともに、舵角センサの検出結果に基づき、右左折又は車線変更に係る消灯条件が成立した旨判定されたとき前記ターンシグナルの自動消灯が実行されるターンシグナル点灯制御装置において、

前記舵角センサにより検出されるステアリングの操舵角が、予め右左折時に検出が想定される操舵角を基準に設定されるしきい値に達した場合には右左折に係る消灯条件が成立するか否か判定を行い、前記しきい値未満の場合には車線変更に係る消灯条件が成立するか否か判定を行うターンシグナル点灯制御装置。

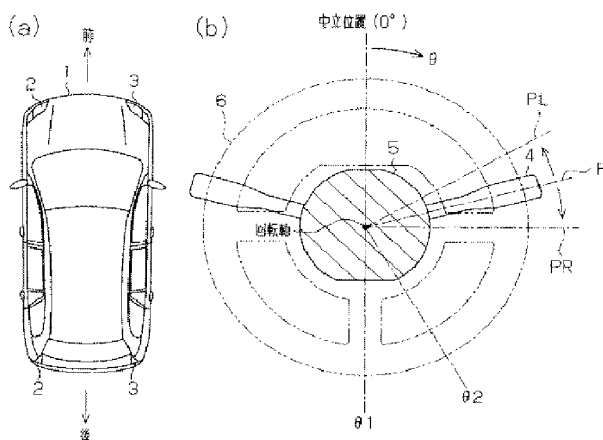
(57) 【要約】

【課題】ターンシグナル点灯制御装置において、右左折時において、ターンシグナルの誤消灯を防止することにある。

【解決手段】舵角センサ13の操舵角がキャンセル準備角に達するか否かに基づき消灯条件が変わる。すなわち、操舵角がキャンセル準備角に達したときには、右左折であるとして、操舵角がキャンセル角となったときに消灯条件が成立した旨判断され、ターンシグナル2、3が消灯される。一方、操舵角がキャンセル準備角未満のときには、車線変更であるとして、操舵角が第1ピーク及び第2ピークを検出したとき、消灯条件が成立した旨判断され、ターンシグナル2、3が自動消灯される。これにより、右左折時におけるターンシグナル2、3の誤消灯を防止することができる。

【選択図】図2

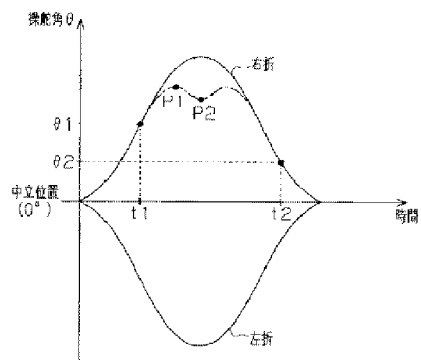
【図1】



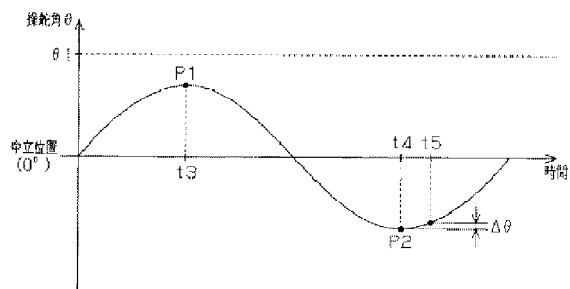
【図2】



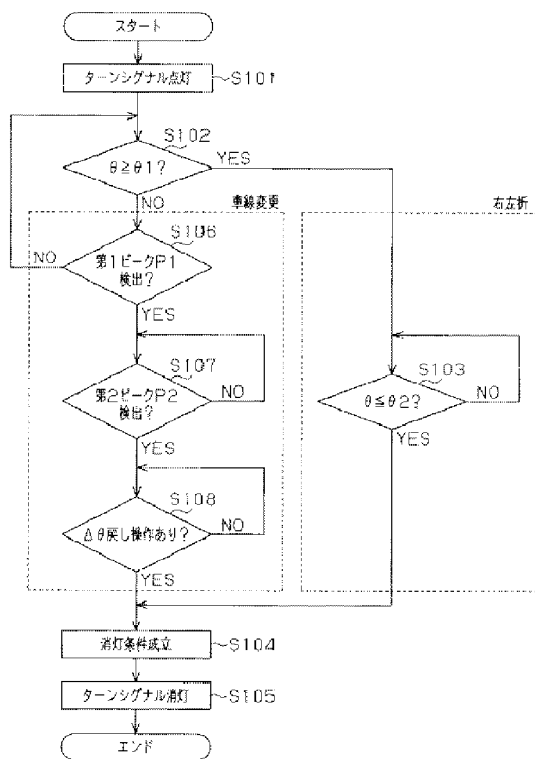
【圖 3】



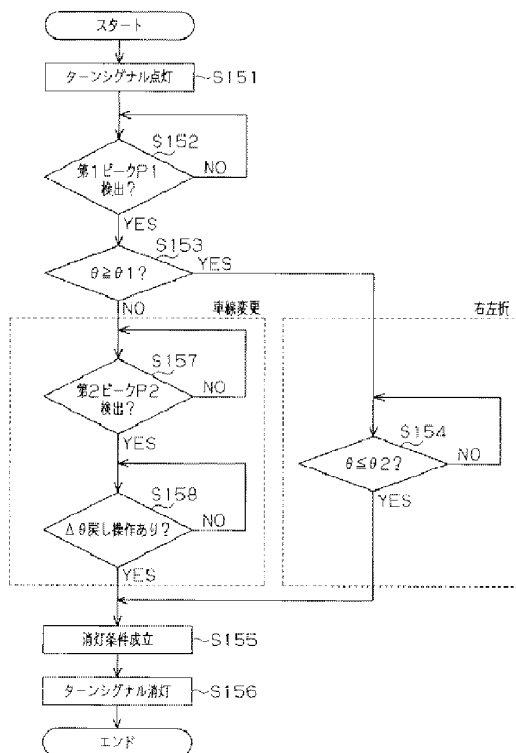
【圖 4】



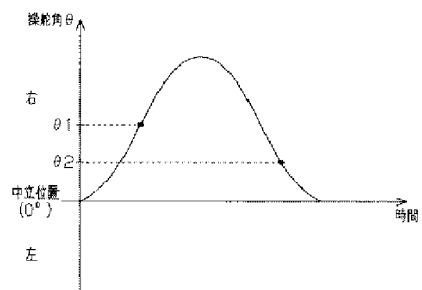
【図 5】



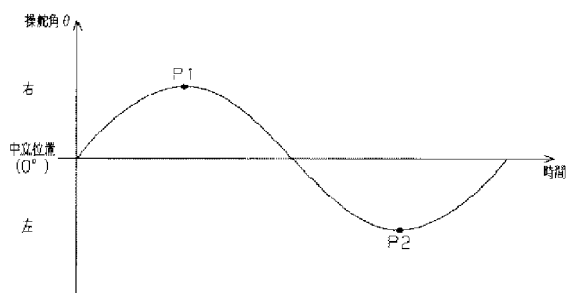
【図 6】



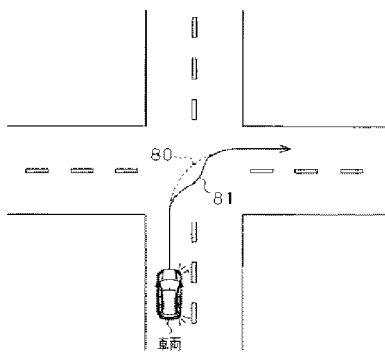
【図 7】



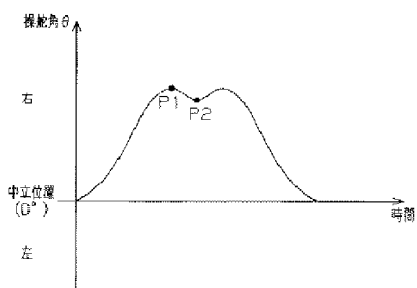
【圖 8】



【圖 9】



【圖 10】



Machine Translation of JP 2011-131631 A

CLAIMS

[Claim(s)]

[Claim 1]

When a control means provided near the driver's seat of vehicles is operated, a turn signal is switched to lighting status from the putting-out-lights state till then, A rotation mode of the aforementioned vehicles is detected based on a predetermined detection value detected according to a rotation mode of vehicles by a rotation mode detection means, In a turn signal lighting controller with which putting-out-lights conditions were satisfied when it became a second value smaller than said first value, after the aforementioned detection value reached a first value set to a standard in a detection value detection is previously assumed to be at the time of a right and left chip box and which makes a purport judgment and makes the aforementioned turn signal switch off automatically,

A first peak of the aforementioned detection value detected when rotating operation is started in said first direction and the second direction which is opposite directions, after rotating operation of the steering was carried out in the first direction, when the aforementioned detection value was less than said first value, A turn signal lighting controller which judges that putting-out-lights conditions were satisfied and makes the aforementioned turn signal switch off when a second peak of the aforementioned detection value detected when rotating operation is again started in said first direction is detected after the 1st peak was detected.

[Claim 2]

In the turn signal lighting controller according to claim 1,

A turn signal lighting controller which judges that putting-out-lights conditions were satisfied and makes the aforementioned turn signal switch off when a detection value in said first peak is less than said first value and said second peak is detected.

[Claim 3]

When a control means provided near the driver's seat of vehicles is operated, while switching a turn signal to lighting status from the putting-out-lights state till then, In a turn signal lighting controller with which automatic putting out lights of the aforementioned turn signal is performed when [at which putting-out-lights conditions concerning a right and left chip box or a lane change were satisfied based on a detection result of a rudder sensor] a purport judging is carried out,

It judges [whether putting-out-lights conditions which require for a right and left chip box a steering angle of a steering detected by the aforementioned rudder sensor when a threshold value set to a standard is reached in a steering angle detection is previously assumed to be at the time of a right and left chip box are satisfied, and], A turn signal lighting controller which judges [whether in a case of less than the aforementioned threshold value, putting-out-lights conditions concerning a lane change are satisfied, and].

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Field of the Invention]

[0001]

The present invention relates to the light control of the turn signal of vehicles, and relates to the turn signal lighting controller which makes the turn signal turned on in detail switch off automatically.

[Background of the Invention]

[0002]

Vehicles are equipped with the turn signal which shows the direction of a right and left chip box or course changing to the circumference. According to operation of the turn lever which it has near the steering of a driver's seat, a turn signal lighting controller performs control of lighting of a turn signal, and putting out lights. And a turn signal lighting controller performs control which makes a turn signal switch off to timing suitable in the right and left chip box of vehicles, or the case of a lane change. For example, the turn signal lighting controller of the description to a Patent document 1 judges whether putting-out-lights conditions were satisfied based on the detection result of the rudder sensor which detects the amount of rudder angles of a steering. And a turn signal lighting controller makes a turn signal switch off, when [at which putting-out-lights conditions were satisfied] a purport judgment is made.

[0003]

First, it describes about the judgment method concerning automatic putting out lights of the turn signal at the time of a right and left chip box.

When turning to the right, after rotating operation of the steering is carried out to a clockwise rotation from a center valve position, return operation is carried out counter clockwise.

Therefore, as shown in Fig.7 in the case of right-turn, the steering angle θ detected through a rudder sensor changes to sine wave shape by a half cycle. The cancel angle θ_2 which is an angle smaller than the cancel preparation angle θ_1 and the cancel preparation angle θ_1 is set up on the basis of the center valve position of a steering. for example, when return operation was carried out counter clockwise and a steering became less than cancel angle θ_2 after rotating operation of the steering was carried out clockwise and the steering angle θ reached the cancel preparation angle θ_1 when turning to the right, the putting-out-lights conditions concerning right-turn were satisfied -- a purport judgment is made. And a turn signal is switched off. Also in the case of left turn, after rotating operation of the steering was carried out counter clockwise and the steering angle θ reached the cancel preparation angle θ_1 similarly, when return operation is carried out and it becomes less than cancel angle θ_2 at a clockwise rotation, the light is put out.

[0004]

Next, it describes about the judgment method concerning automatic putting out lights of the turn signal at the time of a lane change.

When changing lanes into the right lane, after rotating operation of the steering is carried out to a clockwise rotation from a center valve position, return operation is carried out counter clockwise. Therefore, as shown in Fig.8, the steering angle θ detected through a rudder sensor changes to sine wave shape by a round term. By the time a lane change is completed here compared with the case of the above-mentioned right-turn, operation of the steering will be too many needed by the half cycle. By the operation for this half cycle, vehicles are returned to the course direction before a lane change.

[0005]

Therefore, in a lane change, the 1st peak P1 accompanying the rotating operation of a steering in the steering angle θ and the 2nd peak P2 accompanying return operation are detected.

Inclination of a waveform [2 / both the peaks P1 and / P] for example, is judged considering the change in the zero θ , i.e., a steering angle, having become zero as conditions. when both the peaks P1 and P2 were detected, the putting-out-lights conditions concerning a lane change were satisfied -- a purport judgment is made and a turn signal is switched off. A turn signal is switched off when changing lanes into the left lane, and both the peaks P1 and P2 are detected like the above.

[0006]

As mentioned above, even if it is which [of a lane change and a right and left chip box] case, a turn signal is switched off automatically.

[Citation list]

[Patent literature]

[0007]

[Patent document 1] JP,H11-70833,A

[Summary of Invention]

[Problem to be solved by the invention]

[0008]

By the way, in the above-mentioned turn signal lighting controller, there is a possibility that the putting-out-lights conditions which take for a lane change at the time of a right and left chip box may be satisfied. Specifically, at the time of a right and left chip box, rotating operation of the steering is not necessarily smoothly done by the driver, and a steering is operated according to the situation at that time. For example, it may correspond to a right and left chip box, the course direction of vehicles may be corrected, and a driver may not mean, but rotating operation of the steering may be carried out slightly. As shown in Fig.9 in these cases, vehicles turn to the right not through the circular locus 80 by rotating operation as shown in previous Fig.7 but through the winding locus 81. Therefore, as shown in Fig.10, there is a possibility that the 1st peak P1 and the 2nd peak P2 of the steering angle θ may be detected at the time of the rotating operation of the steering corresponding to the locus 81. In this case, in spite of a right and left compromise, a judgment of that the putting-out-lights conditions concerning a lane change were satisfied is made, and a turn signal is switched off. Thus, there was a possibility that a turn signal might not be switched off to timing suitable at the time of a right and left chip box.

[0009]

At the time of a right and left chip box, there is the object of this invention in providing the turn signal lighting controller which can prevent incorrect putting out lights of a turn signal.

[Means for solving problem]

[0010]

Hereafter, it describes about the means for attaining the above-mentioned purpose, and its operation effect.

When the control means by which the invention according to claim 1 is provided near the driver's seat of vehicles is operated, Switch a turn signal to lighting status from the putting-out-lights state till then, and the rotation mode of the aforementioned vehicles is detected based on the predetermined detection value detected according to the rotation mode of vehicles by a rotation mode detection means, After the aforementioned detection value reaches the first value set to a standard in the detection value detection is previously assumed to be at the time of a right and left chip box, In the turn signal lighting controller with which putting-out-lights conditions were satisfied when it became a second value smaller than the above-mentioned first value and which makes a purport judgment and makes the aforementioned turn signal switch off automatically, The first peak of the aforementioned detection value detected when rotating operation is started in the above-mentioned first direction and the second direction which is opposite directions, after rotating operation of the steering was carried out in the first direction, when the aforementioned detection value was less than the above-mentioned first value, When the second peak of the aforementioned detection value detected when rotating operation is again started in the above-mentioned first direction is detected after the 1st peak was detected, it is making to judge that putting-out-lights conditions were satisfied and to make the aforementioned turn signal switch off into the summary.

[0011]

According to the composition, putting-out-lights conditions change based on whether the detection value of a rotation mode detection means reaches a first value. that is, when a detection value turned into a second value, putting-out-lights conditions were satisfied for being a right and left chip box, when a detection value reaches a first value -- a purport judgment is made and a turn signal is switched off. on the other hand, when a detection value detected the 1st peak and the 2nd peak for being a lane change, when a detection value is less than a first value, putting-out-lights conditions were satisfied -- a purport judgment is made and a turn signal is switched off automatically. Here, neither the case where the course direction of vehicles is readjusted, nor a driver may mean to a right and left compromise, for example, but rotating operation of the steering may be carried out to it. Even if the detection value detected the 1st peak and the 2nd peak in such cases, after the detection value reached the first value, in order not to detect both peaks, a turn signal is not switched off automatically. Thereby, incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented.

[0012]

In the turn signal lighting controller according to claim 1 the invention according to claim 2,

When the detection value in the above-mentioned first peak is less than the above-mentioned first value and the above-mentioned second peak is detected, it is making to judge that putting-out-lights conditions were satisfied and to make the aforementioned turn signal switch off into the summary.

[0013]

When according to the composition the detection value in a first peak is less than the above-mentioned first value and a second peak is detected after that noting that it is a lane change, a judgment of that putting-out-lights conditions were satisfied is made, and a turn signal is switched off. Thereby, the turn signal lighting controller should just perform comparison with a detection value and a first value, when a first peak is detected. Therefore, incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented more easily.

[0014]

When the control means provided near the driver's seat of vehicles is operated, while switching a turn signal to lighting status from the putting-out-lights state till then, the invention according to claim 3, In the turn signal lighting controller with which automatic putting out lights of the aforementioned turn signal is performed when [at which the putting-out-lights conditions concerning a right and left chip box or a lane change were satisfied based on the detection result of the aforementioned rudder sensor] a purport judging is carried out, It judges [whether the putting-out-lights conditions which require for a right and left chip box the steering angle of the steering detected by the aforementioned rudder sensor when the threshold value set to a standard is reached in the steering angle detection is previously assumed to be at the time of a right and left chip box are satisfied, and], It is making whether in the case of less than the aforementioned threshold value, the putting-out-lights conditions concerning a lane change are satisfied, and to judge into the summary.

[0015]

According to the composition, a judgment is performed on the putting-out-lights conditions which require the steering angle detected by a rudder sensor for any of a right and left chip box and a lane change they are based on whether a threshold value is reached. The threshold value is set to the standard in the steering angle detection is assumed to be at the time of a right and left chip box. It is appropriately judged by this on the putting-out-lights conditions which take for a right and left chip box at the time of a right and left chip box, and is appropriately judged on the putting-out-lights conditions which take for a lane change at the time of a lane change. Here, neither the case where the course direction of vehicles is readjusted, nor a driver may mean to a right and left compromise, for example, but rotating operation of the steering may be carried out to it. Even if a steering angle is detected in such cases in the mode in which the putting-out-lights conditions of a lane change are satisfied, when the steering angle has reached the threshold value, since the judgment of whether the putting-out-lights conditions of a lane change are satisfied is not performed, a turn signal is not switched off automatically. Thereby, incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented.

[Effect of the Invention]

[0016]

According to the present invention, in a turn signal lighting controller, incorrect putting out lights of a turn signal can be prevented at the time of a right and left chip box.

[Brief Description of the Drawings]

[0017]

[Drawing 1](a) in a first embodiment is a plan of vehicles, and (b) is a front view of a steering.

[Drawing 2]The block diagram showing the electric composition of the direction indicating device in a first embodiment.

[Drawing 3]The graph which shows change of the steering angle θ detected at the time of the right and left chip box in a first embodiment.

[Drawing 4]The graph which shows change of the steering angle θ detected at the time of the lane change in a first embodiment.

[Drawing 5]The flow chart which shows the procedure of the light control program in a first embodiment.

[Drawing 6]The flow chart which shows the procedure of the light control program in a second embodiment.

[Drawing 7]The graph which shows change of the steering angle θ detected at the time of the right and left chip box in the former.

[Drawing 8]The graph which shows change of the steering angle θ detected at the time of the lane change in the former.

[Drawing 9]The plan showing the locus of the vehicles at the time of the right-turn in the former.

[Drawing 10]The graph which shows change of the steering angle θ detected at the time of the right and left chip box in the former.

[Description of Embodiments]

[0018]

(First embodiment)

The first embodiment that materialized the turn signal lighting controller concerning the present invention to the direction indicating device of vehicles hereafter is described according to Drawings.

[0019]

As shown in Fig.1 (a), a direction indicating device performs direction instruction operation which tells the driver of the other car, etc. about the moving direction of self-vehicles by making the pair of right and left turn signals 2 and 3 provided before and behind the vehicles 1, respectively turn on. As shown in Fig.1 (b), the cantilevered suspension of the proximal end of the turn lever 4 is carried out to the steering column 5 of the vehicles 1, and the point of the turn lever 4 is projected on the outside of the steering column 5. The proximal end of the turn lever 4 is supported that only a predetermined angle can be tilted in the direction along the hand of cut of the steering 6 to the steering column 5 around the center of the axis of rotation arranged inside the steering column 5. The aforementioned direction instruction operation is performed through the tilting operation of the turn lever 4.

[0020]

Specifically, the turn lever 4 is held in the operation center valve position P shown in Fig.1 (b) with an alternate long and short dash line. And the turn lever 4 will be tilted to left-turn actuated-valve-position PL, if tilting operation is carried out to above from the operation center valve position P. Thereby, the left-hand side turn signal 2 starts lighting. The turn lever 4 will be tilted to the right-turn actuated valve position PR, if tilting operation is carried out to down from the operation center valve position P. Thereby, the right-hand side turn signal 3 starts lighting. If the operating physical force to the turn lever 4 is released, the turn lever 4 will return to the operation center valve position P by operation of the return mechanism which is not illustrated. That is, the turn lever of the mho MENTARI type is adopted in this example. Even if the turn lever 4 returns to the operation center valve position P, unless the putting-out-lights conditions mentioned later are satisfied, lighting of the turn signals 2 and 3 is continued.

[0021]

Next, it describes about the electric constitution of a direction indicating device.

As shown in Fig.2, the direction indicating device 10 is provided with the turn signal lighting controller 11 which comprised CPU, ROM, RAM, etc. which are not illustrated. The light control program for controlling lighting and putting out lights of the turn signals 2 and 3, etc. are stored in ROM of the turn signal lighting controller 11. RAM is workspace to develop the light control program stored in ROM, and for CPU perform various kinds of processings.

[0022]

The rudder sensor 13 is connected to the turn signal lighting controller 11. When rotatably operating of the steering 6 is done by the driver, the rudder sensor 13 detects the steering angle theta which is the angle of rotation, and outputs rudder angle detecting-signal Stheta to the turn signal lighting controller 11 according to the detected steering angle theta. The rudder sensor 13 functions as a rotation mode detection means to detect the steering angle theta which is the information which shows the rotation mode to the moving direction of vehicles.

[0023]

The turn switch 16 which is interlocked with operation of the turn lever 4 and turned on and off is connected to the turn signal lighting controller 11. The turn switch 16 will output actuated-valve-position detecting-signal SP who shows that to the turn signal lighting controller 11, if it detects that tilting operation of the turn lever 4 was carried out from the operation center valve position P to left-turn actuated-valve-position PL. The turn switch 16 will output actuated-valve-position detecting-signal SP who shows that to the turn signal lighting controller 11, if it detects that rotating operation of the turn lever 4 was carried out to the right-turn actuated valve position PR.

[0024]

The turn signals 2 and 3 are connected to the turn signal lighting controller 11. The turn signal lighting controller 11 makes the turn signals 2 and 3 turn on according to this detection result, when the operation to each actuated valve position PL and PR of the turn lever 4 is detected based on aforementioned actuated-valve-position detecting-signal SP.

[0025]

The turn signal lighting controller 11 judges whether putting-out-lights conditions were satisfied based on detecting-signal S_{θ} from the rudder sensor 13, when lighting of the turn signals 2 and 3 is started. And the turn signal lighting controller 11 makes the turn signals 2 and 3 switch off, when judging that putting-out-lights conditions were satisfied.

[0026]

As shown in Fig.1 (b) and Fig.3, the cancel angle θ_2 smaller than the cancel preparation angle θ_1 and the cancel preparation angle θ_1 is memorized by ROM of the turn signal lighting controller 11 on the basis of the center valve position (0 degree of steering angles) of the steering 6. The turn signal lighting controller 11 judges the existence of change of the steering angle θ based on rudder angle detecting-signal S_{θ} from the rudder sensor 13. And the turn signal lighting controller 11 switches off the turn signals 2 and 3 noting that putting-out-lights conditions are satisfied, when it becomes less than cancel angle θ_2 after the steering angle θ reached the cancel preparation angle θ_1 . The cancel preparation angle θ_1 is equivalent to a first value and threshold value, and the cancel angle θ_2 is equivalent to a second value.

[0027]

Specifically, the turn signal lighting controller 11 starts detection of the steering angle θ of the steering 6 from the time of lighting of the turn signals 2 and 3 being started by the aforementioned direction instruction operation. The steering angle θ at that time is set as zero by making the position of the steering 6 at the time of the vehicles 1 going straight on into a center valve position. In this example, the rudder sensor 13 outputs the steering angle θ of a negative value, when the steering angle θ of the positive value on the basis of 0 degree is outputted when rotating operation of the steering 6 is carried out from a center valve position to a clockwise rotation, and rotating operation of the steering 6 is similarly carried out to a counterclockwise rotation. Therefore, if the steering 6 rotates clockwise from the center valve position concerned, while the value of the steering angle θ will increase, the course of the vehicles 1 changes rightward from rectilinear propagation. If the steering 6 rotates counterclockwise from a center valve position, while the value of the steering angle θ will decrease, the course of the vehicles 1 changes leftward from rectilinear propagation.

[0028]

As shown in Fig.3 in the case of a right and left chip box, the steering angle θ changes to sine wave shape by a half cycle. This is that return operation of the steering 6 is carried out, when rotating operation of the steering 6 is carried out and the vehicles 1 take the course after a right and left chip box in order to carry out a right and left chip box, and it is because the vehicles 1 go straight on with the course after a right and left chip box. The right-hand side turn signal 3 is switched off noting that putting-out-lights conditions are satisfied, when the turn signal lighting controller 11 becomes less than cancel angle θ_2 at the time of right-turn after the steering angle θ reached the cancel preparation angle θ_1 (time t_1) (time t_2). The left-hand side turn signal 2 is similarly switched off at the time of left turn. Here, the cancel preparation angle

theta 1 is set as the steering angle theta detection is assumed to be at the time of a right and left chip box. If it puts in another way, the cancel preparation angle theta 1 will be set as the steering angle theta which detection cannot assume easily at the time of a lane change. Therefore, when the steering angle theta reaches the cancel preparation angle theta 1, it can be presumed that it is operation of the steering 6 concerning a right and left chip box.

[0029]

When a lane change is carried out, as shown in Fig.4, the steering angle theta changes to sine wave shape by a round term. For example, when changing lanes into the right lane, the steering angle theta increases in connection with the rotating operation of the steering 6, and when a course required for the vehicles 1 to change lanes is taken, return operation of the steering 6 is started. At this time, the steering angle theta takes the 1st peak P1 that changes from increase to reduction (time t3). After taking the 1st peak P1, the steering angle theta decreases toward the center valve position (0 degree of steering angles) by return operation of the steering 6. This return operation is performed across a center valve position to the position from which the steering angle theta serves as a negative value. This is for returning the moving direction of the vehicles 1 in the same direction as lane change before. When the moving direction of the vehicles 1 returns, the return operation to the center valve position of the steering 6 is started. At this time, the steering angle theta takes the 2nd peak P2 that changes from reduction to increase (time t4).

[0030]

The turn signal lighting controller 11 detects the 1st peak P1 and the 2nd peak P2. Specifically, inclination of the curve of the sine wave shape both the peaks P1 and P2 indicate change of the steering angle theta to be, for example is detected considering the change in the zero theta, i.e., a steering angle, having become zero as conditions.

[0031]

when the turn signal lighting controller 11 detected both the peaks P1 and P2 and return operation was carried out for the steering 6 only specified quantity $\Delta\theta$ from the 2nd peak P2 (time t5), putting-out-lights conditions were satisfied -- a purport judgment is made. A turn signal lighting controller switches off the right-hand side turn signal 3, when [at which the putting-out-lights conditions concerning a lane change were satisfied] a purport judgment is made. Thus, the turn signals 2 and 3 are switched off to more suitable timing by only specified quantity $\Delta\theta$ waiting for return operation of the steering 6 from detection of the 2nd peak P2. When changing lanes into the left lane, and both the peaks P1 and P2 are detected like the above and return operation is carried out only specified quantity $\Delta\theta$, the left-hand side turn signal 2 is switched off.

[0032]

Thus, automatic putting out lights of a turn signal is performed in a decision criterion which is different in a lane change and a right and left chip box. Specifically, the turn signal lighting controller 11 has changed the decision criterion of automatic putting out lights by whether the steering angle theta reaches the cancel preparation angle theta 1.

[0033]

Here, a lane change differs in the amount of rotating operation of the steering 6 from a right and left chip box. That is, the amount of rotating operation of the steering 6 concerning a right and left chip box is large compared with the amount of rotating operation of the steering 6 concerning a lane change. therefore -- it is detection about the cancel preparation angle θ_1 as mentioned above at the time of a right and left chip box -- assumption -- it can be presumed the thing about any of a lane change and a right and left chip box operation of the steering 6 is by considering it as the steering angle θ which detection cannot assume easily at the time of a lane change.

[0034]

when the steering angle θ turned into the cancel angle θ_2 after that in detail for being a right and left chip box when the steering angle θ reaches the cancel preparation angle θ_1 as shown in [Fig.3](#), putting-out-lights conditions were satisfied -- a purport judgment is made and a turn signal is switched off. That is, when the steering angle θ reaches the cancel preparation angle θ_1 , detection of both peak P1 and P2 is not performed henceforth. Therefore, even if both the peaks P1 and P2 are seen as the alternate long and short dash line of [Fig.3](#) shows after the steering angle θ reaches the cancel preparation angle θ_1 , the turn signals 2 and 3 will not be switched off automatically. Here, after the steering angle θ reaches the cancel preparation angle θ_1 , as a case where both the peaks P1 and P2 are seen, the case where the course direction of vehicles is corrected, and the case where a driver does not mean but rotating operation of the steering is carried out can be considered, for example. An erroneous decision is not carried out to that and a lane change by the case where such a situation occurs. For this reason, incorrect putting out lights of the turn signals 2 and 3 at the time of a right and left chip box can be prevented.

[0035]

Comparison with the steering angle θ and the cancel preparation angle θ_1 does not twist to information, including the vehicle speed etc., but judgment of a lane change and a right and left chip box is attained easily.

Next, operation of the turn signal lighting controller 11 constituted as mentioned above is described according to the flow chart shown in [Fig.5](#). This flow chart is performed according to the light control program stored in own ROM by the turn signal lighting controller 11.

[0036]

First, the turn signals 2 and 3 are made to turn on based on actuated-valve-position detecting-signal SP (S101). And it is judged whether the steering angle θ is more than cancel preparation angle θ_1 (S102). It is judged whether the steering angle θ is less than cancel angle θ_2 noting that it is operation of the steering 6 accompanying a right and left chip box, when [whose steering angle θ is more than cancel preparation angle θ_1] a purport judgment is made (it is YES at S102) (S103). when it waited for the steering angle θ to become less than cancel angle θ_2 (it is NO at S103) and the steering angle θ became less than cancel angle θ_2 (it is YES at S103), putting-out-lights conditions were satisfied -- a

purport judgment is made (S104). And the turn signals 2 and 3 are switched off (S105).

[0037]

On the other hand, when [whose steering angle θ is less than / cancel preparation angle θ_{11}] a purport judgment is made (it is NO at S102), it is judged whether the 1st peak P1 was detected (S106). when the 1st peak P1 is not detected (it is NO at S106), processing shifts to Step S102, it is judged again whether the steering angle θ is more than cancel preparation angle θ_{11} , and it is more than cancel preparation angle θ_{11} -- if a purport judgment is made, processing will shift to Step S103. That is, the steering angle θ becomes more than cancel preparation angle θ_{11} after lighting of the turn signals 2 and 3, or the steering angle θ and the cancel preparation angle θ_{11} are always compared until the 1st peak P1 is detected.

[0038]

It is judged whether the 2nd peak P2 was detected noting that it is operation of the steering 6 accompanying a lane change, when the 1st peak P1 is detected (it is YES at S106) (S107). And when it waits to detect the 2nd peak P2 (it is NO at S107) and the 2nd peak P2 is detected (it is YES at S107), it is judged whether return operation of the steering 6 was carried out only specified quantity $\Delta\theta$ (S108). when the steering 6 waited to carry out return operation only of specified quantity $\Delta\theta$ (it is NO at S108) and return operation only of specified quantity $\Delta\theta$ was carried out (it is YES at S108), putting-out-lights conditions were satisfied -- a purport judgment is made (S104). And the turn signals 2 and 3 are switched off (S105). Above, a series of processings from lighting of the turn signals 2 and 3 to putting out lights are completed.

[0039]

In the above-mentioned procedure, the steering angle θ compared with the cancel preparation angle θ_{11} and the cancel angle θ_2 is judged in an absolute value. Even when the steering 6 outputs the steering angle θ of a negative value to a counterclockwise rotation by rotating operation being carried out by this, it is judged correctly.

[0040]

As mentioned above, according to the described embodiment, the following operation effects can be generated.

(1) Putting-out-lights conditions change based on whether the steering angle θ of the rudder sensor 13 reaches the cancel preparation angle θ_{11} . that is, when the steering angle θ turned into the cancel angle θ_2 , putting-out-lights conditions were satisfied for being a right and left chip box, when the steering angle θ reaches the cancel preparation angle θ_{11} -- a purport judgment is made and the turn signals 2 and 3 are switched off. on the other hand, when the steering angle θ detected the 1st peak and the 2nd peak for being a lane change, when the steering angle θ is less than [cancel preparation angle θ_{11}], putting-out-lights conditions were satisfied -- a purport judgment is made and the turn signals 2 and 3 are switched off automatically. Here, neither the case where the course direction of vehicles is readjusted, nor a driver may mean to a right and left compromise, for example, but rotating operation of the steering may be carried out to it. Even if the steering angle θ detected the 1st peak and the

2nd peak in such cases, after the steering angle θ reached the cancel preparation angle θ_1 , in order not to perform detection of both peak P1 and P2, the turn signals 2 and 3 are not switched off automatically. Thereby, incorrect putting out lights of the turn signals 2 and 3 at the time of a right and left chip box can be prevented.

[0041]

(Second embodiment)

Hereafter, with reference to Fig.6, it describes about the second embodiment of the present invention. This embodiment differs in the light control program from a 1st embodiment of the above. Hereafter, it describes focusing on a point of difference with a first embodiment. The direction indicating device of this embodiment is provided with the same composition as the direction indicating device of the first embodiment shown in Fig.2.

[0042]

Operation of the turn signal lighting controller 11 in this embodiment is described according to the flow chart shown in Fig.6.

First, the turn signals 2 and 3 are made to turn on based on actuated-valve-position detecting-signal SP (S151). And it is judged whether the 1st peak P1 was detected (S152). It waits to detect the 1st peak P1 (it is NO at S152), and it is judged whether the steering angle θ when the 1st peak P1 is detected is more than cancel preparation angle θ_1 (S153). It is judged whether the steering angle θ is less than cancel angle θ_2 noting that it is operation of the steering 6 accompanying a right and left chip box, when [whose steering angle θ is more than cancel preparation angle θ_1] a purport judgment is made (it is YES at S153) (S154). when it waited for the steering angle θ to become less than cancel angle θ_2 (it is NO at S154) and the steering angle θ became less than cancel angle θ_2 (it is YES at S154), putting-out-lights conditions were satisfied -- a purport judgment is made (S155). And the turn signals 2 and 3 are switched off (S156).

[0043]

On the other hand, it is judged whether the 2nd peak P2 is detected noting that it is operation of the steering 6 accompanying a lane change, when [whose steering angle θ is less than / cancel preparation angle θ_1] a purport judgment is made (it is NO at S153) (S157). When it waits to detect the 2nd peak P2 (it is NO at S157) and the 2nd peak P2 is detected (it is YES at S157), it is judged whether return operation of the steering 6 was carried out only specified quantity $\Delta\theta$ (S158). when the steering 6 waited to carry out return operation only of specified quantity $\Delta\theta$ (it is NO at S158) and return operation only of specified quantity $\Delta\theta$ was carried out (it is YES at S158), putting-out-lights conditions were satisfied -- a purport judgment is made (S154). And the turn signals 2 and 3 are switched off (S155).

[0044]

As mentioned above, what is necessary is just to perform comparison with the steering angle θ and the cancel preparation angle θ_1 , when the 1st peak P1 is detected. Therefore, it differs from a first embodiment and it is not necessary to always perform comparison with the steering angle θ and the cancel preparation angle θ_1 after lighting of the turn signals 2

and 3. For this reason, incorrect putting out lights of the turn signals 2 and 3 at the time of a right and left chip box can be prevented by easier control.

[0045]

As mentioned above, according to the described embodiment, in addition to the operation effect of (1) of a first embodiment, the following operation effects can be generated.

(2) When the steering angle θ in the 1st peak P1 is less than [cancel preparation angle θ_{11}] and the 2nd peak P2 is detected after that noting that it is a lane change, a judgment of that putting-out-lights conditions were satisfied is made, and the turn signals 2 and 3 are switched off. Thereby, the turn signal lighting controller 11 should just perform comparison with the steering angle θ and the cancel preparation angle θ_{11} , when the 1st peak P1 is detected. Therefore, incorrect putting out lights of the turn signals 2 and 3 at the time of a right and left chip box can be prevented more easily.

[0046]

The above-mentioned embodiment can carry this out with the following forms changed suitably.

- In the above-mentioned embodiment, although the cancel preparation angle θ_{11} and the cancel angle θ_{21} were constant, according to the vehicle speed, it is good also as variable in the cancel preparation angle θ_{11} and the cancel angle θ_{21} . In this case, it is necessary to equip the vehicles 1 with a speed sensor.

[0047]

Since the acceleration of an excessive transverse direction is added to a driver etc. while running at the high speed of what has possible carrying out rotating operation of the steering largely generally while vehicles are running at a low speed, rotating operation of the steering cannot be largely carried out like under low speed running. Therefore, the rotating operation and return operation amount of the steering 6 become small as it becomes high-speed at the time of a right and left chip box. Therefore, for example, when the cancel angle θ_{21} and the cancel preparation angle θ_{11} are set up uniformly, it is assumed that the steering angle θ of the steering 6 does not reach the cancel preparation angle θ_{11} at the time of a right and left chip box, or the timing which becomes less than cancel angle θ_{21} delays. The above-mentioned problem can be solved by changing the cancel angle θ_{21} and the cancel preparation angle θ_{11} according to the vehicle speed, and the turn signals 2 and 3 can be made to switch off to suitable timing. Specifically, the cancel preparation angle θ_{11} and the cancel angle θ_{21} are small set up as the vehicle speed becomes largely.

[0048]

- In both the above-mentioned embodiments, inclination of the sine-wave-shape curve both the peaks P1 and P2 indicate change of the steering angle θ to be was detected considering the change in the zero θ , i.e., a steering angle, having become zero as conditions. However, both the peaks P1 and the detection technique of P2 may make the maximal value of the steering angle θ the 1st peak P1 in addition to this, for example, and may judge the minimal value to be the 2nd peak P2.

[0049]

- in both the above-mentioned embodiments, in the lane change, when return operation was carried out for the steering 6 only specified quantity $\Delta\theta$ from the 2nd peak P2, putting-out-lights conditions were satisfied -- a purport judgment was made. however, when the 2nd peak P2 was detected, putting-out-lights conditions were satisfied -- a purport judgment may be made.

[0050]

- In both the above-mentioned embodiments, although the rudder sensor 13 was provided as a rotation mode detection means, the yaw rate sensor which detects the rotation not only the rudder sensor 13 but accompanying [as a rotation mode detection means] the course changing of vehicles for example may be provided. In this composition, in connection with the rotating operation of the steering 6, a yaw rate is detected through a yaw rate sensor, and change of the detection value is detected as a waveform of sine wave shape like Fig.3, Fig.4, etc. At this time, the same effect as both the above-mentioned embodiments is acquired by changing into the cancel preparation angle θ_1 and the cancel angle θ_2 , and setting up a first yaw rate value and a second yaw rate value.

[0051]

Next, the technical idea which can be grasped from the aforementioned embodiment is described with the effect.

(b) A turn signal lighting controller which the aforementioned rotation mode detection means is a yaw rate sensor which detects the rotation accompanying the course changing of vehicles in Claim 1 or the turn signal lighting controller of the description to 2, and is a yaw rate from which the aforementioned yaw rate sensor detects the aforementioned detection value.

[0052]

According to the composition, through the yaw rate which a yaw rate sensor detects, the rotation mode of vehicles can be judged and incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented.

[0053]

(**) A turn signal lighting controller which sets up small said first value and said second value as the vehicle speed becomes largely based on the detection result of the speed sensor which detects the speed of vehicles in Claims 1-3 and the turn signal lighting controller of a description in any 1 item of (b).

[0054]

Since the acceleration of an excessive transverse direction is added to a driver etc. while running at the high speed of what has possible carrying out rotating operation of the steering largely generally while vehicles are running at a low speed, rotating operation of the steering cannot be largely carried out like under low speed running. Therefore, the rotating operation and return operation amount of a steering become small as it becomes high-speed at the time of a right and left chip box. Therefore, for example, when a first value and second value are set up uniformly, it is assumed that a detection value does not reach a first value at the time of a right and left chip box, or the timing which becomes below in a second value delays. By changing a first value and

second value according to the vehicle speed, the above-mentioned problem can be solved and putting-out-lights timing of a turn signal can be made more suitable.

[Explanations of letters or numerals]

[0055]

2 and 3 -- a turn signal and 4 -- a turn lever (control means) and 10 -- a direction indicating device and 11 -- a turn signal lighting controller and 13 -- a rudder sensor.

TECHNICAL FIELD

[Field of the Invention]

[0001]

The present invention relates to the light control of the turn signal of vehicles, and relates to the turn signal lighting controller which makes the turn signal turned on in detail switch off automatically.

PRIOR ART

[Background of the Invention]

[0002]

Vehicles are equipped with the turn signal which shows the direction of a right and left chip box or course changing to the circumference. According to operation of the turn lever which it has near the steering of a driver's seat, a turn signal lighting controller performs control of lighting of a turn signal, and putting out lights. And a turn signal lighting controller performs control which makes a turn signal switch off to timing suitable in the right and left chip box of vehicles, or the case of a lane change. For example, the turn signal lighting controller of the description to a Patent document 1 judges whether putting-out-lights conditions were satisfied based on the detection result of the rudder sensor which detects the amount of rudder angles of a steering. And a turn signal lighting controller makes a turn signal switch off, when [at which putting-out-lights conditions were satisfied] a purport judgment is made.

[0003]

First, it describes about the judgment method concerning automatic putting out lights of the turn signal at the time of a right and left chip box.

When turning to the right, after rotating operation of the steering is carried out to a clockwise rotation from a center valve position, return operation is carried out counter clockwise.

Therefore, as shown in Fig.7 in the case of right-turn, the steering angle θ detected through a rudder sensor changes to sine wave shape by a half cycle. The cancel angle θ_2 which is an angle smaller than the cancel preparation angle θ_1 and the cancel preparation angle θ_1 is set up on the basis of the center valve position of a steering. for example, when return operation was carried out counter clockwise and a steering became less than cancel angle θ_2 after rotating operation of the steering was carried out clockwise and the steering angle θ reached

the cancel preparation angle θ_1 when turning to the right, the putting-out-lights conditions concerning right-turn were satisfied -- a purport judgment is made. And a turn signal is switched off. Also in the case of left turn, after rotating operation of the steering was carried out counter clockwise and the steering angle θ reached the cancel preparation angle θ_1 similarly, when return operation is carried out and it becomes less than cancel angle θ_2 at a clockwise rotation, the light is put out.

[0004]

Next, it describes about the judgment method concerning automatic putting out lights of the turn signal at the time of a lane change.

When changing lanes into the right lane, after rotating operation of the steering is carried out to a clockwise rotation from a center valve position, return operation is carried out counter clockwise. Therefore, as shown in Fig.8, the steering angle θ detected through a rudder sensor changes to sine wave shape by a round term. By the time a lane change is completed here compared with the case of the above-mentioned right-turn, operation of the steering will be too many needed by the half cycle. By the operation for this half cycle, vehicles are returned to the course direction before a lane change.

[0005]

Therefore, in a lane change, the 1st peak P1 accompanying the rotating operation of a steering in the steering angle θ and the 2nd peak P2 accompanying return operation are detected.

Inclination of a waveform [2 / both the peaks P1 and / P] for example, is judged considering the change in the zero θ , i.e., a steering angle, having become zero as conditions. when both the peaks P1 and P2 were detected, the putting-out-lights conditions concerning a lane change were satisfied -- a purport judgment is made and a turn signal is switched off. A turn signal is switched off when changing lanes into the left lane, and both the peaks P1 and P2 are detected like the above.

[0006]

As mentioned above, even if it is which [of a lane change and a right and left chip box] case, a turn signal is switched off automatically.

EFFECT OF THE INVENTION

[Effect of the Invention]

[0016]

According to the present invention, in a turn signal lighting controller, incorrect putting out lights of a turn signal can be prevented at the time of a right and left chip box.

TECHNICAL PROBLEM

[Problem to be solved by the invention]

[0008]

By the way, in the above-mentioned turn signal lighting controller, there is a possibility that the putting-out-lights conditions which take for a lane change at the time of a right and left chip box may be satisfied. Specifically, at the time of a right and left chip box, rotating operation of the steering is not necessarily smoothly done by the driver, and a steering is operated according to the situation at that time. For example, it may correspond to a right and left chip box, the course direction of vehicles may be corrected, and a driver may not mean, but rotating operation of the steering may be carried out slightly. As shown in Fig.9 in these cases, vehicles turn to the right not through the circular locus 80 by rotating operation as shown in previous Fig.7 but through the winding locus 81. Therefore, as shown in Fig.10, there is a possibility that the 1st peak P1 and the 2nd peak P2 of the steering angle theta may be detected at the time of the rotating operation of the steering corresponding to the locus 81. In this case, in spite of a right and left compromise, a judgment of that the putting-out-lights conditions concerning a lane change were satisfied is made, and a turn signal is switched off. Thus, there was a possibility that a turn signal might not be switched off to timing suitable at the time of a right and left chip box.

[0009]

At the time of a right and left chip box, there is the object of this invention in providing the turn signal lighting controller which can prevent incorrect putting out lights of a turn signal.

MEANS

[Means for solving problem]

[0010]

Hereafter, it describes about the means for attaining the above-mentioned purpose, and its operation effect.

When the control means by which the invention according to claim 1 is provided near the driver's seat of vehicles is operated, Switch a turn signal to lighting status from the putting-out-lights state till then, and the rotation mode of the aforementioned vehicles is detected based on the predetermined detection value detected according to the rotation mode of vehicles by a rotation mode detection means, After the aforementioned detection value reaches the first value set to a standard in the detection value detection is previously assumed to be at the time of a right and left chip box, In the turn signal lighting controller with which putting-out-lights conditions were satisfied when it became a second value smaller than the above-mentioned first value and which makes a purport judgment and makes the aforementioned turn signal switch off automatically, The first peak of the aforementioned detection value detected when rotating operation is started in the above-mentioned first direction and the second direction which is opposite directions, after rotating operation of the steering was carried out in the first direction, when the aforementioned detection value was less than the above-mentioned first value, When the second peak of the aforementioned detection value detected when rotating operation is again started in the above-mentioned first direction is detected after the 1st peak was detected, it is making to judge that putting-out-lights conditions were satisfied and to make the aforementioned

turn signal switch off into the summary.

[0011]

According to the composition, putting-out-lights conditions change based on whether the detection value of a rotation mode detection means reaches a first value. that is, when a detection value turned into a second value, putting-out-lights conditions were satisfied for being a right and left chip box, when a detection value reaches a first value -- a purport judgment is made and a turn signal is switched off. on the other hand, when a detection value detected the 1st peak and the 2nd peak for being a lane change, when a detection value is less than a first value, putting-out-lights conditions were satisfied -- a purport judgment is made and a turn signal is switched off automatically. Here, neither the case where the course direction of vehicles is readjusted, nor a driver may mean to a right and left compromise, for example, but rotating operation of the steering may be carried out to it. Even if the detection value detected the 1st peak and the 2nd peak in such cases, after the detection value reached the first value, in order not to detect both peaks, a turn signal is not switched off automatically. Thereby, incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented.

[0012]

In the turn signal lighting controller according to claim 1 the invention according to claim 2, When the detection value in the above-mentioned first peak is less than the above-mentioned first value and the above-mentioned second peak is detected, it is making to judge that putting-out-lights conditions were satisfied and to make the aforementioned turn signal switch off into the summary.

[0013]

When according to the composition the detection value in a first peak is less than the above-mentioned first value and a second peak is detected after that noting that it is a lane change, a judgment of that putting-out-lights conditions were satisfied is made, and a turn signal is switched off. Thereby, the turn signal lighting controller should just perform comparison with a detection value and a first value, when a first peak is detected. Therefore, incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented more easily.

[0014]

When the control means provided near the driver's seat of vehicles is operated, while switching a turn signal to lighting status from the putting-out-lights state till then, the invention according to claim 3, In the turn signal lighting controller with which automatic putting out lights of the aforementioned turn signal is performed when [at which the putting-out-lights conditions concerning a right and left chip box or a lane change were satisfied based on the detection result of the aforementioned rudder sensor] a purport judging is carried out, It judges [whether the putting-out-lights conditions which require for a right and left chip box the steering angle of the steering detected by the aforementioned rudder sensor when the threshold value set to a standard is reached in the steering angle detection is previously assumed to be at the time of a right and left chip box are satisfied, and], It is making whether in the case of less than the aforementioned threshold value, the putting-out-lights conditions concerning a lane change are satisfied, and to

judge into the summary.

[0015]

According to the composition, a judgment is performed on the putting-out-lights conditions which require the steering angle detected by a rudder sensor for any of a right and left chip box and a lane change they are based on whether a threshold value is reached. The threshold value is set to the standard in the steering angle detection is assumed to be at the time of a right and left chip box. It is appropriately judged by this on the putting-out-lights conditions which take for a right and left chip box at the time of a right and left chip box, and is appropriately judged on the putting-out-lights conditions which take for a lane change at the time of a lane change. Here, neither the case where the course direction of vehicles is readjusted, nor a driver may mean to a right and left compromise, for example, but rotating operation of the steering may be carried out to it. Even if a steering angle is detected in such cases in the mode in which the putting-out-lights conditions of a lane change are satisfied, when the steering angle has reached the threshold value, since the judgment of whether the putting-out-lights conditions of a lane change are satisfied is not performed, a turn signal is not switched off automatically. Thereby, incorrect putting out lights of the turn signal at the time of a right and left chip box can be prevented.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[0017]

[Drawing 1](a) in a first embodiment is a plan of vehicles, and (b) is a front view of a steering.

[Drawing 2]The block diagram showing the electric composition of the direction indicating device in a first embodiment.

[Drawing 3]Graf who shows change of the steering angle θ detected at the time of the right and left chip box in a first embodiment.

[Drawing 4]The graph which shows change of the steering angle θ detected at the time of the lane change in a first embodiment.

[Drawing 5]The flow chart which shows the procedure of the light control program in a first embodiment.

[Drawing 6]The flow chart which shows the procedure of the light control program in a second embodiment.

[Drawing 7]The graph which shows change of the steering angle θ detected at the time of the right and left chip box in the former.

[Drawing 8]The graph which shows change of the steering angle θ detected at the time of the lane change in the former.

[Drawing 9]The plan showing the locus of the vehicles at the time of the right-turn in the former.

[Drawing 10]The graph which shows change of the steering angle θ detected at the time of the right and left chip box in the former.



Espacenet

Bibliographic data: JP2011142704 (A) — 2011-07-21**METHOD FOR MANAGING CHARGING OF SECONDARY BATTERY OF WORK VEHICLE, AND CHARGING SYSTEM**

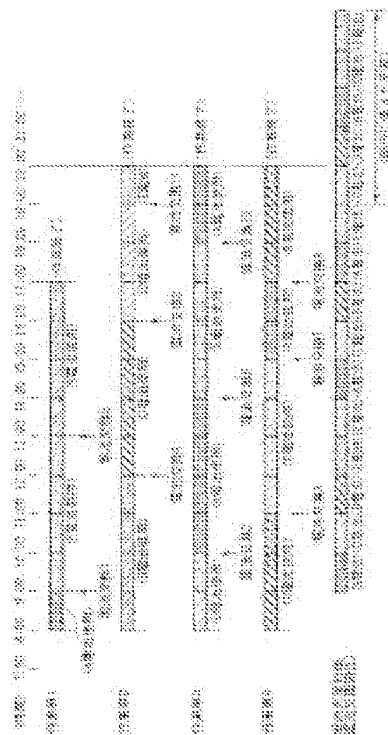
No documents available for this priority number.

Inventor(s): AKAHA FUMIHIRO; TSUMAKI TOSHIMICHI ± (AKAHA FUMIHIRO, ; TSUMAKI TOSHIMICHI)**Applicant(s):** MITSUBISHI HEAVY IND LTD ± (MITSUBISHI HEAVY IND LTD)**Classification:** - international: B60L11/18; H01M10/42; H01M10/44; H01M10/46; H02J7/00; H02J7/02
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Abstract of JP2011142704 (A)

PROBLEM TO BE SOLVED: To provide a method for managing charging of a secondary battery of a work vehicle and a charging system, to achieve highly efficiently operation of the secondary battery by improving the efficiency of a rotation schedule such as use, exchange, and charging of the secondary battery to be attached to the electric work vehicle. ;

SOLUTION: The management method includes the steps of: capturing the residual capacity of lithium ion batteries A-E for supplying power to a plurality of forklift trucks (work vehicles) 1-4; computing estimated power consumption of the work vehicles 1-4 to be consumed between the current time and a predetermine time; computing an index value for deciding priority order of exchanging the batteries of the work vehicles 1-4 on the basis of the difference between the residual capacity of each of the lithium ion batteries A-E and the estimated power consumption; and outputting a return command to a corresponding work vehicle among the vehicles 1-4 on the basis of the index value and a chargeable power of the lithium ion batteries A-E. ; COPYRIGHT: (C)2011,JPO&INPIT



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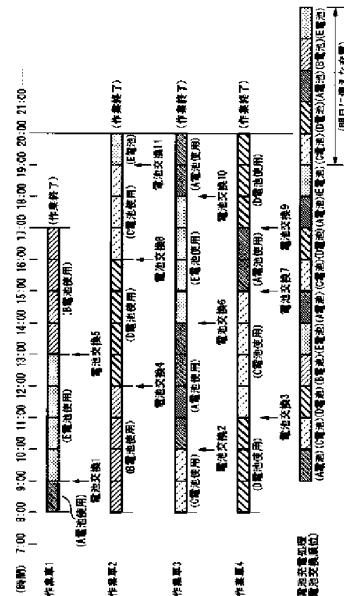
(54) 【発明の名称】 作業車の二次電池充電マネジメント方法及び充電システム

(57) 【要約】

【課題】電気作業車に取り付ける二次電池の使用・交換・充電といったローテーションスケジュールを効率化して、該二次電池の運用を効率良く行うことができる、作業車の二次電池充電マネジメント方法及び充電システムを提供する。

【解決手段】複数のフォークリフト（作業車）1～4へ各々電源を供給するリチウムイオン電池A～Eの残量を取り込むステップと、複数の作業車1～4の現在から所定時間後までの予想消費電力を演算するステップと、リチウムイオン電池A～Eの残量と該予想消費電力との差から、複数の作業車1～4の電池交換優先順位を定めるための指標値を演算するステップと、前記指標値及び前記リチウムイオン電池A～Eの充電受け入れ可能な許容量に基づき、該当する作業車1～4に対して、帰還指令を出力するステップと、を有する。

【選択図】 図4



【特許請求の範囲】**【請求項 1】**

複数の作業車へ各々電源を供給する二次電池の残量を取り込むステップと、
複数の作業車の現在から所定時間後までの予想消費電力を演算するステップと、
前記二次電池の残量と該予想消費電力との差から、前記複数の作業車の電池交換優先順位を定めるための指標値を演算するステップと、
前記指標値及び前記二次電池の充電受け入れ可能な許容量に基づき、該当する作業車に対して、帰還指令を出力するステップと、を有することを特徴とする作業車の充電マネジメント方法。

【請求項 2】

前記二次電池の残量不足により、現在の作業を完了させるのに支障が出ると判断された場合には、当該作業の中止、スケジュールの変更等を行わせることを特徴とする請求項 1 に記載の作業車の充電マネジメント方法。

【請求項 3】

前記予想消費電力は、作業車が基地に帰還するまでの電力消費量を含むことを特徴とする請求項 1 又は 2 のいずれか 1 項に記載の作業車の充電マネジメント方法。

【請求項 4】

複数の作業車にそれぞれ装填される二次電池の使用可能時間と、充電器による該二次電池の充電受け入れ可能な許容量とに基づき、これら複数の作業車の運用及び前記二次電池の充電スケジュールとを予め定めるステップと、

前記作業車の運用及び二次電池の充電スケジュールに従って、前記作業車による作業を実行させるステップと、を有することを特徴とする作業車の充電マネジメント方法。

【請求項 5】

前記作業車の運用及び二次電池の充電スケジュールに基づき、前記作業車を一定時間毎に出発させることを特徴とする請求項 4 に記載の作業車の充電マネジメント方法。

【請求項 6】

前記二次電池はリチウムイオン電池であることを特徴とする請求項 1 ～ 5 のいずれか 1 項に記載の作業車の充電マネジメント方法。

【請求項 7】

前記作業車は電気フォークリフトであることを特徴とする請求項 1 ～ 6 のいずれか 1 項に記載の作業車の充電マネジメント方法。

【請求項 8】

二次電池を搭載し、該二次電池から供給される電力によって作動する複数の作業車と、該作業車との間で通信を行うとともに、前記二次電池を充電する充電基地と、から構成された作業車の二次電池充電システムにおいて、

前記複数の作業車の各々において、該作業車に電源を供給する二次電池の残量を測定する電池残量センサと、

複数の作業車の各々において、該作業車の消費電力を測定する消費電力センサと、

これら電池残量センサ、消費電力センサから得られたデータを前記充電基地へ送信するとともに、前記充電基地から前記複数の作業車へ充電を行わせるための帰還指令を送信する通信手段と、を有し、

前記充電基地は、前記消費電力センサから受信したデータと、各作業車の作業予定データとから前記作業車の現在から所定時間経過後までの予想消費電力を算出するとともに、演算された予想消費電力と前記電池残量との差から、前記複数の作業車の電池交換優先順位を定め、該優先順位に従って該当する作業車を、前記充電基地へ戻る旨の帰還指令を出力する制御部と、を有することを特徴とする作業車の二次電池充電システム。

【請求項 9】

前記二次電池の残量不足により、現在の作業を完了させるのに支障が出ると判断された場合には、当該作業の中止、スケジュールの変更等を行わせることを特徴とする請求項 8 に記載の作業車の二次電池充電システム。

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【請求項 10】

前記予想消費電力は、作業車が基地に帰還するまでの電力消費量を含むことを特徴とする請求項 8 又は 9 のいずれか 1 項に記載の作業車の二次電池充電システム。

【請求項 11】

複数の作業車にそれぞれ装填される二次電池の使用可能時間と、充電器による該二次電池の充電受け入れ可能な許容量とに基づき、これら複数の作業車の運用及び前記二次電池の充電スケジュールとを予め定めるスケジュール作成部と、

前記作業車の運用及び二次電池の充電スケジュールに従って、前記作業車による作業を実行させるスケジュール発信部とからなる制御部を有することを特徴とする作業車の二次電池充電システム。

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【請求項 12】

前記作業車の運用及び二次電池の充電スケジュールに基づき、前記作業車を一定時間毎に出発させることを特徴とする請求項 11 に記載の二次電池充電システム。

【請求項 13】

前記二次電池はリチウムイオン電池であることを特徴とする請求項 8 ～ 12 のいずれか 1 項に記載の作業車の二次電池充電システム。

【請求項 14】

前記作業車は電気フォークリフトであることを特徴とする請求項 8 ～ 13 のいずれか 1 項に記載の作業車の二次電池充電システム。

【発明の詳細な説明】

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【技術分野】**【0001】**

本発明は、充電池により駆動される電気作業車に係り、特に、電気作業車に取り付ける充電池の使用・交換・充電といったローテーションスケジュールを効率の良いものとすることが可能な、作業車の二次電池充電マネジメント方法及び充電システムに関する。

【背景技術】**【0002】**

電気式フォークリフト等の電気作業車に搭載用の鉛電池の場合、急速充電（満充電を数時間以内に完了する）はできず、8 時間程度までの連続稼働に対して、8 時間以上をかけての緩充電（標準的な、電池に無理をかけない方式）を行う。緩充電では満充電での稼働時間に対して充電時間はそれと同じかそれ以上の時間を要する。

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このため、高稼働のユーザー（24 時間フル、あるいはそれに近い 1 日に占める 1 台当りの電気作業車の稼働時間が長いユーザー）では、1 台のフォークリフトに 2 ～ 3 個の交換用鉛電池パックを用意し、搭載している電池パックの電気残量が無くなると、予め充電済みのものと交換ローテーションする。

【0003】

鉛電池パックが電気作業車に搭載中のものと交換用の計 2 個である場合には、8 時間充電した直後の鉛電池パックを即座に、電気作業車に搭載する必要があるが、充電直後の鉛電池パックは加熱しており、放置冷却する必要性がある。その冷却を行わずに直に電気作業車に搭載して使用すると、電池パックの寿命の劣化が目立って早まる。そのため多くのユーザー（特に欧米）では、24 時間の電気作業車の使用において、1 台の電気作業車に対して 3 個の鉛電池パック（搭載中 1 個 + 交換用 2 個）を用意する、すなわち、8 時間の電気作業車での搭載及び使用に対して 1 個、充電器での 8 時間の充電に対して 1 個、充電後 8 時間の冷却に対して 1 個、合計 3 個もの鉛電池パックを用意して、8 時間毎のローテーションスケジュールを組んで運用している。

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【0004】

なお、電気作業車である電気式フォークリフトに使用されるバッテリー又はその交換管理について、特許文献 1 ～ 3 に示される技術が示されている。この中で、例えば、引用文献 1 に示されるフォークリフト用バッテリーの充電システムでは、バッテリーを充電するための充電器と、バッテリーの引き出し操作を行ったことを検出して、その検出信号を出力する検

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出手段と、検出手段における検出信号に応答して、充電器を制御する制御手段とを含み、バッテリー引き出し検出信号の検出後の最初の1回の充電を均等充電として、バッテリーダメージを低減している。

【先行技術文献】

【特許文献】

【0005】

【特許文献1】特開2009-118596号公報

【特許文献2】特開2004-266892号公報

【特許文献3】特開2004-32869号公報

【発明の概要】

【発明が解決しようとする課題】

【0006】

ところで、上述した電気作業車の駆動に際して、鉛電池を使用した場合には、充電に長時間を要し、鉛電池であるから、質量が大きく、取り扱い及び管理が面倒である。さらに、前述したようなローテーションスケジュールで鉛電池を運用した場合には、4台の電気作業車を有するユーザーにとっては、4台の緩充電器（充電時間：8時間以上）と、4台（電気作業車）×3個／台＝12個の鉛電池パックが必要となり、このようなユーザーでは、充電とバッテリー保管のために、貴重な倉庫内面積が占有されるという問題も発生していた。

【0007】

この発明は、上述した事情に鑑みてなされたものであって、電気作業車に取り付ける二次電池に例えば例としてリチウムイオン電池のような急速充電可能なものを使用し、該二次電池の使用・交換・充電といったローテーションスケジュールを効率化して、該二次電池の運用を効率良く行うことができる、作業車の二次電池充電マネジメント方法及び充電システムを提供する。

【課題を解決するための手段】

【0008】

上記課題を解決するために、この発明は以下の手段を提案している。すなわち、本発明に示される作業車の充電マネジメント方法によれば、複数の作業車へ各々電源を供給する二次電池の残量を取り込むステップと、複数の作業車の現在から所定時間後までの予想消費電力を演算するステップと、前記二次電池の残量と該予想消費電力との差から、前記複数の作業車の電池交換優先順位を定めるための指標値を演算するステップと、前記指標値及び前記二次電池の充電受け入れ可能な許容量に基づき、該当する作業車に対して、帰還指令を出力するステップと、を有することを特徴としている。

【0009】

また、本発明では、二次電池を搭載し、該二次電池から供給される電力によって作動する複数の作業車と、該作業車との間で通信を行うとともに、前記二次電池を充電する充電基地と、から構成された作業車の二次電池充電システムにおいて、前記複数の作業車の各々において、該作業車に電源を供給する二次電池の残量を測定する電池残量センサと、複数の作業車の各々において、該作業車の消費電力を測定する消費電力センサと、これら電池残量センサ、消費電力センサから得られたデータを前記充電基地へ送信するとともに、前記充電基地から前記複数の作業車へ充電を行わせるための帰還指令を送信する通信手段と、を有し、前記充電基地は、前記消費電力センサから受信したデータと、各作業車の作業予定データとから前記作業車の現在から所定時間経過後までの予想消費電力を算出するとともに、演算された予想消費電力と前記電池残量との差から、前記複数の作業車の電池交換優先順位を定め、該優先順位に従って該当する作業車を、前記充電基地へ戻る旨の帰還指令を出力する制御部と、を有することを特徴とする。

【発明の効果】

【0010】

本発明によれば、複数の作業車から取り込んだ二次電池の残量と、該作業車の現在から

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所定時間後までの予想消費電力との差から、該作業車の電池交換優先順位を定めるための指標値を演算し、該指標値及び二次電池の充電受け入れ可能な許容量に基づき、該当する作業車に対して、帰還指令を出力するようにした。そして、このような作業車の運用及び二次電池の充電順位によって、作業車に取り付ける二次電池の使用・交換・充電といったローテーションスケジュールを効率化して、該二次電池の運用を効率良く行うことができ、その結果、従来のように予備電池を余計に用意する必要が無く、二次電池の効率的な運用が可能となる。

【0011】

また、本発明によれば、複数の作業車にそれぞれ装填される二次電池の使用可能時間と、充電器による該二次電池の充電受け入れ可能な許容量とに基づき、これら複数の作業車の運用及び二次電池の充電スケジュールとを予め定め、該スケジュールに従って、該作業車による作業を実行させるようにした。そして、このような作業車の二次電池充電システム及び充電マネジメント方法によって、作業車に取り付ける二次電池の使用・交換・充電といったローテーションスケジュールを効率化して、該二次電池の運用を効率良く行うことができ、その結果、従来のように予備電池を余計に用意する必要が無く、二次電池の効率的な運用が可能となる。

【図面の簡単な説明】

【0012】

【図1】実施例1に係る二次電池充電システムの全体図である。

【図2】図1の制御部を中心とした制御ブロック図である。

【図3】制御部の制御内容を示すフローチャートである。

【図4】実施例1に係るフォークリフトの運用及びリチウムイオン電池の充電スケジュールを具体的に示すタイムチャートである。

【図5】実施例2に係る二次電池充電システムの全体図である。

【図6】図5の制御部を中心とした制御ブロック図である。

【図7】制御部の制御内容を示すフローチャートである。

【図8】実施例2に係るフォークリフトの運用及びリチウムイオン電池の充電スケジュールを具体的に示すタイムチャートである。

【発明を実施するための形態】

【0013】

[実施例1]

本発明の実施例1として示した充電マネジメント方法及び該充電マネジメント方法を使用した二次電池充電システムについて、図1～図4を参照して説明する。

【0014】

本実施例では、図1及び図2に示すように、電気作業車であるフォークリフトを4台（図面に、作業車1、作業車2、作業車3、作業車4として示す）使用し、二次電池として急速充電可能なリチウムイオン電池（電池A～E）を5個使用し、バッテリー充電器を1台使用している。

なお、5個のリチウムイオン電池の中で、4個は充電を完了した状態で4台のフォークリフトにそれぞれ装填され、1個は予備電池として使用される。

【0015】

また、バッテリー充電器は、リチウムイオン電池（電池A～E）を急速充電を可能とするものであって、通常では、4時間のリチウムイオン電池の使用に対して1時間の急速充電を行うことにより、再び、4時間の使用が可能となる。このようなりチウムイオン電池では、4時間稼動した場合に1時間で充電が完了し、8時間稼動した場合に2時間で充電が完了するが、本例では、リチウムイオン電池を（最大）4時間使用し、その後、1時間で充電を完了させる「急速充電」の場合について説明する。

【0016】

図1は、本発明に係る二次電池充電システムの全体を示す概略図であって、符号1～4は電気作業車（作業車1、作業車2、作業車3、作業車4）となるフォークリフトである

。このフォークリフト 1～4 には、上述したリチウムイオン電池（電池 A～E：後述する）がそれぞれ装填されるとともに、図 2 に詳細に示すように、該リチウムイオン電池の残量を測定する電池残量センサ 1 A～4 A と、該フォークリフト 1～4 の消費電力を測定する消費電力センサ 1 B～4 B と、該フォークリフト 1～4 の位置を示す位置センサ 1 C～4 C とがそれぞれ設けられている。

【0017】

また、図 1 に符号 10 で示すものは基地局であって、この基地局 10 には、フォークリフト 1～4 を制御するための制御部 C 1、フォークリフト 1～4 に装填されたりチウムイオン電池を充電するための 1 台のバッテリー充電器 11 が設けられている。

また、この基地局 10 と、フォークリフト 1～4 との間には、通信手段 12 が設けられており、この通信手段 12 を通じて、フォークリフト 1～4 の電池残量センサ 1 A～4 A、消費電力センサ 1 B～4 B、及び位置センサ 1 C～4 C の検出データが制御部 C 1 に供給され、一方、制御部 C 1 からフォークリフト 1～4 へは、リチウムイオン電池を充電するための帰還指令が出力されるようになっている。

また、制御部 C 1 には、該制御部 C 1 での演算結果を表示するための表示部 13、各種データを入力するための入力手段 14 が設けられている。

【0018】

前記制御部 C 1 は、図 2 に示すように、信号送受信部 20、指標値演算部 21、充電スケジュール決定部 22 を有するものであり、信号送受信部 20 では、通信手段 12 を通じて、フォークリフト 1～4 から、電池残量センサ 1 A～4 A、消費電力センサ 1 B～4 B、位置センサ 1 C～4 C での検出データを受信し、また、フォークリフト 1～4 に対して充電のための帰還信号を発信する。

【0019】

また、前記制御部 C 1 の指標値演算部 21 では、電池残量センサ 1 A～4 A、消費電力センサ 1 B～4 B 及び位置センサ 1 C～4 C の検出データに基づき、いずれのフォークリフト 1～4 を基地局 10 に帰還させて、バッテリー充電器 11 にてリチウムイオン電池（電池 A～E）の充電を行わせるかの判断因子となる、指標値（ Z_n ）を計算する。このような指標値（ Z_n ）の計算は、例えば「 $Z_n = Q_n - (L_n + f(W_n))$ 」という計算式を用いて行われる。ここで、「 Q_n 」は、電池残量センサ 1 A～4 A での検出データを基にしたリチウムイオン電池（電池 A～E）の電池残量を示す値である。「 L_n 」は、外に出ているフォークリフト 1～4 が基地局 10 に戻るまでに要する電力量を示す値であり、位置センサ 1 C～4 C からの検出データと予め記憶させておいた単位時間当たりの消費電力値とから計算する。また、「 $f(W_n)$ 」は、予め定めたおいた直近（例えば 10 分先）までの電力消費量を示す値であって、消費電力センサ 1 B～4 B からの検出データを基にして計算する。

【0020】

また、前記制御部 C 1 の充電スケジュール決定部 22 では、指標値演算部 21 で計算された指標値（ Z_n ）を、フォークリフト 1～4 毎に計算した指標値（ Z_n ）を比較して、リチウムイオン電池（電池 A～E）の消耗の度合いから電池交換の優先順位を付けるとともに、該優先順位に従って、指標値（ Z_n ）が最小となるフォークリフト 1～4 を基地局 10 に帰還させる指示を出力する。そして、このような帰還指示に基づき、該フォークリフト 1～4 に搭載されていたリチウムイオン電池を、バッテリー充電器 11 にて充電済のリチウムイオン電池と交換する作業を行わせる。

【0021】

ここで、フォークリフト 1～4 の作業内容、及びリチウムイオン電池 A～E の交換手順について、図 3 に示す前記制御部 C 1 の処理ステップと、図 4 に示すタイムチャートを参照して説明する。

【0022】

なお、図 4 のタイムチャートにおいて、リチウムイオン電池 A～D はそれぞれのフォークリフト 1～4 に最初に搭載され、リチウムイオン電池 E は予備に用意されると、規定す

る。また、フォークリフト 1～4 による荷役作業を開始（開始時間 8 時）するに当たり、各リチウムイオン電池 A～E は予めフルに充電されていることを前提とする。また、図 4 のタイムチャートに示すリチウムイオン電池の交換処理は、〔1〕バッテリー充電器 11 でのリチウムイオン電池 A～E の充電時間（本例では 1 時間）、〔2〕フォークリフト 1～4 の台数（本例では 4 台）、〔3〕予備電池及びバッテリー充電器 11 の個数（本例では各 1 個）、〔4〕（リチウムイオン電池 A～D の）フォークリフトの標準運用での最大使用可能時間（本例では 4 時間）に基づくものであり、このような〔1〕～〔4〕のデータは人力手段 14 を通じて予め制御部 C 1 に入力しておく。

【0023】

《ステップ 1》

全車が朝 8 時に出発した後、予め定めた一定の時間間隔（例えば 5 分間隔）に、フォークリフト 1～4 から、電池残量センサ 1A～4A、消費電力センサ 1B～4B、位置センサ 1C～4C からの検出データを受信する。

【0024】

《ステップ 2》

ステップ 1 でのデータ受信に基づき、各フォークリフト 1～4 における指標値（ Z_n ）を、先の演算式から予め定めた一定時間毎（例えば 5 分間隔）に演算する。

【0025】

《ステップ 3》～《ステップ 4》

ステップ 2 で計算した各フォークリフト 1～4 毎の指標値（ Z_n ）を比較して、リチウムイオン電池（電池 A～E）の消耗の度合いから電池交換の優先順位を付けた後（ステップ 3）、優先順位の高い 1 台のフォークリフト 1～4 を基地局 10 に帰還させて、そのリチウムイオン電池を交換する（ステップ 4）。

具体的には、図 4 のタイムチャートに示すように、例えば 9 時の時点で、フォークリフト 1 が非常に負荷の大きい作業をしており、リチウムイオン電池 A が他のリチウムイオン電池 B～E と比較して大きく消耗していると判断した場合には、フォークリフト 1 を基地局 10 に帰還させて、予め 8 時から充電しておいた予備電池であるリチウムイオン電池 E と交換する。そして、ここでフォークリフト 1 から取り外したリチウムイオン電池 A は、バッテリー充電器 11 で充電する。

【0026】

その後、10 時の時点でフォークリフト 3 が負荷の大きい作業をしており、リチウムイオン電池 C が他のリチウムイオン電池と比較して大きく消耗していると判断した場合には、フォークリフト 3 を基地局 10 に帰還させて、予め充電しておいた先のリチウムイオン電池 A と交換する。そして、ここでフォークリフト 3 から取り外したリチウムイオン電池 C は、バッテリー充電器 11 で充電する。

その後、11 時の時点でフォークリフト 4 が負荷の大きい作業をしており、リチウムイオン電池 D が他のリチウムイオン電池と比較して大きく消耗していると判断した場合には、フォークリフト 4 を基地局 10 に帰還させて、予め充電しておいた先のリチウムイオン電池 C と交換する。そして、ここでフォークリフト 4 から取り外したリチウムイオン電池 D は、バッテリー充電器 11 で充電する。そして、以上のようなリチウムイオン電池の消耗に応じた交換を繰り返すことによって、フォークリフト 1～4 の連続した作業を行わせる。

【0027】

そして、このようなバッテリー充電器 11 での充電処理は、該バッテリー充電器 11 の台数及び充電時間に左右されるものであり、従って、上記ステップにて、このようなバッテリー充電器 11 でのリチウムイオン電池の受け入れ可能な許容量（1 時間に 1 個のリチウムイオン電池を充電できるという受け入れ可能な許容量）に基づき、前述のリチウムイオン電池 A～E の交換順位（図 4 の下段参照）を決定する。また、フォークリフト 1～4 による荷役作業が終了した後は、充電処理の末尾に示すように、翌日の処理に備えて全てのリチウムイオン電池 A～E をフル充電する。

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【0028】

以上詳細に説明したように本発明の実施例1に示す電気作業車の二次電池充電システム及び充電マネージメント方法によれば、複数のフォークリフト1～4の現在から所定時間後までの予想消費電力と、リチウムイオン電池A～Eの残量との差から、前記複数のフォークリフト1～4のリチウムイオン電池A～Eの交換優先順位を定めるための指標値を演算した後、該指標値及び前記バッテリー充電器11でのリチウムイオン電池A～Eの充電受け入れ可能な許容量に基づき、該当するフォークリフト1～4に対して、帰還指令を出力するようにした。すなわち、このような電気作業車の二次電池充電システム及び充電マネージメント方法によって、フォークリフト1～4に取り付けるリチウムイオン電池A～Eの使用・交換・充電といったローテーションスケジュールを効率化して、該リチウムイオン電池A～Eの運用を効率良く行うことができ、従来のように予備電池を余計に用意する必要が無く、二次電池の効率的な運用が可能となる。

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【0029】

なお、図4のタイムチャートに示すようなリチウムイオン電池A～Eの交換順位では、バッテリー充電器11でのリチウムイオン電池の受け入れ可能な許容量（1時間に1個のリチウムイオン電池を充電できるという受け入れ可能な許容量）に制限されるために、状況に応じて複数のリチウムイオン電池A～Eが順番待ちすることも予想されるが、その場合には、例えば、フル充電せずに部分充電のみで対応する、いずれか1台のフォークリフト1～4の運転を休止する、予備電池となるリチウムイオン電池／バッテリー充電器11をもう1台増やす、などで対応すると良い。

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【0030】

また、ステップ2で計算した各フォークリフト1～4における指標値（ Z_n ）が、マイナスになる、すなわち、電池容量の残量不足により、現在の作業を完了させるのに支障が出ると判断された場合には、当該作業の中止、スケジュールの変更（予定時間まで待つ）などの措置を行い、例えば、電池残量不足になっていない代替のフォークリフト1～4により作業を続行させるようにしても良い。

【0031】

また、上記実施例1では、フォークリフト1～4を例に挙げたが、これに限定されず、電気自動車、電動式のカートなどの電気作業車に適用しても良い。

このとき、数十キロ、数百キロ遠方まで出向いて荷物を運搬する電気自動車に適用する場合には、電気自動車に搭載したリチウムイオン電池が走行途中で消耗しないように、前述した指標値（ Z_n ）を常に監視することで、このような作業途中での走行停止というトラブルを未然に防止することができる。

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【0032】

また、図4で示す複数のフォークリフト1～4の運用及びリチウムイオン電池A～Eの充電順位は一例を示すものであり、上述した〔1〕～〔4〕のデータ内容、及び作業負荷により刻々と変化する指標値（ Z_n ）に応じて適宜、変更されることは言うまでもない。

【0033】

〔実施例2〕

本発明の実施例2として示した充電マネージメント方法及び該充電マネージメント方法を使用した二次電池充電システムについて、図5～図8を参照して説明する。実施例2が実施例1と異なる点は、フォークリフト1～4に搭載したセンサの検出値に基づき電池交換順位を定めるのではなく、予め設定した電池交換スケジュールに従って電池交換を行うようにした点である。

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また、実施例1との共通な技術事項は、バッテリー充電器11によるリチウムイオン電池A～Eの受け入れ可能な許容量（例えば、1時間に1個のリチウムイオン電池を充電できるという受け入れ可能な許容量）に基づき、これら複数のフォークリフト1～4の運用及びリチウムイオン電池A～Eを予め定めるようにした点である。

【0034】

図5は、実施例2を示す全体構成図であって、図1との相違点は、符号C2で示す制御

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部の制御内容の他、フォークリフト 1～4 にセンサ類が備えられていない点である。

【0035】

ここで、実際例 2 の制御部 C 2 は、複数のフォークリフト 1～4 にそれぞれ装填されるリチウムイオン電池 A～E の使用可能時間と、バッテリー充電器 1 1 による該リチウムイオン電池 A～E の充電受け入れ可能な許容量とに基づき、これら複数のフォークリフト 1～4 の運用及び前記リチウムイオン電池 A～E の充電スケジュールとを予め定めるスケジュール作成部 3 0 と、該スケジュール作成部 3 0 で作成されたフォークリフト 1～4 の運用及びリチウムイオン電池 A～E の充電スケジュールに従って、前記フォークリフト 1～4 の作業を実行させるスケジュール発信部 3 1 とから構成される。

【0036】

そして、このような制御部 C 2 の制御内容を、ステップで示すと図 7 で示すようになる。

《ステップ 1》

まず、ステップ 1 において、フォークリフト 1～4 の運用及び前記リチウムイオン電池 A～E の充電スケジュールを予め定めるために必要な各種データを、入力手段 1 4 を通じて入力する。ここで入力するデータとしては、〔1〕バッテリー充電器 1 1 でのリチウムイオン電池 A～E の充電時間（本例では 1 時間）、〔2〕フォークリフト 1～4 の台数（本例では 4 台）、〔3〕予備電池及びバッテリー充電器 1 1 の個数（本例では各 1 個）、〔4〕（リチウムイオン電池 A～D の）フォークリフトの標準運用での最大使用可能時間（本例では 4 時間）である。

【0037】

《ステップ 2》

次に、スケジュール作成部 3 0 において、複数のフォークリフト 1～4 にそれぞれ装填されるリチウムイオン電池 A～E の使用可能時間、及びバッテリー充電器 1 1 による該リチウムイオン電池 A～E の充電受け入れ可能な許容量（ステップ 1 で入力したデータによる）に基づき、これら複数のフォークリフト 1～4 の運用及びリチウムイオン電池 A～E の充電スケジュール（図 8 参照）を予め定める。

具体的には、図 8 で示すように、1 時間毎に、バッテリー充電器 1 1 にてリチウムイオン電池 A～E が 1 個ずつ順番に受け入れ可能なようにするために、まず、作業開始 1 時間前の朝 7 時からフォークリフト 1 に装填するリチウムイオン電池 A の充電を開始し、その後、8 時に、該リチウムイオン電池 A をフォークリフト 1 に装填して出発させた後、次のフォークリフト 2 で使用するリチウムイオン電池 B の充電を開始する。その後、9 時に、該リチウムイオン電池 B をフォークリフト 2 に装填して出発させた後、次のフォークリフト 3 で使用するリチウムイオン電池 C の充電を開始する。その後、10 時に、該リチウムイオン電池 C をフォークリフト 3 に装填して出発させた後、次のフォークリフト 4 で使用するリチウムイオン電池 D の充電を開始する。

その後、11 時に、該リチウムイオン電池 D をフォークリフト 4 に装填して出発させた後、先に出発しかつ 12 時に帰還予定のフォークリフト 1 で使用するためのリチウムイオン電池 E（予備電池となる）の充電を開始する。その後、12 時に、該リチウムイオン電池 E を、4 時間が経過して帰還したフォークリフト 1 に装填して出発させるとともに、該フォークリフト 1 から取り外したリチウムイオン電池 A の充電を開始する、というスケジュールを決定する。

そして、このような処理を順次繰り返すことで、フォークリフト 1～4 による荷役作業と、バッテリー充電器 1 1 によるリチウムイオン電池 A～E の充電とを中断することなく連続的に行うことができる。

【0038】

《ステップ 3》

作業開始前に、通信手段 1 2 を通じて、先のステップで決定した図 8 に示すような、フォークリフト 1～4 の運用及びリチウムイオン電池 A～E の充電スケジュールを各フォークリフト 1～4 に送信し、該スケジュールに従ってフォークリフト 1～4 に対して荷役及

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びリチウムイオン電池 A ～ E の充電作業を実行させる。

【 0 0 3 9 】

以上詳細に説明したように本発明の実施例 2 に示す電気作業車の二次電池充電システム及び充電マネージメント方法によれば、複数のフォークリフト 1 ～ 4 にそれぞれ装填されるリチウムイオン電池 A ～ E の使用可能時間と、充電器による該リチウムイオン電池 A ～ E の充電受け入れ可能な許容量とに基づき、これら複数のフォークリフト 1 ～ 4 の運用及びリチウムイオン電池 A ～ E の充電スケジュールとを予め定め、該スケジュールに従って、該フォークリフト 1 ～ 4 に対して荷役作業及びリチウムイオン電池 A ～ E の充電作業を実行させるようにした。すなわち、このような作業車の二次電池充電システム及び充電マネージメント方法によって、フォークリフト 1 ～ 4 に取り付けるリチウムイオン電池 A ～ E の使用・交換・充電といったローテーションスケジュールを効率化して、該リチウムイオン電池 A ～ E の運用を効率良く行うことができ、従来のように予備電池を余計に用意する必要が無く、二次電池の効率的な運用が可能となる。

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【 0 0 4 0 】

なお、図 8 で示す複数のフォークリフト 1 ～ 4 の運用及びリチウムイオン電池 A ～ E の充電スケジュールは一例を示すものであり、上述した〔 1 〕～〔 4 〕のデータ内容に応じて適宜、変更されることは言うまでもない。

【 0 0 4 1 】

なお、上記実施例 2 では、フォークリフト 1 ～ 4 を例に挙げたが、これに限定されず、電気自動車、電動式のカートなどの電気作業車に適用しても良い。

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【 0 0 4 2 】

以上、本発明の実施形態について図面を参照して詳述したが、具体的な構成はこの実施形態に限られるものではなく、本発明の要旨を逸脱しない範囲の設計変更等も含まれる。

【産業上の利用可能性】

【 0 0 4 3 】

本発明は、フォークリフト、電気自動車、電動式のカートなど充電池により駆動される電気作業車に係り、特に、電気作業車に取り付ける充電池の使用・交換・充電といったローテーションスケジュールを効率の良いものとすることができる、作業車の二次電池充電マネージメント方法及び充電システムに関する。

【符号の説明】

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【 0 0 4 4 】

- 1 フォークリフト（作業車 1）
- 2 フォークリフト（作業車 2）
- 3 フォークリフト（作業車 3）
- 4 フォークリフト（作業車 4）

1 A ～ 4 A 電池残量センサ

1 B ～ 4 B 消費電力センサ

C 1 制御部

C 2 制御部

A リチウムイオン電池

B リチウムイオン電池

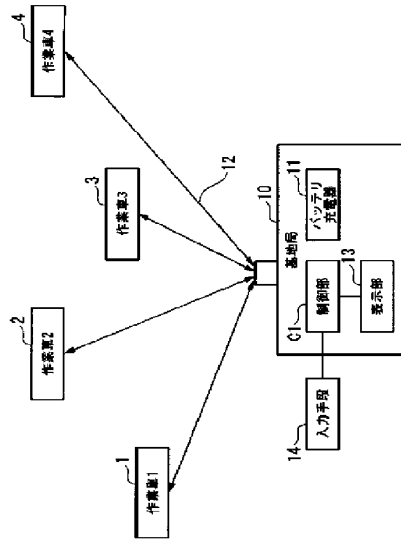
C リチウムイオン電池

D リチウムイオン電池

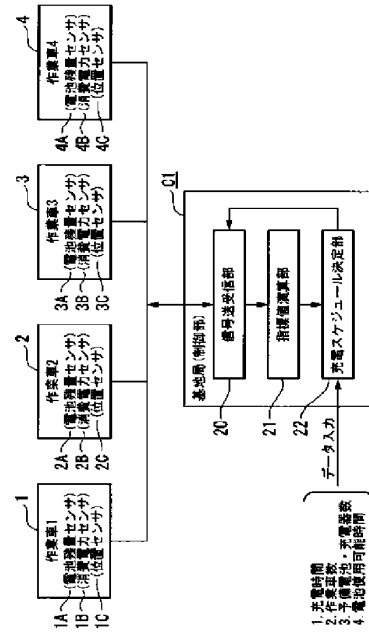
E リチウムイオン電池（予備電池）

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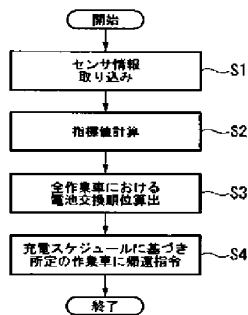
【図 1】



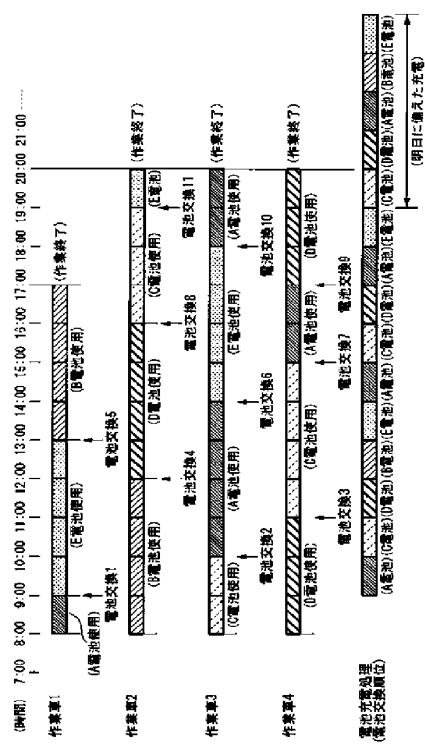
【図 2】



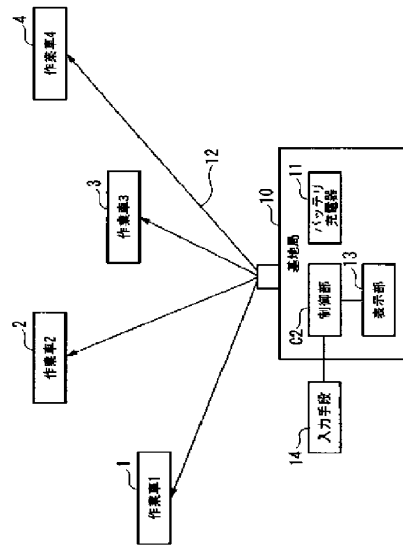
【図 3】



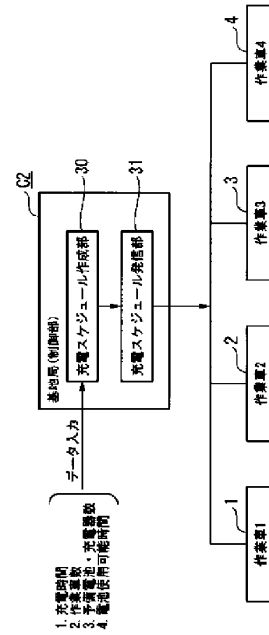
【図 4】



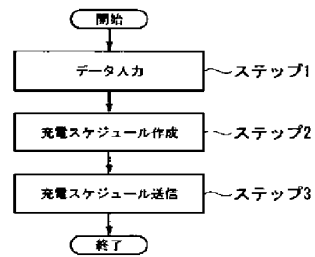
【図 5】



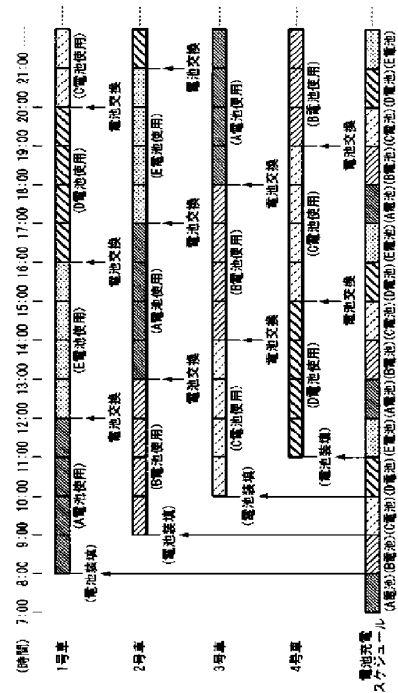
【図 6】



【図 7】



【図 8】



フロントページの続き

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(54) 전기자동차의 시동확인장치

요약

본 고안은 전기자동차의 시동확인장치에 관한 것으로서, 본 고안의 목적은 전기자동차에서 모터와 축전지 간에 전기적인 접속이 완료되었음을 알리는 전기자동차의 시동확인장치를 제공함에 있다.

상기와 같은 목적을 이루기 위한 본 고안은 축전지와 모터를 서로 연결시키기 위한 시동스위치(10)와, 축전지의 전원이 모터에 연결된것을 감지하는 시스템제어기(20)와, 시스템제어기(20)의 제어에 따라 작동되는 멜로디발생장치(30)와, 멜로디발생장치(30)에 의해 발생된 신호를 운전자에게 들리도록 하는 스피커(40)를 포함하여 이루어져 시동이 완료되었음을 청각적으로 통지하여 확신을 줌으로써 심리적 안정에 도움을 줄 수 있다.

대표도

도 1

명세서

도면의 간단한 설명

도1은 본 고안에 의한 전기자동차의 시동확인장치를 나타낸 회로구성도이다.

- 도면의 주요부분에 대한 부호의 설명 -

10 : 시동스위치 20 : 시스템제어기
30 : 멜로디발생장치 40 : 스피커

고안의 상세한 설명

고안의 목적

고안이 속하는 기술분야 및 그 분야의 종래기술

본 고안은 전기자동차의 시동확인장치에 관한 것으로서, 보다 상세하게는 전기자동차에서 모터와 축전지 간에 전기적인 접속이 완료되었음을 알리는 전기자동차의 시동확인장치에 관한 것이다.

전기자동차는 소음이 적고 배기가스가 전혀 발생되지 않기 때문에 내연기관에 의한 공해문제를 해결하기 위해 많은 연구가 행해져서 급속한 발전을 이루고 있다. 일반적으로 전기자동차는 일반전원으로 부터 충전기를 통해 충전된 축전지를 동력원으로 전동기의 구동을 제어하여 발생된 구동력으로 휠을 회전시킴으로써 차량이 주행할 수 있도록 하는 구조를 가진다.

그리고, 전기자동차에서 사용되는 전기장치 즉, 램프류나 전장품등은 내연기관에서 사용하는 것을 그대로 사용하기 있기에 축전지의 전압을 강압하여 얻은 전원을 공급받는다. 이때 강압된 전원은 보조배터리를 충전하여 전장품등에 일정한 전원이 공급되도록 되어있다.

전기자동차에는 플라이휠이나 아이들링이라는 개념없이 축전지의 전원을 모터에 공급될 수 있도록 하는 것이기 때문에 내연기관처럼 엔진음으로 시동이 걸렸는지 확인할 수 없다는 문제점이 있다.

고안이 이루고자 하는 기술적 과제

본 고안은 상기와 같은 문제점을 해결하기 위해 창작된 것으로서, 본 고안의 목적은 전기자동차에 시동이 걸렸음을 청각적 수단으로 운전자에게 알리도록 하는 전기자동차의 시동확인장치를 제공함에 있다.

고안의 구성 및 작용

상기와 같은 목적을 이루기 위한 본 고안은 축전지와 모터를 서로 연결시키기 위한 시동스위치와, 축전지의 전원이 모터에 연결된것을 감지하는 시스템제어기와, 시스템제어기의 제어에 따라 작동되는 멜로디발생장치와, 멜로디발생장치에 의해 발생된 신호를 운전자에게 들리도록 하는 스피커를 포함하여 이루어진다.

상기와 같이 이루어진 본 고안의 작동을 설명하면 다음과 같다.

시동스위치를 작동시켜 축전지의 전원이 모터로 공급될 수 있도록 하면 시스템제어기에서 이를 감지한다. 이 때 시동이 완료되었으면 멜로디발생장치를 작동시켜 스피커를 통해 소리가 나도록 한다.

이하, 본 고안을 구체적으로 실현하기 위한 본 고안의 바람직한 실시예를 첨부된 도면을 참조하여 설명한다. 또한 본 실시예는 본 고안의 권리범위를 한정하는 것은 아니고, 단지 예시로 제시된 것이다.

도1은 본 고안에 의해 이루어진 전기자동차의 시동확인장치를 구체적으로 실현한 실시예를 나타낸 블록구성도이다.

도1에 도시된 바와 같이 전기자동차를 시동시키기 위한 시동스위치(10)와, 시동스위치(10)에 의해 축전지의 전원이 모터로 공급되도록 회로가 연결되었는가를 판단하는 시스템제어기(20)와, 시스템제어기(20)의 출력에 따라 소리를 발하도록 하는 멜로디발생장치(30)와, 멜로디발생장치(30)에 의해 출력된 신호를 들을 수 있도록 하는 스피커(40)로 이루어진다.

또한 청각적인 수단외에도 램프를 통한 시각적 수단으로 시동이 완료되었음을 표시할 수도 있다.

상기와 같이 이루어진 본 실시예의 작동을 설명하면 다음과 같다.

전기자동차는 내연기관과 달리 플라이휠이나 아이들링이라는 엔진의 회전음이 없고 시동스위치(10)에 의해 시동을 걸면 축전지의 고전압이 모터로 공급될 수 있도록 서로 연결시켜 줌으로써 시동이 완료된다. 그러면 시스템제어기(20)에서 축전지의 전원이 모터로 공급되고 있음을 판단하여 멜로디발생장치(30)를 작동시켜 스피커(40)를 통해 소리를 발하도록 함으로써 운전자에게 보다 정확하게 시동이 걸렸음을 알릴 수 있다.

고안의 효과

상기한 바와 같이 본 고안은 전기자동차의 시동시 시동이 완료되었음을 청각적인 수단으로 알림으로써 운전자가 보다 정확하게 시동이 완료되었음을 알 수 있음으로써 심리적 안정을 줄 수 있다는 이점이 있다.

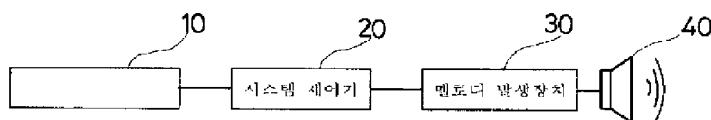
(57) 청구의 범위

정구항 1

축전지와 모터를 서로 연결시키기 위한 시동스위치(10)와,
축전지의 전원이 모터에 연결된것을 감지하는 시스템제어기(20)와,
상기 시스템제어기(20)의 제어에 따라 작동되는 멜로디발생장치(30)와,
상기 멜로디발생장치(30)에 의해 발생된 신호를 운전자에게 들리도록 하는 스피커(40)
를 포함하여 이루어진 전기자동차의 시동확인장치.

도면

도면1



(19) Republic of Korea Intellectual Property Office (KR)

(12) Public Utility Model Gazette (U)

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(74) Agent	Eun Seop Jung and Won Gi Jung
<i>Request for examination : none</i>	
(54) Start-up checking device for electric cars	
<i>Summary</i>	

This design is regarding a start-up checking device for electric cars, and its purpose is to provide start-up checking devices for electric cars to indicate complete electrical connection between the motor and battery of an electric car.

In order to achieve the aforementioned purpose, this design is consisted of a start-up switch (10) for connecting the battery to the motor, a system controller (20) for detecting connection between the battery power to the motor, a melody generator (30) which is operated by the system controller (20), and a speaker (40) which enables drivers to hear signals generated by the melody generator (30), and this design is able to help with psychological assurance by providing confidence through auditory notification of a successful start-up.

*Representative drawings**Drawing 1**Statements**Brief description of the drawings*

Drawing 1 is a circuit diagram displaying the start-up checking device for electric cars according to this design.

- Description of the code regarding major parts in the diagram -

10 : Start-up switch 20 : System controller
30 : Melody generator 40 : Speaker

*Detailed description of the design**Purpose of the design**The design's field of technology and its conventional technology*

This design is regarding a start-up checking device for electric cars, and more specifically, is regarding a start-up checking device for electric cars which indicates completion of electrical connection between the motor and the battery of an electric car.

Since electric cars produce less noise and no exhaust gas, they are being rapidly developed through many researches in order to solve the pollution problems of internal combustion engines. A typical electric car is structured so that its wheels are rotated by the driving force of an electric motor powered by a battery, which is recharged by general power source.

And, since electric devices such as lamps or electronics used in electric cars are the same as the ones that are used in cars with internal combustion engines, they are powered by a battery whose voltage is amplified to a higher voltage. This higher-voltage power recharges an auxiliary battery to provide constant power to electronics. etc.

Since electric cars enable battery power to be supplied to the motor without the concept of Flywheel or Idling, their problem is that drivers cannot check for start-ups by sound of engines like internal combustion engines.

Technical challenges the design is trying to overcome

This design was invented in order to solve the aforementioned problems, and its purpose is to provide start-up checking devices for electric cars to indicate a start-up to drivers through auditory means.

The design's configuration and operation

In order to achieve the aforementioned purpose, this design is consisted of a start-up switch for connecting the battery to the motor, a system controller for detecting connection between the battery power to the motor, a melody generator which is operated by the system controller, and a speaker which enables drivers to hear signals generated by the melody generator.

Operation of this design, as described above, is described as follows.

When the start-up switch is operated to provide battery power to the motor, the system controller detects this. If the start-up is complete, the melody generator is operated to create sound through the speaker.

From now on, illustrations of desirable implementation of this design in detail will be described by referring to the attached drawings. These illustrations do not limit this design's scope of rights but are merely suggested as examples.

Drawing 1 is a block diagram illustrating detailed implementation of the start-up checking device for electric cars based on this design.

As described in Drawing 1, [this device/design] is consisted of a start-up switch (10) for connecting the battery to the motor, a system controller (20) for detecting connection between the battery power to the motor made the start-up switch (10) by within the circuit, a melody generator (30) which is operated by the system controller (20), and a speaker (40) which enables the driver to hear signals generated by the melody generator (30)

In addition to auditory means, a successful start-up can be indicated by visual means such as a lamp.

Operation of this design, as described above, is described as follows.

Unlike internal combustion engines, electric cars do not produce revving engine sound, called Flywheel or Idling, and their start-up is achieved by connecting the battery's high voltage to the motor after using the start up switch (10) to start vehicles. Then, the system controller (20)—which determines whether battery power is being supplied to the motor—operates the melody generator (30) to cause the speaker (40) to generate sound so that drivers are more accurately notified of a start-up.

Effects of the design

As described above, this design has an advantage of providing psychological assurance by accurately notifying drivers of a successful start-up through auditory means when electric cars are started.

(57) *Claims*

Claim 1

Start-up checking device with the following components:

Start-up switch (10) to connect the battery to the motor;

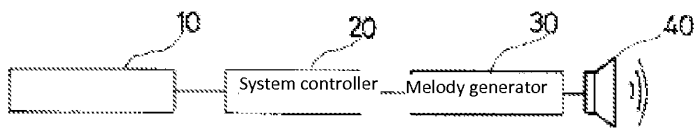
System controller (20), which detects connection between the battery power and the motor;

Melody generator (30), which operates under control of the aforementioned system controller (20);

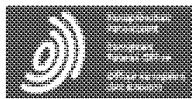
Speaker (40), which allows drivers to hear signals generated by the aforementioned melody generator (30).

Drawings

Drawing 1



No documents available for this priority number.



Espacenet

Bibliographic data: KR20040005146 (A) — 2004-01-16

METHOD FOR SELECTING IDLE STOP MODE OF HYBRID ELECTRIC VEHICLE

Inventor(s): CHO SEONG TAE; PARK JIN HO $\pm$ (CHO, SEONG TAE, ; PARK, JIN HO)

Applicant(s): HYUNDAI MOTOR CO LTD $\pm$ (HYUNDAI MOTOR COMPANY)

Classification: - **international:** **B60L7/24**; (IPC1-7): B60L7/24
- **cooperative:**

Application number: KR20020039449 20020708

Priority number(s): KR20020039449 20020708

Abstract of KR20040005146 (A)

PURPOSE: A method for selecting an idle stop mode of a hybrid electric vehicle is provided to select the idle stop mode by using only one accelerometer. **CONSTITUTION:** An acceleration pedal sensor is checked and an operating state of an accelerating pedal is checked(110,120). A braking position sensor and an operating state of a brake pedal are checked if the accelerating pedal is not operated(130,140). A speed of a hybrid electric vehicle is checked if the brake pedal is properly operated(150). A stopping state of the hybrid electric vehicle is checked(160). A gradient is measured by checking an accelerometer and a low pass filter(170). An output voltage is converted to the gradient (180). The gradient is compared to a critical gradient(190). An idle stop mode is selected if the gradient is more than a critical gradient(200).

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심사청구 : 있음

(54) 하이브리드 전기자동차의 아이들 스톱 모드 결정방법

요약

하이브리드 전기자동차의 아이들 스톱 모드 결정방법이 개시된다. 개시된 하이브리드 전기자동차의 아이들 스톱 모드 결정방법은, (a) 하이브리드 전기자동차의 액셀 페달 센서를 체크하고, 액셀 페달이 작동했는지 판단하는 단계와; (b) 상기 단계 (a)에서의 조건을 만족하지 못하는 경우, 브레이크 포지션 센서를 체크하고, 브레이크 페달이 작동했는지 판단하는 단계와; (c) 상기 단계 (b)에서의 조건을 만족하는 경우, 상기 하이브리드 전기자동차의 속도를 체크하는 단계와; (d) 상기 하이브리드 전기자동차가 정지하고 있는지 판단하는 단계와; (e) 상기 단계 (b)에서의 조건을 만족하는 경우, 가속도계와 지역 통과 필터를 체크하고, 이를 이용하여 경사로의 경사도를 판별하는 단계와; (f) 출력전압을 경사도로 변환하는 단계와; (g) 상기 단계 (f)에서 구한 상기 경사도가 한계 경사도를 초과했는지 판단하는 단계와; (h) 상기 단계 (g)에서의 조건을 만족하는 경우, 아이들 스톱 모드를 선택하는 단계;를 포함하는 것을 그 특징으로 한다. 본 발명에 따르면, 경사로 발진시 차량의 밀림 현상을 해결할 수 있고, 고가의 경사계 대신에 하나의 가속도계 사용으로 구현되므로 경사도 판별이 쉽고, 경제적인 이점이 있다.

대표도

도 1

색인어

가속도계, 하이브리드 전기자동차, 아이들 스톱 모드

명세서

도면의 간단한 설명

도 1은 본 발명에 따른 하이브리드 전기자동차의 아이들 스톱 모드 결정방법을 순차적으로 나타내 보인 개략적인 플로차트.

도 2는 본 발명에 적용되는 경사도 판별을 설명하기 위한 도면.

도 3은 경사도와 출력전압의 상관 관계를 나타내 보인 그래프.

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 하이브리드 전기자동차의 아이들 스톱 모드 결정방법에 관한 것으로서, 보다 상세하게는 하나의 가속도계를 이용한 하이브리드 전기자동차의 아이들 스톱 모드 결정방법에 관한 것이다.

발전 기구로서 클러치를 채택한 차량(AMT; Automated Manual Transmission 또는 클러치를 구비한 CVT)의 경우 경사로에서 정지 후, 발전할 경우에는 필연적으로 클러치 결합시의 차량 밀림 현상이 존재하게 된다.

그리고 하이브리드 차량의 경우에는 연비 향상을 위해서 차량이 정지할 때, 아이들 스톱 모드(idle stop mode)로 진입하게 되는데 이때 엔진이 꺼지게 되므로 추후 차량 발전시 클러치 제어를 위한 유압을 충분히 발생시키지 못할 뿐 아니라, 엔진의 토크 출력이 지연되기 때문에 차량의 밀림 현상이 기존의 내연기관 차량에 비해서 매우 심하게 발생된다.

또한 일부 차량에 채용된 풀 하이브리드(Full- Hybrid) 형식은 ZEV 모드(Zero Emission Vehicle)(전동기로만 주행하는 모드)가 가능하므로 이러한 초기 과도 상태 시 엔진이 충분히 안정 상태에 진입하기까지 전동기를 이용하여 차량을 주행시킴으로써 이러한 현상을 막는 것이 가능하다.

이에 반해 풀 하이브리드 형식이 채용되지 않은 차량의 경우 ZEV 모드가 불가능하여 경사로 출발시 차량이 크게 밀리는 문제점을 갖고 있다. 이것은 운전자에게 있어 매우 위험한 현상이므로 경사로를 감지하여 아이들 스톱을 금지하거나 아이들 스톱 모드에서 엔진이 정상상태로 복귀하기까지 차량을 유지시켜 줄 수 있는 기구 또는 알고리즘이 필요하게 된다.

또한 차량이 밀리는 상태에서의 클러치 결합은 차량의 내구성에도 영향을 주게 되며 클러치 결합시 과도한 충격을 발생시키게 된다.

경사로에서 차량의 밀림을 방지하거나 경사도를 판단하기 위한 기구는 기존의 내연기관 차량용으로도 여러 가지가 소개되고 있으나, 모두 고가의 전자 또는 기계장치가 추가적으 필요하다는 단점이 있다.

한편, 기존 차량에 적용되는 경사도 판별은 2개의 가속도 센서를 사용하는 방법과, 전자와 포텐서미터를 사용하는 방법 등이 있다.

이러한 방법들은 차량의 운동가속도와 중력가속도를 분리하는데 어려움이 있으며, 이를 극복하기 위하여 차량의 운동가속도를 차량 속도를 미분하여 구하는 방법들을 사용하고 있다.

이와 같이 미분을 사용하는 방법들은 과도 상태에서 필연적으로 큰 오차가 발생하게 되며 이를 제거하기 위해 필터를 사용하게 되므로 경사 측정에 시간 지연이 발생하게 되고, 결과치 또한 상당히 부정확한 값이 출력될 수밖에 없다.

발명이 이루고자 하는 기술적 과제

본 발명은 상기와 같은 문제점을 해결하기 위하여 창출된 것으로서, 경사로 발전시 차량의 밀림을 방지하고, 오차 없이 간단하게 구현될 수 있도록 한 하이브리드 전기자동차의 아이들 스톱 모드 결정방법을 제공하는데 그 목적이 있다.

발명의 구성 및 작용

상기와 같은 목적을 달성하기 위한 본 발명의 하이브리드 전기자동차의 아이들 스톱 모드 결정방법은, (a) 하이브리드 전기자동차의 액셀 페달 센서를 체크하고, 액셀 페달이 작동했는지 판단하는 단계와; (b) 상기 단계 (a)에서의 조건을 만족하지 못하는 경우, 브레이크 포지션 센서를 체크하고, 브레이크 페달이 작동했는지 판단하는 단계와; (c) 상기 단계 (b)에서의 조건을 만족하는 경우, 상기 하이브리드 전기자동차의 속도를 체크하는 단계와; (d) 상기 하이브리드 전기자동차가 정지하고 있는지 판단하는 단계와; (e) 상기 단계 (b)에서의 조건을 만족하는 경우, 가속도계와 저역 통과 필터를 체크하고, 이를 이용하여 경사로의 경사도를 판별하는 단계와; (f) 출력전압을 경사도로 변환하는 단계와; (g) 상기 단계 (f)에서 구한 상기 경사도가 한계 경사도를 초과했는지 판단하는 단계와; (h) 상기 단계 (g)에서의 조건을 만족하는 경우, 아이들 스톱 모드를 선택하는 단계;를 포함하는 것을 그 특징으로 한다.

이하, 첨부된 도면을 참조하여 본 발명에 따른 바람직한 실시예를 상세히 설명하기로 한다.

도 1에는 본 발명에 따른 하이브리드 전기자동차의 아이들 스톱 모드 결정방법을 순차적으로 나타내 보인 개략적인 플로차트가 개략적으로 도시되어 있다.

도면을 참조하면, 본 발명에 따른 하이브리드 전기자동차의 아이들 스톱 모드 결정방법은, 우선, 하이브리드 전기자동차의 액셀 페달 센서(Accel Pedal Sensor)를 체크(check)하고, 액셀 페달이 작동했는지 판단한다.(단계 110,120)

상기 단계 120에서의 조건을 만족하지 못하는 경우 즉, 상기 액셀 페달이 작동되지 않았을 경우, 브레이크 포지션 센서(Break Position Sensor)를 체크하고, 브레이크 페달이 작동했는지 판단한다.(단계 130,140)

그리고 상기 단계 140에서의 조건을 만족하는 경우, 하이브리드 전기자동차의 속도를 체크한다.(단계 150)

상기 하이브리드 전기자동차가 정지(stop)하고 있는지 판단하고, 이를 만족하는 경우, 가속도계(Acceleration meter)와 저역 통과 필터(Low Pass Filter)를 체크하고, 이를 이용하여 경사로의 경사도를 판별한다.(단계 160,170)

이어서, 출력전압을 경사도로 변환하고, 상기에서 구한 경사도가 한계 경사도를 초과했는지 판단한다.(단계 180,190)

상기 단계 180에서의 조건을 만족하는 경우 즉, 상기한 경사도가 한계 경사도를 초과한 경우, 아이들 스톱 모드(idle stop mode)를 선택한다.(단계 200)

한편, 상기 단계 120에서의 조건을 만족하는 경우 즉, 액셀 페달이 작동되었으면, 가속 모드(acceleration mode)를 수행한다.(단계 210)

그리고 상기 단계 140에서의 조건을 만족하지 못하는 경우 즉, 브레이크 페달이 작동되지 않았으면, 감속 모드(deceleration mode)를 수행한다.(단계 220)

상기 단계 180에서 출력전압과 경사도의 관계식에서 차량이 경사로를 올라갈 경우에는 아래의 식 1과 같이 이루어진다.

[식 1]

$$V_{out} = -\sin(\tan^{-1} \frac{\alpha}{100}) \times g \times S_f + V_{offset}$$

또한 상기 식 1을 이용하여 하이브리드 차량이 경사로를 내려갈 때, 출력전압은 아래의 식 2와 같이 이루어진다.

[식 2]

$$V_{out} = \sin(\tan^{-1} \frac{\alpha}{100}) \times g \times S_f + V_{offset}$$

식 1,2에서, V_{out} 은 출력전압, α 는 경사도(=arctan θ × 100), g는 중력 가속도, S_f 는 스케일 팩터, 및 V_{offset} 는 0 가속도시 오프셋(offset) 전압이다.

그리고 상기 단계 190에서의 조건을 만족하지 못하는 경우, 일반적인 스톱 모드(general stop mode)를 선택한다.(단계 230)

상기한 바와 같은 본 발명에 따른 하이브리드 전기자동차의 아이들 스톱 모 드 결정방법에서 식 1과 식 2의 유도과정을 보다 상세히 설명하면 다음과 같다.

설명에 앞서 하이브리드 전기자동차의 경우에는 경사로에서 차량 정지시 아이들 스톱을 막기 위한 용도에서는 차량의 운동 가속도가 포함되지 않기 때문에 종래와 같이, 차량 속도를 미분할 필요가 없으며 기존의 경사도 판별 기술을 간략히 변형하여 적용하는 것이 가능하다.

도 2에는 경사로 주행시 하이브리드 전기자동차에 작용하는 가속도를 표시한 개략도가 도시되어 있다.

차량 정지시 차량 가속도는 0이다. 따라서 경사 등판시 차량에 작용하는 가속도를 벡터(vector)로 나타내면 식 (1)과 같이 표현된다.

$$\vec{g} = -g \times \sin\theta \times \vec{i} - g \times \sin\theta \times \vec{j} \text{ ---- (1)}$$

여기서 i, j는 각각 i, j 좌표의 방향 벡터를 의미하며, θ 는 경사로의 경사각을 의미한다.

그리고 전술한 바와 같이 차량 정지시에는 차량 가속도가 없으므로 (1)식만으로 차량의 모든 가속도가 표현되며, 여기서 중력 가속도 g값은 고정된 상수이므로 차량에 수평(i 방향 벡터) 또는 수직(j 방향 벡터) 방향 성분 가속도계를 1개만 장착하더라도 경사각 θ 의 판별이 가능하다.

예컨대, 서스펜션(suspension)의 진동 등을 감안할 때 i 방향으로 가속도계를 장착하는 것이 오차를 줄일 수 있다. 일정 방향의 가속도 성분을 측정하는 센서로는 여러 종류가 존재하나 차량에 탑재하기 위해서는 크기가 작고 가격이 저렴하여야 한다.

그리고 가속도계를 이용하여 다음과 같이 경사도를 판단할 수 있으며, 동일한 특성을 가진 가속도계라면 제조사에 관계없이 모두 적용이 가능하다.

우선, i 방향의 가속도는 정지시 중력 가속도를 초과할 수 없으므로 가속도 측정 범위는 $\pm 1G$ 로 설정한다. 그리고 노이즈 신호(noise signal) 처리를 위해서 가속도 출력 신호 단에 저역통과필터를 장착한다. 또한 상기한 저역통과필터를 통과한 전압 신호를 관계 아래의 식 (2)에 의해서 중력가속도로 변환한다.

$$A_{out} = \frac{V_{out} - V_{offset}}{S_f} \text{ ---- (2)}$$

식 (2)에서 Aout은 실제 가속도, Vout은 가속도계 출력 전압, Voffset은 0 가속도시 오프셋 전압 및 Sf는 스케일 팩터(Acceleration → Voltage)이다.

이상의 과정에 의해서 측정된 가속도 신호를 Aout이라 하면 다음의 과정에 의해서 차량의 경사도를 판별할 수 있다.

상기한 식 (1)에서 i 방향의 가속도 성분만 검출하면 가속도 신호와 경사도의 관계는 아래의 식 (3)과 같이 표현된다.

$$A_{out} = -g \sin\theta$$

따라서 경사각 θ 는 식 (4)와 같다.

$$\theta = \sin^{-1} \left(-\frac{A_{out}}{g} \right) \text{ ---- (4)}$$

일반적으로 도로의 경사도는 tan값에 100을 곱하여 표시하게 되며 이를 적용하면 식(4)는 아래의 식(5)와 같이 표현된다.

$$\tan\theta \times 100 = \tan \left(\sin^{-1} \left(-\frac{A_{out}}{g} \right) \right) \times 100 \text{ ---- (5)}$$

식 (5)에 식 (2)를 대입하면, 아래의 식(6)이 된다.

$$\tan\theta \times 100 = \tan\left(\sin^{-1}\left(-\frac{V_{out} - V_{offset}}{g \times S_f}\right)\right) \times 100 \quad \text{---- (6)}$$

따라서 출력전압 V_{out} 과 경사도($\alpha = \arctan\theta \times 100$)와의 관계는 아래의 식 (7)과 같다.

$$V_{out} = -\sin\left(\tan^{-1}\frac{\alpha}{100}\right) \times g \times S_f + V_{offset} \quad \text{---- (7)}$$

상기 식(7)은 상기한 식 1의 경사로를 올라갈 때의 식이며, 따라서 경사로를 내려갈 때는 식(7)을 이용하여 식 (8)과 같이 나타낸다.

$$V_{out} = \sin\left(\tan^{-1}\frac{\alpha}{100}\right) \times g \times S_f + V_{offset} \quad \text{---- (8)}$$

상기한 식 (7)과 (8)을 경사도에 의한 출력 전압의 함수로 도식하면 도 3과 같이 표현된다.

도 3에 도시된 바와 같이, 저경사 구간에서 출력 전압과 경사도는 충분한 선형성을 가지고 있으며, 따라서 이를 이용한 아이들 스톱 금지 여부를 결정이 가능하다. 아이들 스톱 금지 여부를의 기준은 경사도에 의한 차량의 밀림 정도에 따라서 결정되므로 차량의 스펙에 따라 최종적으로 결정되게 된다

이와 같이 본 발명은, 정지시 경사도 판별을 위한 수식을 유도하여, 하나의 가속도계만으로 정지시 경사 유무 판별할 수 있고, 이 가속도계의 출력 신호 특성 상 관심 영역에서 선형성이 보장되므로 실질적인 경사 유무 판별이 가능하다.

발명의 효과

상술한 바와 같이 본 발명에 따른 하이브리드 전기자동차의 아이들 스톱 모드 결정방법은 다음과 같은 효과를 갖는다

경사로 발전시 차량의 밀림 현상을 해결할 수 있고, 고가의 경사계 대신에 하나의 가속도계 사용으로 구현되므로 경사도 판별이 쉽고, 경제적이다.

그리고 경사로 발전시 차량의 밀림 및 발전시 과도 충격을 방지할 수 있어 운전의 편의성을 제공할 수 있다.

또한 상기한 바와 같이 하나의 가속도계의 장착으로 본 발명의 방법 구현이 가능하므로 종래의 경사계 또는 경사 브레이크에 비해 차량의 중량이 줄어들 수 있다.

그리고 경사로사 과도한 클러치 슬립 및 충격을 억제함으로써 클러치 및 동력 전달계 전반의 내구성이 향상된다.

본 발명은 도면에 도시된 일 실시예를 참고로 설명되었으나 이는 예시적인 것에 불과하며, 당해 기술 분야에서 통상의 지식을 가진 자라면 이로부터 다양한 변형 및 균등한 실시예가 가능하다는 점을 이해할 것이다. 따라서 본 발명의 진정한 보호 범위는 첨부된 특허청구범위에 의해서만 정해져야 할 것이다.

(57) 청구의 범위

청구항 1.

- (a) 하이브리드 전기자동차의 액셀 페달 센서를 체크하고, 액셀 페달이 작동됐는지 판단하는 단계와;
- (b) 상기 단계 (a)에서의 조건을 만족하지 못하는 경우, 브레이크 포지션 센서를 체크하고, 브레이크 페달이 작동됐는지 판단하는 단계와;
- (c) 상기 단계 (b)에서의 조건을 만족하는 경우, 상기 하이브리드 전기자동차의 속도를 체크하는 단계와;
- (d) 상기 하이브리드 전기자동차가 정지하고 있는지 판단하는 단계와;

(e) 상기 단계 (b)에서의 조건을 만족하는 경우, 가속도계와 저역 통과 필터를 체크하고, 이를 이용하여 경사로의 경사도를 판별하는 단계와;

(f) 출력전압을 경사도로 변환하는 단계와;

(g) 상기 단계 (f)에서 구한 상기 경사도가 한계 경사도를 초과했는지 판단하는 단계와;

(h) 상기 단계 (g)에서의 조건을 만족하는 경우, 아이들 스톱 모드를 선택하는 단계;를 포함하는 것을 특징으로 하는 하이브리드 전기자동차의 아이들 스톱 모드 결정방법.

청구항 2.

제1항에 있어서,

상기 단계 (a)에서의 조건을 만족하는 경우, 가속 모드를 수행하는 단계를 더 포함하여 된 것을 특징으로 하는 하이브리드 전기자동차의 아이들 스톱 모드 결정방법.

청구항 3.

제1항에 있어서,

상기 단계 (b)에서의 조건을 만족하지 못하는 경우, 감속 모드를 수행하는 단계를 더 포함하여 된 것을 특징으로 하는 하이브리드 전기자동차의 아이들 스톱 모드 결정방법.

청구항 4.

제1항에 있어서,

상기 단계 (f)에서, 상기 출력전압과 상기 경사도의 관계식에서 경사로를 올라갈 경우에는 아래의 식 1과 같이 이루어지는 것을 특징으로 하는 하이브리드 전기자동차의 아이들 스톱 모드 결정방법.

[식 1]

$$V_{out} = \sin(\tan^{-1} \frac{\alpha}{100}) \times g \times S_f + V_{offset}$$

여기서, V_{out} 은 출력전압,

α 는 경사도($=\arctan\theta \times 100$)

g 는 중력 가속도,

S_f 는 스케일 팩터,

V_{offset} 는 0가속도시 오프셋 전압.

청구항 5.

제4항에 있어서,

상기 식 1을 이용하여 경사로를 내려갈 때, 상기 출력전압은 아래의 식 2와 같이 이루어지는 것을 특징으로 하는 하이브리드 전기자동차의 아이들 스톱 모드 결정방법.

[식 2]

$$V_{out} = \sin(\tan^{-1} \frac{\alpha}{100}) \times g \times S_f + V_{offset}$$

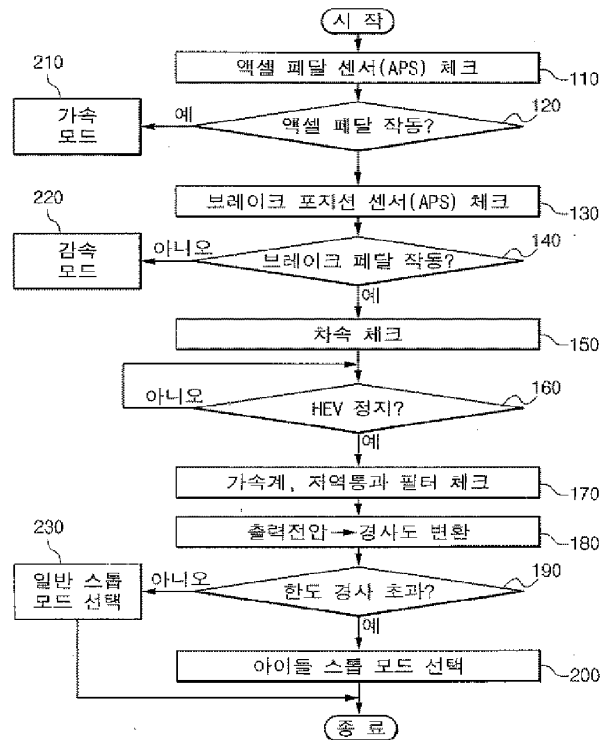
청구항 6.

제1항에 있어서,

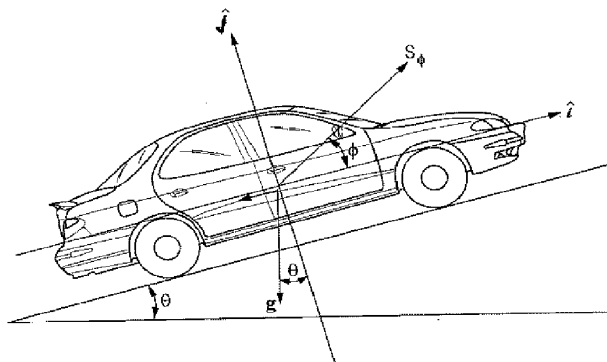
상기 단계 (g)에서의 조건을 만족하지 못하는 경우, 일반적인 스톱 모드를 선택하는 단계를 더 포함하여 된 것을 특징으로 하는 하이브리드 전기자동차의 아이들 스톱 모드 결정방법.

도면

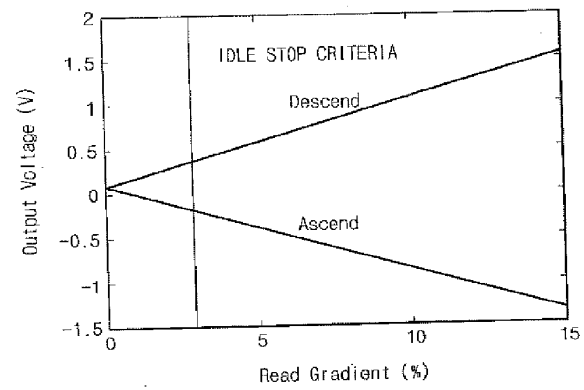
도면1



도면2



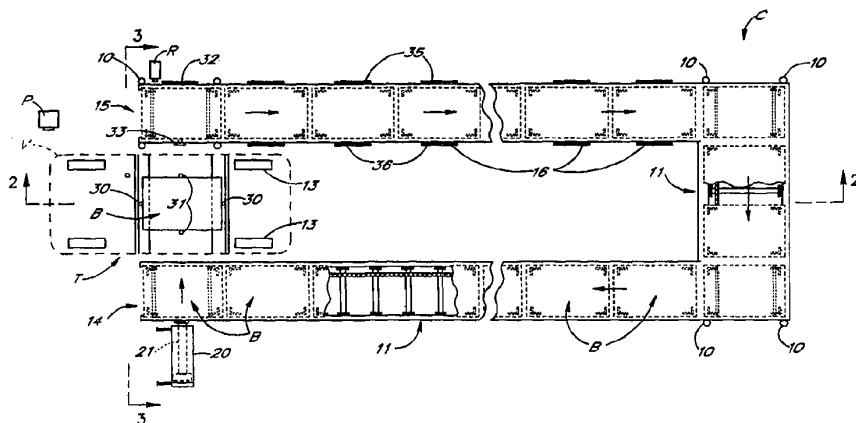
도면3





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(54) Title: BATTERY CHARGING AND EXCHANGE SYSTEM FOR ELECTRICALLY POWERED VEHICLES**(57) Abstract**

A battery transfer and charging system for electrically powered vehicles includes a conveyor loop (C) for conveying batteries (B) from a battery receiving station (15) to a battery delivery station (14). A displacement assembly (16) removes spent batteries of electric vehicles by placing charged batteries into position within the vehicles so as to laterally displace spent batteries. Spent batteries displaced from vehicles are received by the receiving station (15), where the batteries are tested both electrically and by comparing battery status data against predetermined criteria. Batteries which fail the battery test are automatically removed from the conveyor loop (C) by an elevator assembly (43). Batteries are automatically charged as they pass through the conveyor loop (C) in an assembly-line fashion. Following recharge, batteries are conveyed to the displacement station for installation within later vehicles. In one embodiment of the system, vehicles are processed through the system in sequential order, stopping at a specified location for battery installation/removal. A vending machine system (402) for recharging and dispensing portable batteries (204) of electrically assisted bicycles (200) is also disclosed.

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**BATTERY CHARGING AND EXCHANGE SYSTEM
FOR ELECTRICALLY POWERED VEHICLES**

BACKGROUND OF THE INVENTION

5 The present invention relates to battery charging and transfer systems. More particularly, the present invention relates to battery charging and transfer systems which enable the automated exchange and charging of electric vehicle batteries, including batteries for automobiles, motorscooters, and other electrically powered motor vehicles.

10 United States Patent No. 4,334,819 discloses a continuous battery charging system wherein batteries are removed from an electrical vehicle at a battery transfer station. A fresh battery is installed at the transfer station, and the spent battery is placed in a charging system to be charged and returned to the transfer station.

That system contemplates the existence of a need for capability to charge a large number of exchangeable batteries, say, following adoption and acceptance by the motoring public of the concept of electric powered vehicles. One disadvantage of electric powered vehicles is the relatively short range that can be achieved using known battery technology. In order to provide a practical electric vehicle system, battery transfer capabilities must exist at
15 numerous locations, so that the range of travel, without requiring the driver to recharge a battery, may be substantial. This is to say that if the range of an electric vehicle, without recharge of the battery or battery pack is 100 miles, then the user is limited to excursions of 50 miles. However, if at 75 or 100 mile intervals, the user can conveniently replace the partially spent battery with a fresh or fully charged battery, the limit of safe travel is extended.

20 Thus, the prior patent discloses an invention which enables longer range use of electric vehicles, because charged or fresh batteries can be expeditiously installed in the vehicle at locations along a course of a length greater than the round trip capability of the vehicle battery. Notwithstanding the foregoing, there remains a need for an electric battery charging and transfer system which enables the convenient removal of discharged batteries from a vehicle and replacement with a fully charged battery. The batteries and the charging system preferably are adapted
25 to efficiently handle the battery during the removal, charging, and installation procedures.

SUMMARY OF THE INVENTION

To render a battery transfer and charging system of the type generically contemplated in the above-identified patent more universally applicable and commercially acceptable, the present invention provides improvements in the system in terms of the transfer method, for exchanging batteries at the transfer station, and in the mode of
30 construction of the charging stations. In accordance with the present invention, an efficient electric battery charging and transfer station is provided that is fully automated and adaptable to a variety of battery powered, electric motor vehicles. By utilizing a continuously charging conveyor belt, one of the biggest drawbacks of electric vehicles is eliminated: the lengthy and impractical immobilization of the vehicle while the battery is being recharged. The continuous operation of the battery charging and transfer station provides for exchanging a discharged battery with
35 a charged battery in seconds, rather than hours.

More particularly, the present invention contemplates that the electric vehicle is provided with a battery or battery pack in a relatively long and broad, but flat form, which can be laterally installed in the vehicle. The battery may be a unit of, for example, 5' wide, 5' long and 9" in height, or a composite of a series of connected smaller batteries in a pack or box confining the smaller batteries. In another embodiment, the battery may be a unit
5 of, for example, 2' wide, 2' long and 1.5" in height for use in smaller electrically powered vehicles such as an electric motorscooter. In any case, the battery (unit or pack) readily can be displaced laterally from the vehicle, as by laterally forcing a fresh battery into a battery seat in the vehicle or by laterally exchanging the battery using a sprocket, belt or other mechanism. In the battery seat, contact of the battery terminals with the drive motor for the vehicle is automatically established.

10 With such a system, vehicles can be sold with an initial battery which can be exchanged for a fresh battery at a transfer station for a relatively small cost, amounting to the re-charging cost of the battery, plus depreciation and exchange, by a battery charging organization having stations located strategically in areas to service a growing population of compatible electric vehicles.

To facilitate growth of a system of battery transfer stations, the stations according to the present invention
15 are preferably modular in construction. This enables a transfer station to be erected with low initial investment cost, and subsequently enlarged as demand increases. In addition, capacity upgrades through modular expansion allow the battery charging and transfer station to achieve maximum productivity. Modular expansion also provides increased capacity without the need for, or added expense of additional space. Thus, the present invention provides a tremendous competitive advantage in locations where space to construct additional transfer stations is sparse.

20 In accomplishing the foregoing, a battery transfer station is provided into which a standardized vehicle can be driven. The standardized vehicle may be an automobile, a motorscooter, or any other battery powered, electric motor vehicle. The vehicle has a battery seat means for containing a relatively broad, flat battery. A charged battery can be shifted laterally into position within the battery seat means. In one embodiment, as the charged battery is shifted into position, the charged battery comes into contact with the existing battery and laterally forces
25 the existing battery out of the battery seat means to a receiving means. Sprockets of the receiving means engage with notches on the bottom surface of the existing battery as the existing battery is displaced from the battery seat means. The sprockets complete the removal of the existing battery from the vehicle. In other embodiments, removal of the battery is accomplished in-whole or-in-part using drive sprockets in the floor of the battery compartment which engage with the notches on the battery. These sprockets may be powered using an external energy source which
30 is coupled to the vehicle (via a slidably-engaging electrical connector) when the vehicle initially enters the charging station. Alternatively, the battery itself may be partially exposed on its underside, and the sprockets may engage with the notches in the battery by rising up from the base of the transfer station.

35 Drive means are provided to shift a fresh battery horizontally into the battery seat, and means are provided to receive the spent battery in the charging system. The spent battery is tested, rejected if unfit for recharge, or recharged in sequence with other batteries, while being transported through charging locations to the transfer station, for installation in a later vehicle.

One aspect of the invention is a battery transfer station equipped for handling a standardized two-wheel vehicle, such as a motorscooter. The vehicle contemplated has a battery seat means for containing a relatively broad, flat battery, which is preferably located near the area where an operator's feet are positioned on the motorscooter. The motorscooter charging and transfer system is designed with a wheel receptacle area that allows for proper positioning and control of the vehicle during battery transfer. A vehicle securing station maintains the vehicle in an upright position at all times during the battery transfer operation.

In one embodiment, the motorscooter system is designed such that the vehicle operator must dismount the vehicle during the battery transfer operation, and the system is specially equipped for efficient handling and safety of the dismounted vehicle operator. An elevated support area provides for operator safety during battery transfer by elevating the operator above the actual battery transfer location. In one embodiment, the transfer system for the motorscooter also incorporates a sensor to detect whether the vehicle operator is safely positioned above and away from the battery transfer conveyor.

The charging and transfer systems may be built in a vertical orientation in which the transfer conveyor extends above the vehicle rather than laterally around the vehicle. A vertically oriented system provides all of the features and benefits described above but in a much smaller physical area. Thus, the transfer conveyor can extend vertically preserving essential land in space-limited geographic regions.

In another embodiment, the charging and transfer system described above is adapted for use within a vending machine that recharges and dispenses small, portable batteries of the type that are manually installed by a user within an electrically assisted bicycle. The vending machine includes a compact battery conveyor positioned within a secure housing. The conveyor may be implemented as a series of horizontal or vertical conveyors within the vending machine. In operation, a discharged battery is removed from the vehicle by the user, and is placed by the user within or adjacent to an opening in the housing of the vending machine. Once the user has initiated a battery transfer (such by making proper payment), a discharged battery receiving apparatus delivers the discharged battery to the battery receiving end of the conveyor. A fully charged battery is then automatically removed from a delivery end of the conveyor and dispensed to the user. Then the fully charged battery can be manually positioned within a compartment on the vehicle to provide power to the bicycle.

This invention has other advantages and features which will best be understood by reference to the preferred embodiments disclosed herein, but it is to be understood that the following detailed description and the accompanying drawings are not to be taken in a limiting sense. The invention is defined in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a top plan view, with parts broken away, showing a battery transfer and charging system in accordance with the present invention;

Figure 2 is a vertical sectional view on the line 2-2 of Figure 1, showing a first module in full lines, and showing additional modules in broken lines;

Figure 3 is a transverse sectional view on the line 3-3 of Figure 1;

Figure 4 illustrates the primary computer-based components of the system;

Figure 5A is a block diagram showing a preferred database implementation in which battery history data is maintained in a centralized computer database;

Figure 5B illustrates a process followed by the computer of Figure 5A when a battery is initially extracted from a vehicle;

5 Figure 6 is a predominantly bottom perspective view of an exemplary battery or battery box for use with the invention;

Figure 7 is a transverse, fragmentary sectional view on the line 7-7 of Figure 2;

Figure 8 is an enlarged, fragmentary top plan view, on the line 8-8 of Figure 3, with parts broken away, showing the battery installation means;

10 Figure 9 is a vertical sectional view on the line 9-9 of Figure 8, with parts broken away;

Figure 10 is a perspective view illustrating the general manner by which expansion conveyors are added to the system;

Figure 11 is a transverse sectional view taken along the line 11-11 in Figure 10;

15 Figure 12 is an isometric view illustrating a motorscooter battery transfer and charging system in accordance with the present invention;

Figure 13 is a top plan view of the battery transfer and charging system of Figure 12, illustrating additional details of the system;

Figure 14 is an enlarged top plan view illustrating one embodiment of a motorscooter support mechanism in accordance with the present invention;

20 Figure 15 is a vertical sectional view taken along the line 15-15 of Figure 12;

Figure 16 is a transverse sectional view taken along the line 16-16 in Figure 14, illustrating a vertically oriented embodiment of the battery transfer and charging system in accordance with the present invention;

Figure 17 is a predominantly bottom perspective view of an alternative exemplary battery for use with the invention;

25 Figure 18 is an elevational side view of an electrically assisted bicycle in accordance with the present invention;

Figures 19A-19C are enlarged sectional views illustrating various embodiments of a power drive mechanism for an electrically assisted bicycle;

30 Figure 20 is an enlarged elevational isometric view illustrating an exemplary battery and electrical motor assembly in accordance with the present invention;

Figure 21 is an elevational isometric view illustrating a vending machine with a housing and battery transfer system in accordance with the present invention; and

Figure 22 is an enlarged transverse sectional view taken along the line 22-22 in Figure 21.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

35 Figures 1-3 illustrate the general layout and structure of a battery charging and transfer system in accordance with a preferred embodiment of the invention. As best illustrated by Figure 1, the system comprises a

continuous battery conveyor loop C which extends from one side of a vehicle station (shown with a vehicle V positioned therein) to the opposite side of the vehicle station. Batteries B move through the conveyor loop from a receiving end or station 15 of the conveyor to a delivery end 14 of the conveyor while being charged via multiple battery chargers 16. The system also includes a transfer station or apparatus T which laterally shifts a fresh (charged) battery into a battery compartment 17 (Figure 3) of the vehicle V from the delivery end 14 (as described below) while displacing an existing (discharged or partially discharged) battery from the vehicle and onto the receiving end 15 of the conveyor.

As illustrated in Figure 1, the battery chargers 16 are positioned along the conveyor C at respective battery resting locations ("battery locations") to recharge the batteries as they are conveyed from the receiving end 15 to the delivery end 14 of the conveyor. In the preferred embodiment, a battery charging station 16 is provided at each battery location along the two longitudinal runs or segments of the conveyor C. As described below, the battery position at the receiving end 15 of the conveyor serves as a battery testing and removal station for (i) determining whether each extracted battery can be effectively recharged, and (ii) removing bad batteries from the system.

As illustrated in Figure 2, the conveyor structure preferably includes a number of vertical support posts 10, on which a frame structure 11 is mounted in a suitable fashion. The posts 10 extend vertically to enable the application thereto of one or more of vertically-spaced expansion modules C2, as further illustrated in Figure 10 (discussed below). Each expansion module comprises a conveyor loop which is substantially identical in structure and operation to the conveyor loop C described herein.

As further illustrated in Figure 2, the transfer station T includes a positioning structure 12, shown as a receptacle for the front wheels 13 of the vehicle V, as the vehicle is driven into the transfer station T, whereby vehicles of standard length are uniformly longitudinally positioned in the transfer station. If desired, plural positioning means 12 may be provided at the spaced locations for vehicles of different lengths. As illustrated in Figure 3, the battery compartment 17 of the vehicle extends through the vehicle below the passenger compartment from one side of the vehicle to the other. As illustrated in Figures 1 and 3, a hydraulic ram 20 or other shifting means is utilized, in combination with drive sprockets which engage with notches on the batteries (as described below), to shift a charged battery from the conveyor and into the vehicle V. As further described below, the incoming battery displaces the existing vehicle battery from the compartment 17 to a sufficient degree to permit a set of drive sprockets at the receiving end 15 of the conveyor to complete the removal of the existing battery. Alternatively, lateral battery displacement may be performed entirely through the use of drive sprockets without the use of a hydraulic ram. As illustrated by Figure 1, the conveyor structure extends longitudinally from the receiving end 15, thence transversely and in a return run to the delivery end 14. Thus, lateral space to accommodate the vehicle between longitudinal runs is provided. As illustrated in Figure 2, the transverse section of the conveyor loop (i.e., the segment which connects the two, parallel longitudinal segments) is elevated, with the longitudinal segments upwardly inclined from the transfer station T to the transverse segment. This allows vehicles to drive beneath the elevated, transverse section (between the vertical support posts 10) following battery exchange. Alternatively, the transverse section readily can be positioned beneath the path of the exiting car, if desired. This conveyor arrangement allows vehicles

to enter and exit the system without reversing direction, and thus allows vehicles to efficiently pass through the system in a sequential fashion.

With reference to Figure 3, the system includes a battery elevator assembly 43 which allows the extracted battery to be shifted vertically relative to the conveyor C following removal from the vehicle. The elevator assembly 43 operates in cooperation with a battery removal assembly 44 to remove batteries from the conveyor system, such as when the extracted battery fails a battery test. The elevator assembly 43 is also coupled to a battery insertion assembly (not shown) for inserting new batteries into the conveyor system to replace discarded batteries. In implementations which include one or more expansion modules C2 (as in Figures 10 and 11), the elevator assembly 43 is also used move batteries between the multiple conveyor levels, as further described below. A second battery elevator may be provided at the battery delivery end 14 of the conveyor, as illustrated in Figures 10 and 11.

As depicted in Figure 4, the system includes a computer 37 which controls the operation of the conveyor via conventional control circuitry 38. The control circuitry 38 may be in the form of one or more standard add-on cards which plug into expansion slots of the computer. The control circuitry 38 is coupled to the various electrically-actuated components of the conveyor and elevator assemblies via respective control lines 39, which carry control signals generated by the control circuitry in response to commands from the computer 37.

The computer 37 is preferably coupled to an electronic payment system P (Figures 4 and 10) which allows an operator of the vehicle V to enter payment information for paying a fee associated with the exchange of a battery. In the preferred embodiment, the payment system P comprises a magnetic card reader in combination with a standard keypad (not shown). In other embodiments, the payment system P may include, for example, and RF (radio frequency) transceiver which communicates bi-directionally with vehicle transponders of the type commonly used for making toll road payments.

The computer 37 is also preferably coupled to at least one bar code reader R, which is positioned along the conveyor to read bar code labels (Figure 6) on the batteries. The bar code labels include battery ID codes which uniquely identify the batteries of the system. In a preferred embodiment, the computer uses these ID codes to access a centralized database and server 40 (Figure 5A) via a network connection 41, such as a continuous connection to the Internet. As will be appreciated by those skilled in the art, other types of electronic sensing systems can be used in place of the disclosed bar code system. For example, the batteries could be provided with small, embedded RF transmitters, such as MicroStamp™ transmitters available from Micron Communications Inc., which transmit ID codes to a base RF receiver of the station.

With reference to Figure 5A, the centralized database 40 is accessed by the respective computers of multiple, geographically-distributed battery charging and transfer stations 42 (preferably of the same construction as described herein). As further illustrated, the database includes battery tracking and history information ("history data") which is stored, on a battery-specific basis, in association with the unique ID codes of the batteries. For each battery, this information may include, for example, the number of times the battery has been recharged, the date of first use within a vehicle, and the current location (e.g., charging station or vehicle) of the battery. When a given battery is located within a vehicle, the location information may include information about vehicle (such as a vehicle

ID number) and/or the vehicle's driver (such as the driver's credit card number). Updates to the database 40 are made remotely from the battery charging/transfer stations 42 by sending update requests across the network to the server associated with the database. These update requests are generated by the computers 37 of the individual stations in response to battery exchange operations.

5 As further described below, whenever a discharged battery is removed from a vehicle, the computer 37 of the respective station 42 reads the battery's ID code, and then accesses the centralized database to retrieve the battery's history data. The computer 37 then uses this information, in addition to the results of an electrical battery test, to determine whether or not the battery should be discarded or otherwise removed from the system. This allows the decision of whether or not to discard the battery to be based on multiple criteria.

10 While the preferred embodiment uses a centralized database 40 to store battery history data, it will be recognized that other storage methods are possible. For example, the batteries readily can be adapted to store and provide access to their own respective history data via conventional solid state storage devices located with the battery housing. This approach reduces or eliminates the need for a centralized database 40, but does not provide the battery tracking capabilities of the centralized database approach. It will also be recognized that conventional
15 caching techniques can be used to locally store respective copies of the history database 40 at the transfer stations 42, so that accesses to the centralized database 40 need not be performed each time a battery is exchanged.

 The actual battery exchange in the vehicle can be accomplished in any of a variety of alternative ways, depending upon the configuration of the battery and the vehicle's battery receiving structures. For example, instead of forcible displacement of the installed discharged battery with a new charged battery, the installed discharged
20 battery can be previously removed such as by a sprocket as will be discussed *infra*. In addition, although the preferred embodiment utilizes a lateral, horizontal installation and removal of the battery, variations will become apparent to one of ordinary skill in the art in view of the disclosure herein and the desired battery compartment configuration for the vehicle.

 For example, the battery readily can be adapted for vertical removal from the automobile followed by
25 vertical installation of the new battery. This alternative embodiment utilizing a lateral, vertical installation and removal of the battery creates a more compact system in space-limited geographic regions. Similarly, the battery readily can be horizontally removed along an axial direction such as from the rear of the car or from the front of the car. The precise location and mode of removal of the battery is a design consideration that can be optimized through routine experimentation by one of ordinary skill in the art, in view of such considerations as battery size,
30 weight distribution in the vehicle, and other access considerations such as the location of doors, wheels and the like.

 Although a single battery is preferred, two, three, four or more discrete batteries can also be removed or installed into a single vehicle. The use of multiple batteries contained in separate units may be desirable from an engineering or aesthetic design standpoint, depending upon the automobile configuration and the total volume of battery desired. In addition, a principal running battery and a separate "reserve" battery may be desirable from a
35 consumer convenience standpoint.

Adaptation of the various vertical lifts, conveyors and other structural components of the battery charging and transfer system of the present invention to accommodate each of these types of variations will be readily achievable by one of ordinary skill in the art in view of the disclosure herein.

5 A preferred apparatus and method for exchanging batteries will now be described. As illustrated by Figures 1 and 7, the transfer station T includes a hydraulic ram 20 having a rod 21 which extends outward to forcefully displace the battery or battery pack B into the vehicle. The rod 21 laterally forces the battery B1 (Figure 7) into a battery seat 22 in the vehicle. The battery B1 displaces the existing vehicle battery B2, forcing the existing battery B2 onto an exit conveyor such as up an inclined ramp section 23 of the seat 22 toward the receiving end 15 of the conveyor.

10 The battery seat in the vehicle is structured to provide retention means to prevent lateral movement of the battery from the seat, except at the transfer station where suitable displacement means 16, such as the ram 20 is provided. Any of a variety of retention structures can be provided, depending upon the battery design and battery seat design. For example, one or more vertically extending ridges or projections can be provided at the installation side and/or the exit side of the battery to provide a stop over which the battery must travel to exit the car. The stop can be permanently positioned, or movable between a "locked" and "unlocked" position. Alternatively, any of 15 a variety of battery compartment hatches can be used, which will normally be locked shut except during the battery exchange process. In the illustrated embodiment, the battery seat 22 (Figure 7) is provided with a shoulder on the installation side of the seat, to prevent movement of the battery in the reverse direction.

Drive means D, shown in Figure 8, are provided to assist the lateral movement of the spent battery from 20 the vehicle. Such drive means D may include, as partially shown in Figure 7, driven sprocket means 24 adapted to engage in notches or recesses 25 (Figure 6) on the bottom surface of the battery, to complete the transfer of the battery B2 from the vehicle onto the receiving station 15. The notches 25 are located preferably adjacent to the opposite ends of the battery B, and provide sprocket abutments enabling lateral drive of the battery. The underside of the battery also has laterally spaced sprocket receiving recesses 26, providing abutments engageable by additional 25 drive sprockets 27 (Figures 8 and 9) adapted to engage and shift the batteries progressively through the charging stations in a lateral direction perpendicular to the direction of displacement. As is apparent from the figures, the notches 25, 26 illustrated in Figures 6 and 9 are representative of respective rows of notches which extend along the bottom surface of the battery.

Alternatively, any of a variety of engagement structures can be provided on the battery pack, to enable 30 engagement with the drive mechanism of the transfer station. The use of a particular structure, such as hooks, rings, projections or recesses will depend upon the load of the battery to be transferred, the static friction or structural stop to be overcome in removing the battery, and the direction of removal, such as horizontal plane or vertical lift as will be readily apparent to one of skill in the art. In general, the engagement structures are preferably relatively low profile to minimize the opportunity for inadvertent interlocking with other batteries or parts of the 35 system, and yet permit transfer of sufficient force to manipulate the battery through the transfer station. For this

purpose, the present inventor prefers a plurality of spaced recesses on the battery housing, to be engaged by a sprocket as illustrated, or other engagement structure on the drive mechanism.

Although the system just described uses the incoming battery to forcibly displace the existing battery, other battery removal methods can be used. For example, the vehicles can be provided with drive sprockets within the battery compartment for moving batteries into and out of the battery compartment, eliminating the need to forcibly displace the existing battery. These sprockets may be powered using an external energy source which is coupled to vehicle (via a slidably-engaging electrical connector, for example) when the vehicle initially enters the charging station. In addition, although the present inventor prefers a system in which the batteries are introduced and removed in a continuous single direction path of travel, the conveyors and hydraulics of the transfer station can readily be modified by one of skill in the art to accomplish battery removal and installation from the same side of the vehicle if desired.

Alternatively, the underside of the battery may be exposed while situated in the vehicle, so that laterally spaced sprockets may engage from an area directly below the battery's underside, without the need for the vehicle to be equipped with drive sprockets. Optionally, this embodiment can be configured to upwardly lift the battery from the battery seat prior to shifting. Additional details of this embodiment in conjunction with the motorscooter system are discussed infra.

As illustrated by Figures 1 and 6, the battery has contact posts 30 at its opposite ends which are automatically engaged with contacts within the vehicle when the battery is shifted into the vehicle. Also, on opposite sides of the battery are charging contacts 31, which are also used as test contacts. Thus, when the battery is displaced from the vehicle at the transfer station T, the displaced battery enters the receiving station or position 15, and the contact 31 on one side engages a test rail 32 (Figure 1). Preferably, the contact posts 30 and the charging contacts 31 are connected internally. Thus, battery charging is available at all battery positions of the conveyor, including battery positions on both the longitudinal and the transverse segments of the conveyor. As best illustrated by Figure 3, a vertically shiftable test contact 33 is adapted to be elevated and lowered by a ram 34 at the receiving position 15, whereby the battery can be tested. With further reference to Figure 3, the elevator assembly 43 is coupled to the receiving station 15 to enable bad batteries to be removed from the conveyor system under the control of the computer 37. The battery removal assembly preferably includes a hydraulic ram 44 which displaces the battery from the vertically-shiftable receiving station 15 once the battery has been lowered to the level of the ram 44.

As batteries are progressively moved along the conveyor C from one battery position to another, the posts or contacts 31 (Figure 1) engage charging rails 35 and 36. The charging rails 35 and 36 are controlled by a voltage regulator (not shown) so that the charge level of the batteries is controlled. Although the charging rails 35, 36 are only shown along one of the two longitudinal segments of the conveyor in Figure 1, charging stations are preferably provided along both longitudinal segments and transverse sections.

As will be appreciated by those skilled in the art, a variety of different types of battery contacts 30, 31 can be used to reversibly place both the car and the charging station in electrical contact with the battery. In one

embodiment, the contacts 30, 31 are retractable, spring-loaded members which retract into the housing of the battery in response to a physical driving force. In other embodiments, conductive contact surfaces either above or below the adjacent surface of the battery can be used in place of the retractable contacts. Alternatively, any of a variety of plugs, clips, conductive cables and the like can be used. Figure 17 best illustrates an alternative embodiment of the battery with elongated electrical contacts 30, 31 on the sides of the battery. The battery in Figure 17 further depicts the recesses or notches 126 on the underside of the battery for use with a sprocket drive mechanism.

It may be desirable to prevent the charging of batteries at locations other than designated battery transfer and charging stations. For example, it may be desirable to prevent users from using home charging systems or other unauthorized equipment to recharge the batteries. This is preferably accomplished by providing the battery with a disable control circuit (not shown) or switch that can be selectively turned ON or OFF by the transfer system to enable and disable recharging. For example, the battery may contain a disable control circuit that enables recharging only when a valid encrypted authorization message is received by the battery from the transfer station. The battery further may contain a timer that disables recharging a designated time period after the authorization message has been received, or may contain a circuit that disables the charging function as soon as the battery has been fully recharged. Preferably, the control circuit operates by electrically disconnecting the charging contacts from the battery when the circuit is in the disable state.

The battery utilized in the present system may be any of a variety of different types including, for example, conventional lead-acid batteries, alkaline batteries, NiCd (nickel cadmium) batteries, NiMH (nickel metal hydride) batteries, or Zinc-air batteries. In addition, the present system may be readily adapted to handle the exchange or replacement of battery packs or cells rather than displacement of a complete battery. In this context, a "battery" as referred to herein, may include a completely encased battery, a battery pack or a replaceable portion of a battery such as a cell.

Thus, the present system may be adapted to exchange battery packs or cells for Zinc-air or similar batteries, where the Zinc-air battery includes a Zinc core within the battery housing that may be replaced or recharged. The system may be adapted to replace the Zinc core for Zinc-air batteries such as those manufactured by Electric Fuel Corporation of New York or B.A.T., International based in California. Rather than replacing an entire battery, the conveyor may replace a Zinc core within the battery housing.

With reference to Figure 1, the transverse drive notches 25 in the batteries are used by the conveyor system to laterally shift batteries from one longitudinal segment to the other longitudinal segment along the segment denoted generally by reference number 11. As best seen in Figures 8 and 9, because the transverse drive sprockets 24 and the longitudinal drive sprockets 27 cannot be simultaneously engaged with batteries, the sprockets 24 and drive means 24d are mounted on a frame structure 24f which is selectively vertically shifted by a ram 24r. Likewise a ram 27r vertically shifts the sprocket frame structure 27f and sprocket drive 27d. Thus, the sprockets 24 and 27 are selectively engageable with the battery drive recesses 25 and 26.

Figure 5B illustrates the general process followed by the computer 37 each time a battery is extracted from a vehicle. As depicted by block 60, the computer 37 initially reads the battery ID code with the bar code reader

R, and then accesses the centralized database 40 to retrieve the history data of the battery. (In embodiments in which the history data is stored within the batteries, this step may, for example, involve an RF interrogation of the battery's circuitry to cause the battery to transmit its history data.) Concurrently with the data retrieval process, the computer 37 initiates the electrical battery recharge test to determine whether the battery can be adequately recharged, as indicated by block 62. If the battery fails the recharge test, it is removed from the conveyor C via the elevator assembly 43 and replaced with a fresh battery, as indicated by blocks 64 and 66.

With reference to blocks 68 and 70 if the battery passes the battery recharge test, the computer performs a second battery test which involves comparing the retrieved battery history data to pre-specified removal criteria, such as a maximum number of recharges and/or a maximum duration of use. If the battery fails to satisfy the predetermined criteria, it is removed from the system. This combination of an electrical test and a usage-history test provides a high degree of protection against the installation of bad batteries into vehicles.

With reference to blocks 72 and 74, once the battery tests have been conducted (and the battery replaced if necessary), the conveyor is advanced by one battery position. In addition, the centralized database is updated to reflect the results of the battery tests. If the system includes one or more expansion levels or modules (as in Figures 10 and 11), the computer 37 also executes code for shifting batteries between the two or more levels (as described below).

In addition to the battery testing code reflected by Figure 5B, the computer 37 executes code for ensuring that the batteries are sufficiently recharged before being installed into vehicles. In the preferred embodiment, this is accomplished by keeping track, on a battery-specific basis, of the amount of time each battery has been recharged, and by ensuring that the next battery to be installed has been recharged for some minimum amount of time. (Because the batteries enter and exit the conveyor system on a first-in-first-out basis, the battery which resides at the delivery end 14 of the conveyor will normally have been in the system the longest.) In other implementations, a battery testing station may additionally or alternatively be provided at or near the battery delivery end 14 to test the batteries prior to installation. Whenever the computer 37 determines that the next battery to be installed within a vehicle is not sufficiently recharged, the computer displays a message on a road-side display sign (not shown) indicating that batteries are currently not available. This message also preferably indicates the number of minutes until recharged batteries will be available.

Figures 10 and 11 illustrate the general manner by which additional conveyor loops or modules are added to the system to increase battery capacity. The illustrated system includes a main conveyor loop C1, and an expansion conveyor loop C2 which is positioned above the main conveyor loop. Both conveyor loops are substantially identical to the conveyor loop C described above. Additional expansion conveyors can be added as needed to accommodate demand. In the preferred embodiment, both conveyor loops include charging stations (not shown) positioned along their respective longitudinal segments. Battery elevators 43A and 43B are provided at opposite ends of the two conveyor loops C1, C2 to permit the vertical movement of batteries between the two conveyor levels. Both conveyor loops C1, C2 preferably include battery chargers along their respective longitudinal segments, preferably at each battery position.

In operation, the battery elevator 43A at the receiving end receives displaced batteries from vehicles that pass through the system, and selectively delivers the discharged batteries (under the control of the computer 37) to either the upper or the lower conveyor loop C1, C2. The elevator 43B at the battery delivery end is similarly programmably shifted between the two conveyor levels to selectively remove batteries from the conveyor loops for delivery into vehicles. In the preferred embodiment, the computer 37 is programmed to alternate between the two conveyor loops so that roughly half of the batteries are passed through the lower loop C1 and the other half passed through the upper loop C2. With this general approach, the addition of new conveyor loops inherently increases the amount of time each battery spends in the system, and thus increases the available recharge time per battery. Additional conveyor loops can be added to accommodate increased demand.

A motorscooter embodiment of the battery transfer and charging system will now be described with reference to Figures 12-17. Figure 12 illustrates the general layout and structure of a motorscooter battery charging and transfer system in accordance with one embodiment of the invention. The motorscooter system is a variation of the automobile battery charging and transfer system described above, and is specially adapted to handle a two-wheeled electric motorscooter. A preferred apparatus and method for exchanging batteries in a motorscooter will now be described, however the apparatus and method for exchanging batteries discussed above is directly applicable to the motorscooter battery transfer and charging system. As will be appreciated from the following description, the system can be adapted to handle electric motorcycles, mopeds, and other types of two-wheeled vehicles.

As illustrated by Figures 12 and 13, the system comprises a continuous battery conveyor loop C' which extends from one side of a vehicle station T' (shown with a motorscooter vehicle V' positioned therein) to the opposite side of the vehicle station T'. As in the automobile system of Figures 1-11, batteries B' move through the conveyor loop from the receiving end or station 115 of the conveyor to a delivery end 114 of the conveyor while being charged via multiple battery chargers (not shown). In this embodiment, however, the conveyor loop C' passes under an elevated support area 155 located on both sides of the vehicle. The elevated support area on each side of the vehicle is preferably identical in structure.

As illustrated in Figures 14 and 15, the battery compartment 117 of the vehicle extends through the vehicle below the floor area where the operator's feet are positioned while riding the motorscooter. Ideally, electric motorscooters such as those manufactured by Kwang Yang Motor Company (KYMCO) and Piaggio SpA will be modified and equipped to provide a battery compartment as described. In addition, the battery transfer station may be readily adapted for other electric motorscooter-type vehicles, such as three-wheeled rickshaws manufactured by India's Baja Auto Limited and various four-wheeled all-terrain vehicles.

Unlike the battery exchange involving an automobile where the operator and passengers remain in the vehicle, the motorscooter system is preferably designed such that the operator of the motorscooter must dismount the vehicle during battery exchange. The elevated support area 155 consists primarily of a landing 159 which allows the operator of the vehicle to stand above the conveyor without interfering with the battery exchange operation. In addition, the support area 155 provides added safety for the operator of the vehicle by elevating the operator above the conveyor C' during battery transfer. The elevated support area 155 functions in conjunction with the

battery conveyor C' to allow vehicles to enter and exit the system without reversing direction, thus allowing the vehicles to efficiently pass through the system in sequential fashion. In one particular embodiment, the vehicle operator utilizes the elevated support area to walk up the ramp 157 and place the motorscooter into position within the vehicle securing station 150. The operator remains situated on the landing 159 of the elevated support area 155 as the vehicle is positioned and secured within the vehicle securing station 150. Motorscooters of standard length are uniformly longitudinally positioned in the transfer station. When the battery exchange operation is complete the operator pulls the vehicle forward.

As further illustrated in Figure 13, the electronic payment system P' described above can be accessed while the operator is standing on the landing 159 of the elevated support area 155.

As will be appreciated by those skilled in the art, alternative embodiments may be employed in lieu of an elevated support area in order for the vehicle operator to position the motorscooter within the transfer station. For example, a conveyor mechanism or similar apparatus can be utilized to move the vehicle into position within the vehicle securing station. Alternatively, the operator can move the vehicle into position on a level surface and cross over the battery conveyor via a step, rather than a ramp, in order to preserve the sequential processing of vehicles. Alternatively, the battery exchange operation can be initiated by a transfer station operator or attendant.

As illustrated in Figure 13, the elevated support area 155 optionally includes an optical sensor device 161 for detecting the presence of the vehicle operator on the elevated support area. The elevated support area 155 is located on both sides of the vehicle V' and both sides can be equipped with an optical sensor device 161, thus monitoring the presence of additional vehicle passengers or a vehicle operator utilizing the opposite ramp to position the vehicle in the transfer station T'. The sensor 161 is preferably positioned just below the surface of the landing area 159 on the elevated support 155. The sensor 161 is also preferably coupled to the computer system described above via conventional control circuitry. This sensor 161 ensures that the operator is safely away from the battery exchange conveyor area before commencing a battery exchange by monitoring the area around the elevated support area 155. When the sensor 161 detects an object in the path of the optical beam, a control signal is generated to stop the conveyor. This sensor 161 provides an added safety feature for the motorscooter operator not required for an automobile battery exchange system. Alternatively, the sensor can monitor the presence of a transfer station attendant when the battery exchange operation is initiated or performed by an attendant.

As will be appreciated by those skilled in the art, a variety of different sensor devices may be employed to detect the presence of a person on the landing of the elevated support area. For example, detection of an operator's presence on the landing area may be achieved using an weight sensor located just below the landing surface. This sensor would be configured to measure a threshold weight before the battery exchange operation will commence.

In the embodiment depicted by Figure 14, the transfer station T' includes a hydraulic ram 120 having a rod 121 which laterally forces the battery B1' into a battery seat 122 in the vehicle. The battery B1' displaces the existing vehicle battery B2', forcing the existing battery B2' onto an exit conveyor toward the receiving end 115 of the conveyor. One or more drive sprockets 127 may be provided at the receiving end as in Figure 7 to complete

the battery exchange operation. Alternatively, the battery exchange operation can be initiated and manually performed by a transfer station operator or attendant.

In a preferred embodiment as depicted by Figure 15, drive sprockets 127 alone are used to engage with notches 126 on the underside of the vehicle's battery to accomplish the battery exchange. The drive sprockets are positioned below the underside of the battery in the floor of the vehicle securing station 150. The sprockets 127 are provided on a hydraulic vertical lift that can be raised or lowered to engage with the battery located in the battery compartment 117 of the vehicle. The sprockets then retract into the floor to allow the vehicle to exit the transfer station T' upon completion of the exchange operation.

Optionally, this preferred embodiment can be configured to upwardly lift the battery from the battery seat 122 prior to the battery exchange operation. The battery seat 122 provides openings that are aligned with the notches 126 in the battery. The drive sprockets 127 provide a continuous lateral exchange of the battery from the battery delivery end 114 to the battery receiving end 115, functioning in conjunction with the drive sprockets of the battery conveyor, as discussed above.

As illustrated in Figure 15, the transfer station T' includes a vehicle securing station 150 comprised of a positioning structure 112, shown as receptacles for both the front and back wheels 113 of the vehicle V'. As will be appreciated by those skilled in the art, a variety of different positioning structures can be used. If desired, the plural positioning structures 112 may be provided at various spaced locations to accommodate vehicles of different lengths. The positioning structure may alternatively be placed on a roller mechanism or track for adjusting the receptacles to varying distances between the front and rear wheels.

Additionally, the inner sides of the elevated support area 155 serve as added protection against the tipping of the vehicle V' while properly positioned within the motorscooter securing station 150.

As further illustrated in Figure 15, the vehicle securing station 150 is equipped with rollers 165 located on the floor of the vehicle securing station 150 between the wheel receptacles 112. Once the vehicle V' is positioned within the vehicle securing station 150, the base of the vehicle 167 below the battery compartment 117 rests against the rollers maintaining the balance and upright position of the motorscooter during battery transfer. Preferably, the rollers 165 extend across the entire width of the motorscooter's underside to provide maximum vehicle stability. Additional rollers can be provided to increase balance if necessary. The rollers 165 also assist the operator in removing the vehicle from the station upon completion of the battery transfer operation.

As will be appreciated by those skilled in the art, any of a variety of different types of support structures may be employed in place of or in addition to the rollers 165. For example, the motorscooter can be secured in place with laterally-engaging rollers which contact the vehicle from the sides. The laterally-engaging rollers may lock into place upon payment by the operator, and subsequently unlock and retract from the vehicle upon completion of the battery transfer. Another embodiment may consist of a locking hub mechanism which engages from both sides near the tires of the motorscooter to properly hold the vehicle in place during battery transfer. Ideally, the contacting surfaces of the rollers, locking hub mechanism or other support mechanism will be constructed of a material that will not damage the finish of the motorscooter.

Figure 16 is representative of an alternative embodiment of the conveyor loop, and illustrates additional details of the vertically engaging sprocket mechanism described above. In this embodiment, the conveyor loop extends vertically above the vehicle, rather than in front of or behind the vehicle. The vertical conveyor loop is depicted with a motorscooter vehicle V' positioned and secured within the transfer station T'. Batteries B' are continuously charged while moving along the conveyor vertically over the vehicle, rather than longitudinally in front of the vehicle. As in the embodiments discussed above, the battery receiving end 115 is equipped with a vertical battery elevator 143 for removing batteries determined to be unfit for recharge. Preferably, the batteries are shifted from the battery delivery end 114 to the battery receiving end 115, through the battery compartment 117 of the vehicle via drive sprockets 127 deployed within the vehicle securing station 150 which engage with the notches or recesses 126 on the underside of the battery. As further illustrated in Figure 16, the battery chargers 116 are located at various positions along the battery conveyor.

Lateral displacement of the batteries from the vehicle in the vertically oriented conveyor system is similar to the horizontal system described above. Preferably the batteries are carried vertically along the charging conveyor through the use of latches 170. For example, the latches 170 can engage with the notches or recesses in the underside of the battery to carry the battery vertically upwards and downwards along the conveyor belt. Alternatively, the latches 170 may contact the battery along the edge or corner without engaging with the notches or recesses. Lateral movement of the battery across the top of the conveyor can be accomplished using a sprocket mechanism like that disclosed above. As will be appreciated by those skilled in the art, any combination of latches, pulleys, belts, and sprockets can be utilized to carry the batteries along the conveyor loop.

The vertical embodiment just described also provides for increased battery capacity by optionally adding vertical conveyor loops or modules successively in front of an existing conveyor loop. Preferably, each additional conveyor loop would be no more than a few feet in front of the previous conveyor loop, thus increasing capacity without sacrificing space.

Figures 18 through 22 illustrate an electrically assisted bicycle system in accordance with another embodiment of the present invention. The system includes an electrically assisted bicycle (Figure 18) that uses a portable battery that is manually detachable from the bicycle, and includes a vending machine (Figures 21 and 22) that receives, recharges and dispenses the portable batteries. It will be appreciated by those skilled in the art that the vending machine may be adapted to charge and exchange a variety of other types of small, portable batteries, such as those for personal laptop computers or cellular telephones. The vending machines may be located in or near a number of strategically located areas, such as convenience stores, airports, shopping malls, or airplanes, in order to provide quick and easy access to exchange spent batteries.

Figure 18 represents a preferred embodiment of a battery powered, electrically assisted bicycle 200. The bicycle 200 includes a lightweight portable battery 204, a small electric motor 206, an electrical speed control mechanism 202 for controlling the motor, and a power drive mechanism 208 for delivering powered assistance to the bicycle.

Referring to Figure 18, the bicycle speed control mechanism 202 controls the power applied by the motor 204 to the power drive mechanism 208. This mechanism 202 is preferably attached near the handlebars through a lever or switch and is electrically connected to the motor 204, thereby acting as a throttle. The speed control mechanism 202 may also be automatic, where a sensor is employed to speed the bicycle up or down to obtain a proper speed setting. As will be appreciated by those skilled in the art, a variety of configurations and locations for the control mechanism 202 are possible.

The bicycle motor assembly 206 utilizes the power supplied by the battery 204 to operate the power drive mechanism 208. The battery 204 and motor 206 are preferably mounted as a unitary assembly to the frame of the bicycle, and are contained within a modular compartment 210 to provide security and stability.

Preferably, this modular compartment 210 is mounted to the bicycle frame with a spring loaded hinge 212. Alternatively, a variety of fasteners may be used to secure the compartment 210 to the bicycle as is well known to those in the art, including for example, welding, latches, straps, and bolts. The modular compartment 210 preferably includes a locking mechanism 214 to provide security for the battery 204. The electric motor 206 may be a standard clamped rotor motor or other suitable motor as is well known to those skilled in the art.

In a preferred embodiment the bicycle 200 may be specially designed and equipped to operate in the present system. However, as will be appreciated by those skilled in the art, an ordinary bicycle may be retrofitted in order to properly operate in connection with the present system. The bicycle 200 includes a rear wheel 216 and a front wheel 218. Preferably, the rear wheel 216 includes a specially designed tire rim 220 with a larger surface area just below the tire for operation with the power drive mechanism 208 of the bicycle.

Figures 19A through 19C illustrate several alternative embodiments of a power drive mechanism 208 for use with the electrically assisted bicycle. The bicycle power drive mechanism 208 is coupled to the electric motor assembly 206 and operates by providing powered assistance to the rear wheel. The power drive mechanism 208 may be stabilized in place by a support 240 attached to the modular compartment 210 (as shown in Figure 18). As will be appreciated by those skilled in the art, a variety of configurations and locations for the power drive mechanism are possible.

Figure 19A illustrates one such embodiment, where the power drive mechanism 208 comprises a roller 230 with recessed grooves 232 that engage with a specially designed wheel 216 comprising a treaded tire provided with mating interlock grooves 234 to power the bicycle. Alternatively, the power drive mechanism 208 may comprise a roller with a smoother surface that engages with the tire portion of the bicycle wheel 216, and powers the bicycle via friction created by the roller against the surface of the tire. Like reference numbers are used in Figures 19A through 19C to denote functionally similar parts.

Figure 19B illustrates another power drive mechanism 208 embodiment where a pair of rollers 230 engage transversely with the tire portion of the rear wheel 216. The bicycle 200 is powered through the friction created by the roller 230 against the outside surfaces of the tire 222. Alternatively, one roller 230 or a combination of rollers may be used on either side of the tire 222.

Figure 19C illustrates another embodiment where a friction roller 230 engages with the wheel rim 220 just below the tire 222. Again the bicycle 200 is powered through friction created by the roller 230 against the outside surfaces of the wheel rim 220. Alternatively, one roller 230 or a combination of rollers may be used on either side of the wheel rim 220 to assist the bicycle.

5 Referring to Figures 19B and 19C, the support member 240 for the roller 230 is adapted to maintain the friction between the roller 230 and the tire 222 or wheel rim 220 under all conditions. The support member 240 may include a spring mechanism (not shown) that would ensure the roller 230 remains in tight contact with the tire during proper operation. Additionally, the power drive mechanism 208 may include a disengaging mechanism (not shown) which includes either an electrically controlled circuit or a manual lever that enables the user to disengage
10 the roller from the tire 222 or wheel rim 220 when powered assistance is not required.

As will be appreciated by those skilled in the art, a myriad of other power drive mechanisms 208 may be utilized including a gear or pinion mechanism located near the hub of the tire that engages with the sprocket gears on the bicycle wheel in order to power the bicycle. Alternatively, the power drive mechanism and battery/motor assembly may be located near the front wheel of the bicycle.

15 The friction rollers described above may engage with the wheel rim some distance away from the tire towards the center or hub of the tire. As the power drive mechanism is located closer to the center or hub of the wheel, the required torque necessary to turn the wheel will need to be increased. Any number of alternatives as known to those skilled in the art may be employed to resolve torque problems with the power drive mechanism, such as increasing the power from the motor or utilizing an optimal gear ratio for turning the wheel.

20 Figure 20 illustrates a preferred embodiment of the battery 204 and motor assembly 206. The battery may be a unit of, for example, 4" wide, 4" long and 4" in height. In any case, the battery (unit or pack) is lightweight and readily can be displaced from the vehicle by manually lifting the battery from its position on top of the motor 206. The battery 204 includes charging contacts 304 and a terminal contact (not shown) for engaging with the motor 206 and creating an electrical connection with the motor. Contact of the battery terminals with the motor
25 206 is automatically established when the user places the battery 204 directly on top of the motor assembly 206.

The battery 204 may be maintained in position on top of the motor 206 through a sufficient engaging mechanism. In a preferred embodiment the battery 204 is equipped with a spring-loaded, concentric terminal contact (not shown) on the underside of the battery which makes contact with a similar mating contact 306 on the upper surface of the motor 306. Preferably, the charging contacts 304 located on the battery are also spring loaded.
30 As will be appreciated by those skilled in the art, a variety of charging contact and terminal contact positions and configurations may be implemented in connection with the present system. Additionally, the battery 204 and motor assembly 206 are maintained in position and in electrical contact with each other within the module compartment 210 (Figure 18) by the locking mechanism 214 described above.

The battery 204 may also be equipped with a number of different mechanisms for extracting or removing
35 the battery from the modular compartment 210. In a preferred embodiment, the battery 204 comprises a recessed handle 302 at the top of the battery which allows a bicycle user to pull the battery 204 off of the motor 206.

The battery 204 may only be removed from the vehicle after disengaging the locking mechanism 214 on the modular compartment 210 which secures the battery to the motor.

Figures 21 and 22 illustrate the preferred embodiment of the vending machine 402. The vending machine 402 comprises a secure housing that contains a battery transfer conveyor 404. The battery transfer conveyor 404 is substantially similar to the conveyors described above in connection with automobiles and motorscooters. Figure 21 illustrates a vertical conveyor, however, the vending machine may be configured to contain one or more horizontal conveyors or additional vertical conveyors. The vending machine 402 contains a smaller scale transfer conveyor 404 and the continuous conveyor loop does not actually make contact with a vehicle.

Referring to Figure 21, the vending machine preferably comprises a receiving tray 410 for depositing a discharged battery. The receiving tray 410 is coupled to a battery shifting mechanism 414, which comprises a motor-driven belt. The belt 414 is coupled to the battery receiving end 406 of the transfer conveyor 404. Preferably, the belt 414 comprises protrusions 416, ridges or other positioning means that enable a user to properly position the discharged battery on the belt. The battery delivery end 408 of the transfer conveyor 404 is also coupled to the belt 414 to shift a charged battery from the delivery end 408 to a delivery tray 412. The vending machine preferably contains respective openings 418 in the housing to accept discharged batteries from the user and to dispense charged batteries to the user. The vending machine may alternatively have a single opening that is used both to receive and deliver batteries. Although the system shown in Figures 21 and 22 uses a belt to shift the battery to the receiving end of the conveyor, a user may position the battery at the receiving end by reaching through the opening.

The vending machine preferably comprises a computer, not shown, that is programmed to handle the operations of the vending machine similar to the operations described above in connection with the automobile and motorscooter transfer conveyors. The computer controls the operation of the conveyor via conventional control circuitry, as described above and depicted in Figure 4.

For example, the computer may verify whether a battery is properly in place within the housing opening, monitor the batteries for historical data and charging level, control the battery flow to and from the conveyor, and remove batteries from the conveyor that cannot be sufficiently charged to full capacity. The computer may also control an electronic payment system and control battery charging along the conveyor, as well as other diagnostic testing of the batteries.

The electronic payment system, shown generally as 420 in Figure 21, is operatively coupled to the computer and allows the user to initiate a battery exchange transaction. The payment system 420 may utilize a cash receptacle for handling cash, or allow payment through a credit card, small transponder, IC smart card or other payment method. Upon payment by the customer, the vending machine 402 will accept the discharged battery by moving the battery shift mechanism 414 and, upon verifying that a discharged battery has been properly deposited, will deliver a fully charged battery from the battery delivery end 408 of the conveyor to the delivery tray 412. Optionally, the electronic payment system may be configured (through the battery testing circuitry and the computer)

to determine the amount of charge left in a partially discharged battery so that the user only pays for the amount of charge necessary to restore the battery to full capacity.

5 Preferably, a user will remove a discharged or partially discharged battery from the motor assembly within the modular compartment on the bicycle. The user may place the spent battery in the receiving tray 410 located near the battery receiving end 406 of the transfer conveyor 404. After properly initiating a battery transfer through payment, the user may pick up a fully charged battery 204 in the delivery tray 412 located near the battery delivery end 408 of the battery transfer station. The charged battery 204 can then be quickly deposited on the bicycle's motor assembly 206 or in a similar module compartment.

10 Referring to Figure 22, the discharged battery is placed in the receiving tray 410 by the user and the shift mechanism 414 moves the battery into the housing 403. The battery may then be analyzed, and once verified, the battery can be shifted from the belt 414 into the battery receiving end 406 of the battery transfer conveyor 404. The battery 204 may be placed into the conveyor 404 through a discharged battery receiving apparatus (not shown) that would lift the discharged battery from the belt 414 and place the discharged battery into an open battery location along the conveyor. If all positions are filled along the conveyor, the discharged battery may be placed in
15 a holding area until there is a vacant charging position. The conveyor loop comprises charging contacts, shown generally as 430, which charge the battery while in the conveyor loop.

Further referring to Figure 22, the computer monitors the battery at the battery delivery end 408 to determine whether it has been fully charged, and advances the conveyor 404 along until a fully charged battery is present at the battery delivery end 408. A fully charged battery is then shifted from the battery delivery end 408
20 of the transfer conveyor 404 through a charged battery delivery apparatus (not shown) that deposits the charged battery in position on the belt 414. The fully charged battery is then shifted along the belt to the delivery tray 412 for the user to remove.

Preferably, the computer controls the enable/disable switch in the battery to control the charging capabilities of the battery. Once the user has properly deposited a discharged battery, the computer may transmit an
25 authorization message to the battery to enable the battery switch, allowing battery charging to occur along the conveyor within the vending machine. The fully charged battery dispensed into the delivery tray will have the battery switch disabled. In this way, the user will not be able to charge the battery at home or use unauthorized equipment, and the user can only exchange the discharged battery at designated battery transfer locations. When the switch is disabled the charging contacts are disabled, thereby preventing charging and allowing safe manual handling of the
30 battery.

Although the vending machine preferably performs the battery exchange in response to payment by the user, other methods can be used to initiate the exchange process. For example, the user can be required to enter a subscription code or private password on a keypad (in addition to providing a discharged battery) to initiate delivery of a new battery.

35 Although this invention has been described in terms of certain preferred embodiments, other embodiments that are apparent to those of ordinary skill in the art in view of the disclosure herein are also within the scope of

this invention. Accordingly, the scope of the invention is intended to be limited only by reference to the appended claims.

WHAT IS CLAIMED:

1. A battery charging and transfer station for replacing a battery of an electrically powered vehicle, and for monitoring the usage of batteries, the vehicle including a battery compartment which extends through at least a portion of the vehicle, the station comprising:
 - 5 a drive-through vehicle bay having an entrance end and an exit end to permit the vehicle to enter the bay, stop within the bay, and exit from the bay along a predetermined path without reversing direction;
 - a continuous battery transfer conveyor, the conveyor having a battery receiving end which receives a partially discharged battery from a first end of the battery compartment, and having a battery delivery end which delivers a charged battery to a second end of the battery compartment, the conveyor having
 - 10 multiple battery positions for storing multiple batteries between the receiving and delivery ends;
 - at least one battery charger positioned along the conveyor;
 - a computer coupled to the conveyor such that the computer programmably moves batteries along the conveyor from the receiving end to the delivery end;
 - at least one electronic sensing device coupled to the computer, the sensing device positioned along
 - 15 the conveyor to read unique ID codes of batteries on the conveyor; and
 - a database coupled to the computer, the database storing historical data for a plurality of batteries, said historical data stored in association with the unique ID codes of the batteries.
2. The battery charging and transfer station as in Claim 1, further comprising an electronic payment system operatively coupled to the computer, the payment system configured to allow operators of vehicles to specify
- 20 payment information for the payment of a fee associated with a battery exchange.
3. The battery charging and transfer station as in Claim 2, wherein the payment system comprises a magnetic card reader.
4. The battery charging and transfer station as in Claim 1, further comprising a battery evaluation program module running on the computer, the evaluation program module configured to compare the historical data
- 25 of the discharged battery to at least one pre-specified limit value to determine whether the discharged battery should be removed from the conveyor.
5. The battery charging and transfer station as in Claim 1, wherein the at least one electronic sensing device comprises a bar code reader.
6. The battery charging and transfer station as in Claim 1, wherein the at least one electronic sensing
- 30 device comprises an RF receiver.
7. The battery charging and transfer station as in Claim 1, wherein the database comprises a centralized database which is remotely accessed by a plurality of geographically distributed battery charging and transfer stations.
8. The battery charging and transfer station as in Claim 1, further comprising at least one expansion
- 35 module coupled to the continuous conveyor by at least one battery elevator, the expansion module having a second conveyor which has multiple battery positions for holding multiple batteries.

9. The battery charging and transfer station as in Claim 8, wherein the at least one battery elevator and the second conveyor are operatively coupled to the computer such that computer selectively moves batteries between the continuous conveyor and the second conveyor.

10. A battery charging and transfer station for replacing a battery of an electrically powered two-wheel vehicle, said vehicle including a battery compartment which extends through at least a portion of said vehicle, the station comprising:

a vehicle securing station comprising a vehicle positioning and support structure for maintaining said vehicle in an upright position during a battery transfer operation; and

a continuous battery transfer conveyor within the transfer station, the conveyor having a battery receiving end which receives a partially discharged battery from a first end of the battery compartment, and having a battery delivery end which delivers a charged battery to a second end of the battery compartment, the conveyor having multiple battery positions for storing and re-charging multiple batteries between the receiving and delivery ends.

11. The battery charging and transfer station as in Claim 10, further comprising an elevated support area with a surface above said battery transfer conveyor, the elevated support area adapted to support a user in a safe location above the conveyor during a battery transfer operation.

12. The battery charging and transfer station as in Claim 10, wherein said vehicle positioning and support structure comprises two wheel receptacles for positioning said two-wheel vehicle.

13. The battery charging and transfer station as in Claim 12, wherein said vehicle positioning and support structure comprises rollers spaced at the four corners of a square formed between the wheel receptacles of the vehicle securing station.

14. The battery charging and transfer station as in Claim 10, further comprising a computer coupled to the battery transfer conveyor such that the computer programmably moves batteries along the conveyor from the receiving end to the delivery end.

15. The battery charging and transfer station as in Claim 10, further comprising an electronic payment system coupled to the conveyor, the payment system configured to allow an operator of said vehicle to specify payment source information for payment of a fee associated with a battery exchange operation.

16. The battery charging and transfer station as in Claim 10, further comprising a sensor coupled to the computer for detecting whether the vehicle operator is in a safe location.

17. A method of rapidly exchanging a battery of an electrically powered two-wheel vehicle, said vehicle having a battery compartment which extends through at least a portion of the vehicle, the method comprising the steps of:

providing a battery charging and transfer station comprising:

a vehicle securing station comprising a positioning and support structure for maintaining said vehicle in an upright position; and

a continuous battery transfer conveyor within the transfer station, the conveyor having a battery receiving end which receives a partially discharged battery from a first end of the battery compartment, and having a battery delivery end which delivers a charged battery to a second end of the battery compartment, the conveyor having multiple battery positions to store and re-charge multiple batteries between the receiving and delivery ends;

positioning and supporting the vehicle in an upright position within the vehicle securing station such that the battery compartment is aligned with the battery receiving and delivery ends of the conveyor, the battery compartment containing the discharged battery; and

exchanging the discharged battery with the charged battery by advancing the conveyor to shift the charged battery from the delivery end of the conveyor into the compartment and moving the discharged battery from the compartment to the receiving end of the conveyor.

18. The method of Claim 17, wherein exchanging the discharged battery with the charged battery comprises advancing the conveyor by exactly one battery position.

19. The method as in Claim 17, wherein the step of exchanging the discharged battery with the charged battery comprises advancing at least one sprocket into an exposed area on the bottom surface of the discharged battery to shift the discharged battery from the battery compartment.

20. The method as in Claim 17, further comprising advancing the vehicle through the transfer station above or below a vertically displaced segment of the conveyor without interrupting the battery transfer path between the receiving and delivery ends of the conveyor.

21. The method as in Claim 17, further comprising a computer coupled to the battery transfer conveyor, and wherein the step of exchanging comprises advancing the conveyor under the control of the computer.

22. The method as in Claim 21, further comprising an electronic payment system coupled to the computer, and wherein the step of advancing the conveyor under the control of the computer is performed automatically in response to payment by a user with the electronic payment system.

23. A system for recharging and exchanging portable batteries, each battery adapted for manual installation within a battery-powered apparatus by a user, the system comprising:

a secure housing;

a battery conveyor positioned within the housing, the conveyor having a battery receiving end and a battery delivery end, the conveyor having multiple battery positions for storing multiple batteries between the receiving and delivery ends;

at least one battery charging station positioned along the conveyor;

a battery receiving apparatus adapted to receive a partially discharged battery from outside the housing and to deliver the discharged battery to the battery receiving end of the conveyor; and

a battery delivery apparatus adapted to deliver a charged battery from the battery delivery end of the conveyor to a user.

24. The battery charging and exchange system as in Claim 23, in combination with an electrically powered bicycle that is adapted to be powered by the portable batteries.

25. The battery charging and exchange system as in Claim 24, wherein the bicycle comprises a wheel engagement mechanism which provides powered assistance to the bicycle.

5 26. The battery charging and exchange system as in Claim 25, wherein the wheel engagement mechanism comprises at least one roller assembly that engages transversely with a wheel of the bicycle.

27. The battery charging and exchange system as in Claim 25, wherein the wheel engagement mechanism comprises at least one roller assembly that engages transversely with a rim of the bicycle.

10 28. The battery charging and exchange system as in Claim 23, wherein the housing comprises a single opening, and the receiving apparatus receives the partially discharged battery through the opening, and the delivery apparatus delivers the charged battery through the opening.

29. The battery charging and exchange system as in Claim 23, further comprising a computer coupled to the conveyor such that the computer programmably moves batteries along the conveyor from the receiving end to the delivery end.

15 30. The battery charging and exchange system as in Claim 29, further comprising:
at least one electronic sensing device coupled to the computer, the sensing device positioned along the conveyor to read unique ID codes of batteries on the conveyor; and
a database coupled to the computer, the database storing historical data for a plurality of batteries, said historical data stored in association with the unique ID codes of the batteries.

20 31. The battery charging and exchange system as in Claim 30, wherein the at least one electronic sensing device comprises a bar code reader.

32. The battery charging and exchange system as in Claim 29, further comprising an electronic payment system operatively coupled to the computer, the payment system configured to advance the conveyor in response to payment by a user.

25 33. The battery charging and exchange system as in Claim 32, wherein the payment system is further configured to bill a user according to the amount of charge required to recharge a partially discharged battery.

34. A method of exchanging and recharging a portable battery of an electrically powered vehicle, the method comprising the steps of:

30 providing a vehicle comprising;
a battery detachably connected to an electric motor to provide power to the motor;
an electric motor control assembly electrically connected to the electric motor to enable a user of the vehicle to control the motor; and
an electrically powered drive mechanism coupled to the electric motor to provide powered assistance to the vehicle;
35 providing a battery charging and exchange station comprising:
a secure housing;

a battery conveyor positioned within the housing, the conveyor having a battery receiving end which receives a partially discharged battery, and having a battery delivery end which delivers a charged battery, the conveyor having multiple battery positions to store and recharge multiple batteries between the receiving and delivery ends; and

at least one opening in the secure housing coupled to the conveyor to deliver a partially discharged battery to the battery delivery end;

manually removing a discharged battery from the vehicle;

advancing the discharged battery through the housing opening to the receiving end of the conveyor;

and

automatically advancing the charged battery from the delivery end of the conveyor to a position that is accessible to a user.

35. The method as in Claim 34, wherein the step of advancing the discharged battery comprises automatically advancing the discharged battery from the housing opening to the battery receiving end of the conveyor.

36. The method as in Claim 34, wherein the step of advancing the discharged battery comprises manually positioning the discharged battery through the housing opening into the battery receiving end of the conveyor.

37. The method as in Claim 34, wherein the battery charging and exchange station further comprises an electronic payment system coupled to the conveyor, and wherein the step of automatically advancing comprises advancing the conveyor in response to payment by a user.

38. The method as in Claim 34, wherein the battery charging and exchange station further comprises a computer operatively coupled to the conveyor, and wherein the step of automatically advancing the battery comprises programmably advancing batteries via the computer along the conveyor from the receiving end to the delivery end.

39. The method as in Claim 38, wherein the battery charging and exchange station further comprises an electronic sensing device coupled to the computer for detecting unique ID codes of batteries on the conveyor, and wherein the method comprises sensing the unique ID code of the discharged battery with the sensing device.

40. The method as in Claim 38, wherein the battery charging and exchange station further comprises a battery testing device coupled to the computer to determine the charge level of a discharged battery deposited by users, and wherein the method comprises detecting the charge level of the discharged battery with the testing device.

41. The method as in Claim 38, wherein the battery charging and exchange station further comprises an electronic payment system operatively coupled to the computer, and wherein the method comprises automatically advancing the conveyor in response to payment by a user.

42. The method as in Claim 38, wherein the method comprises detecting the charge level of the discharged battery and billing the user according to the amount of charge required to recharge the partially discharged battery.

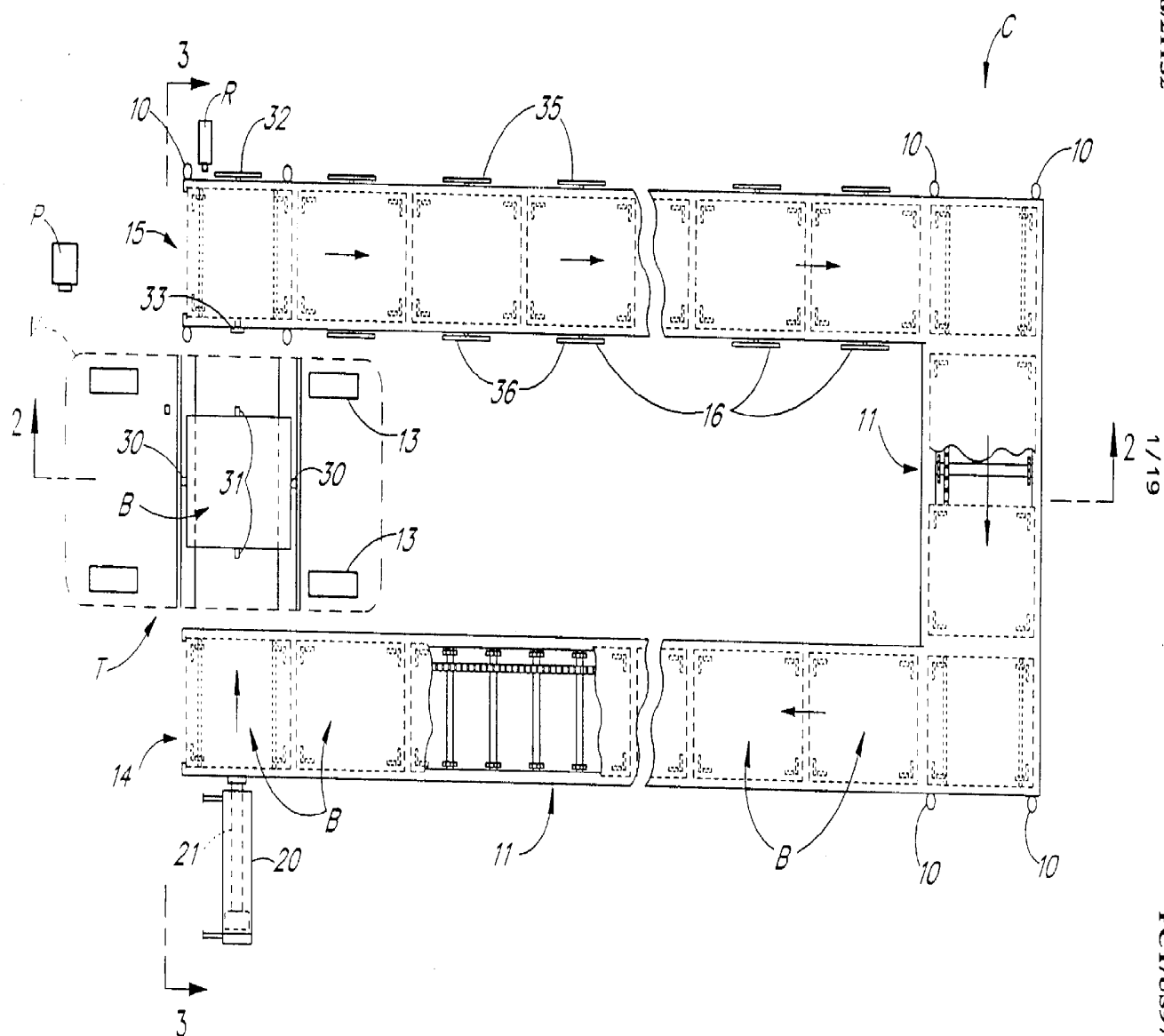
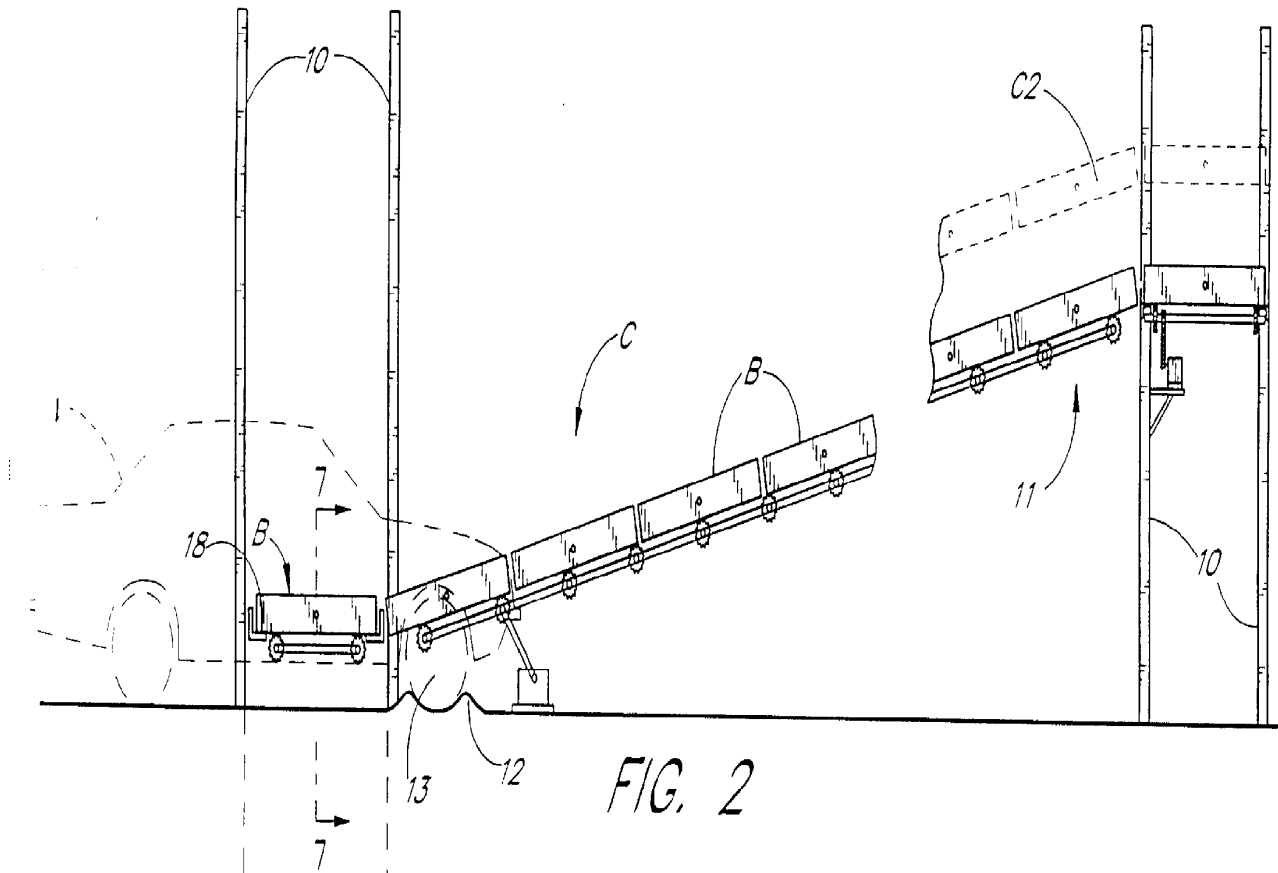
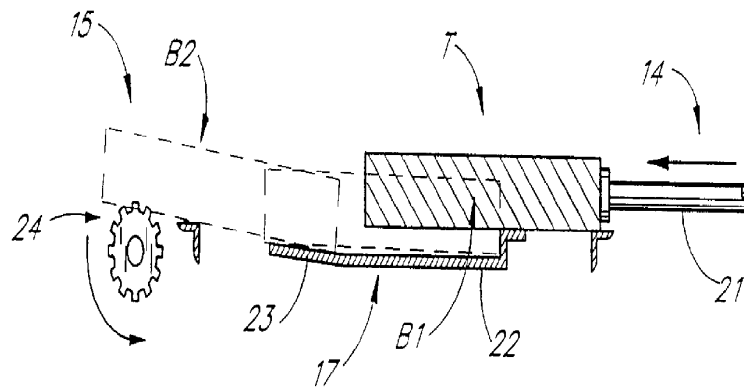


FIG. 1



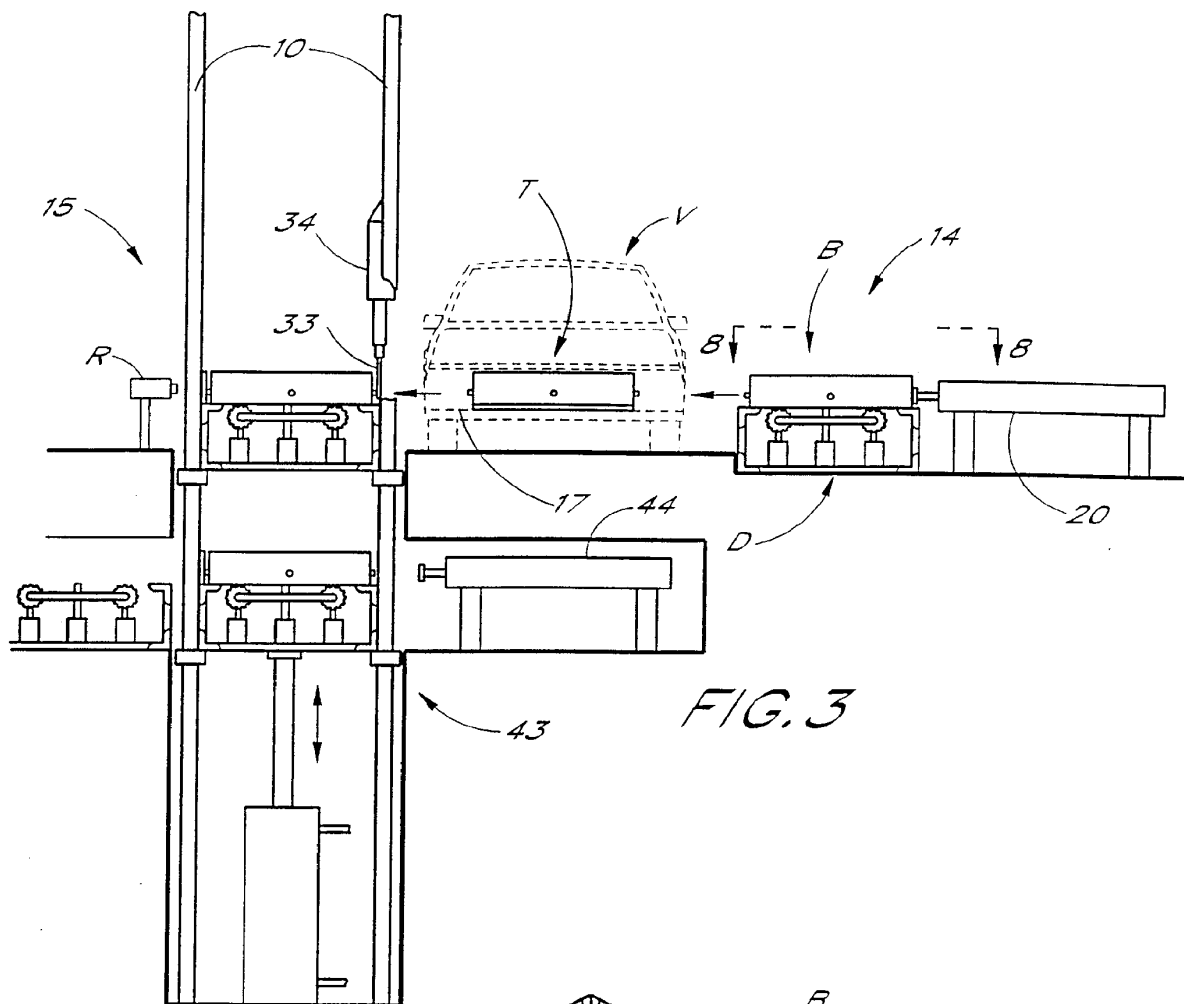


FIG. 3

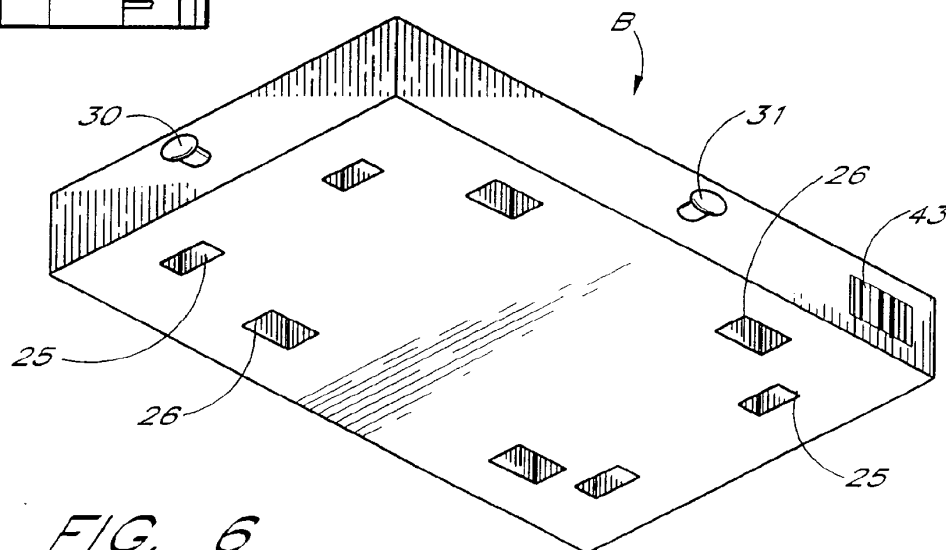
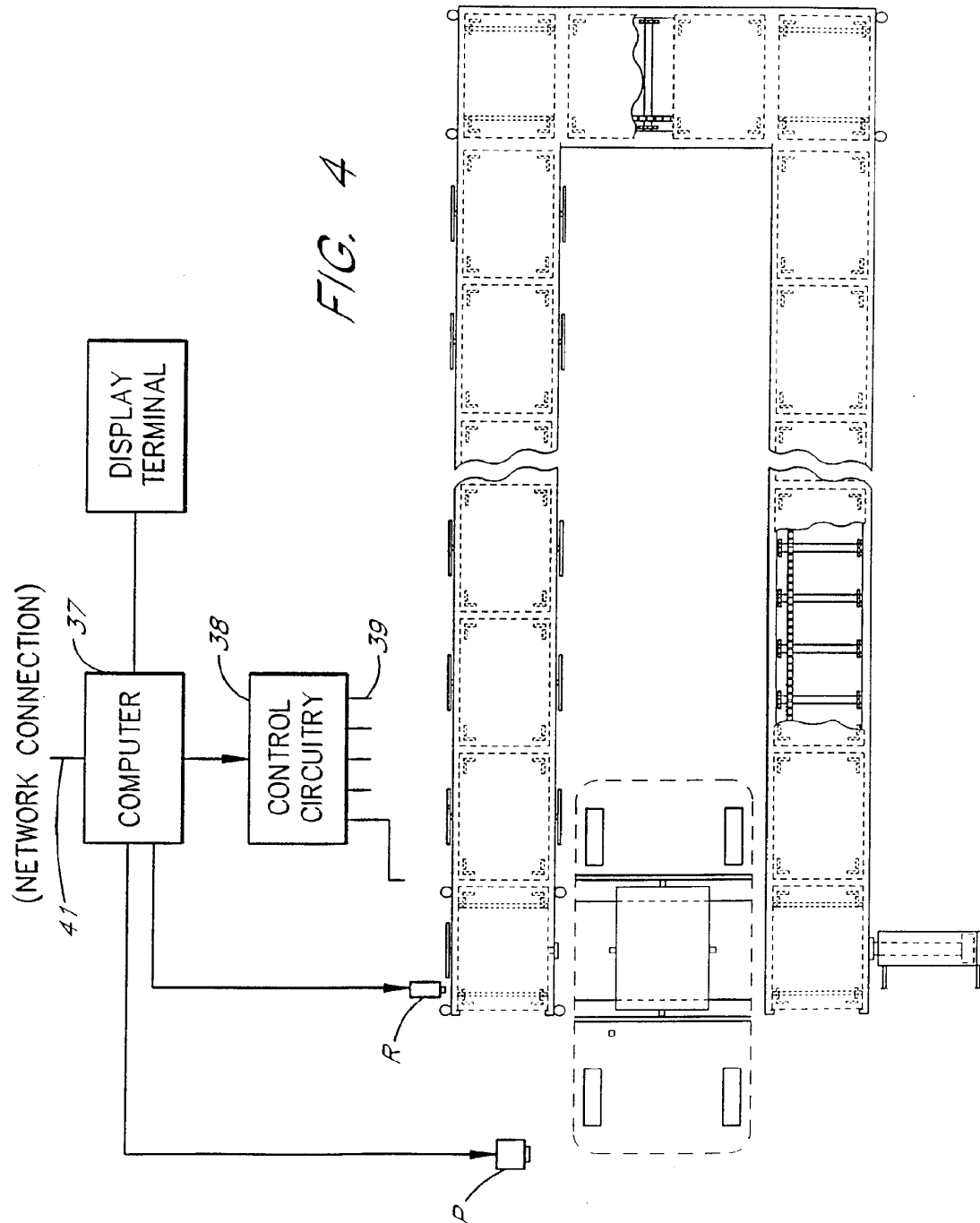
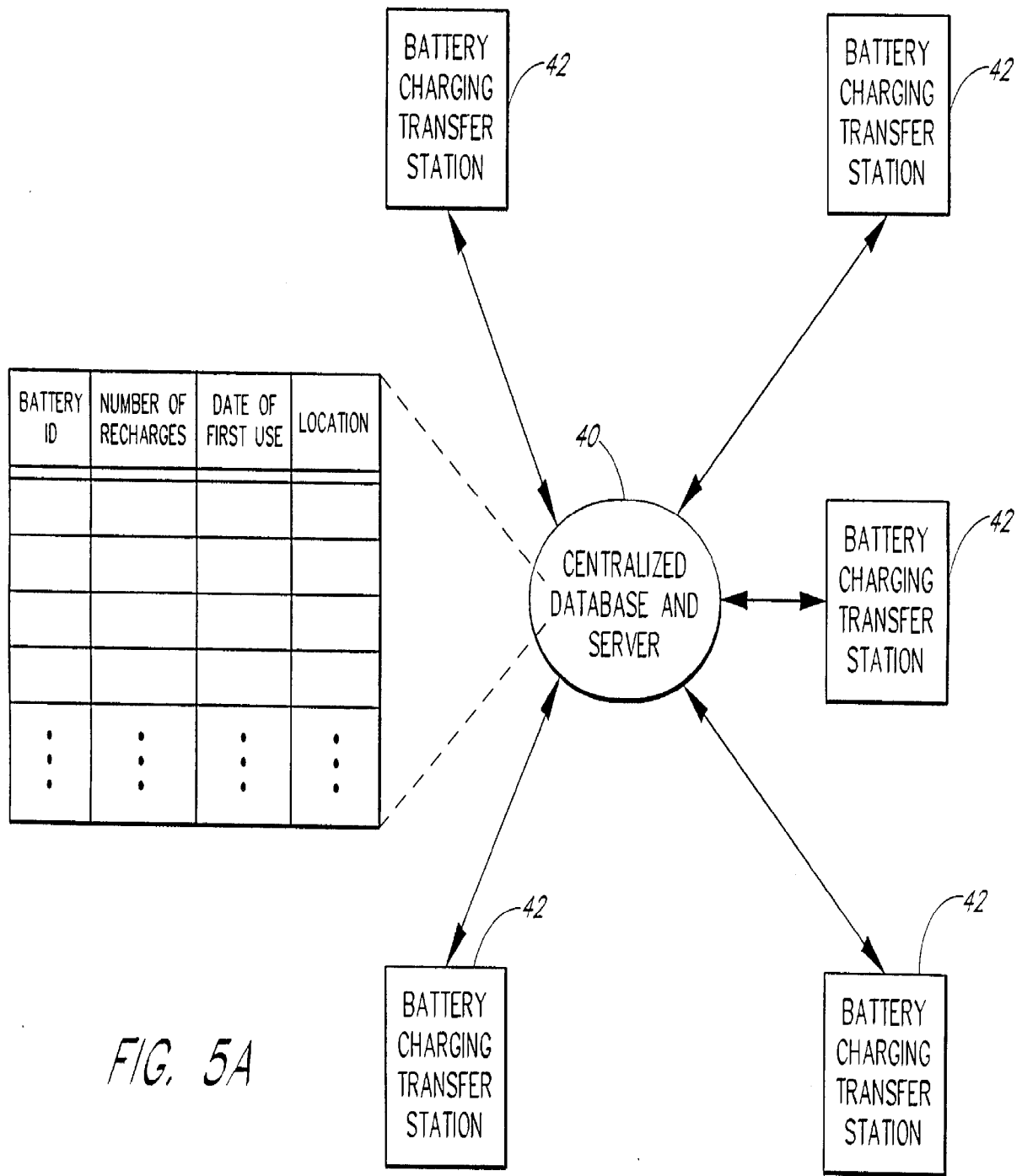


FIG. 6





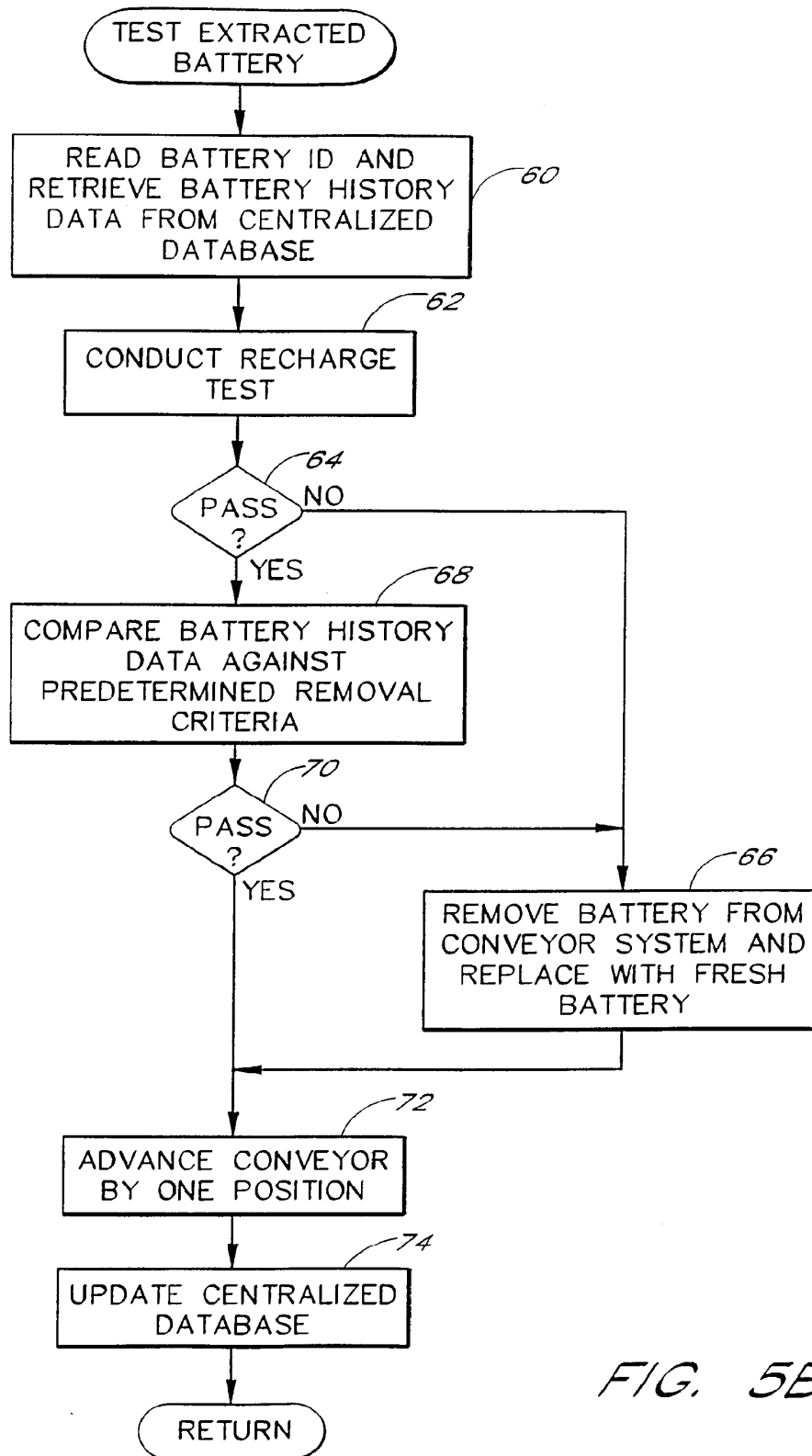
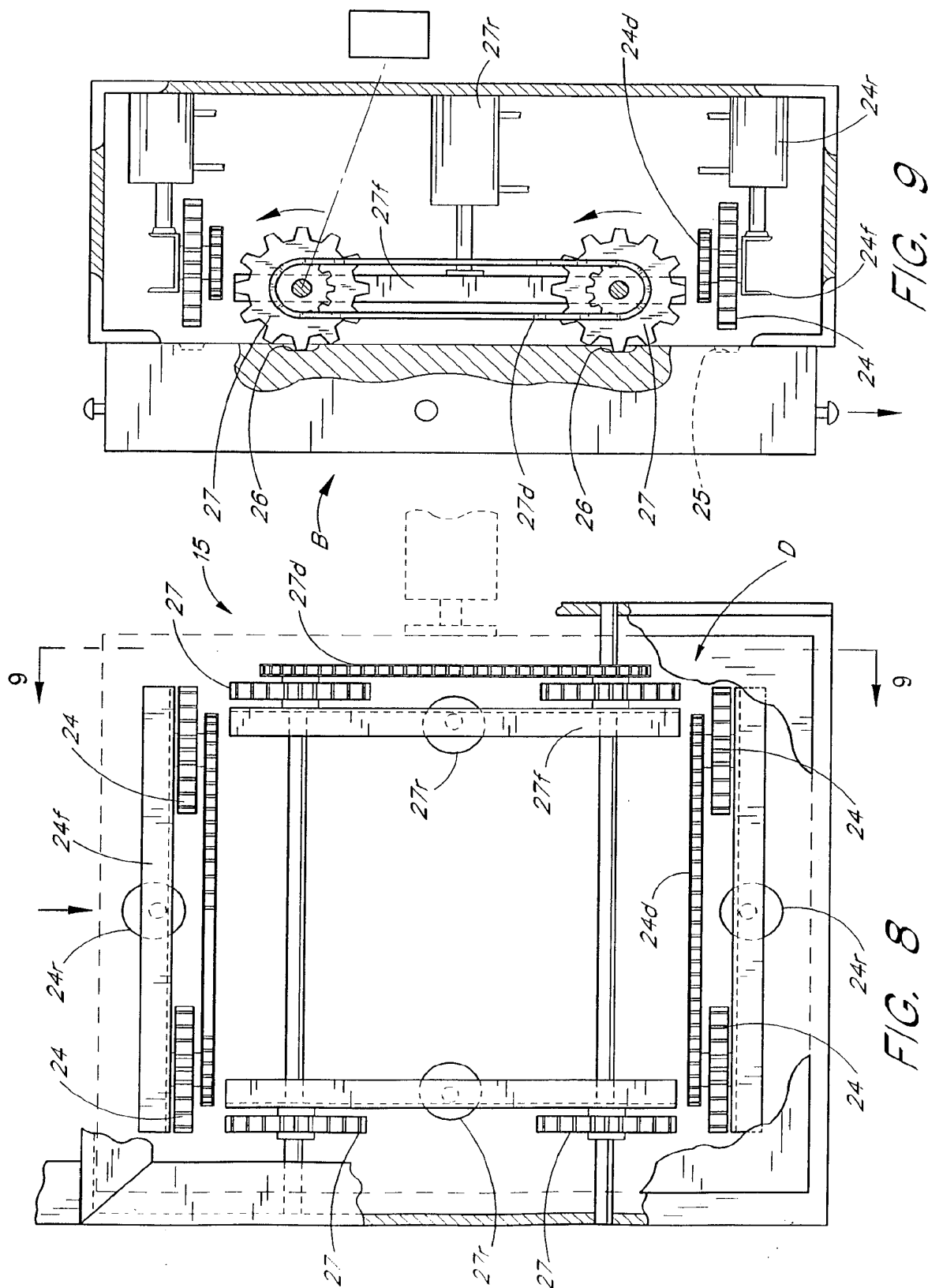
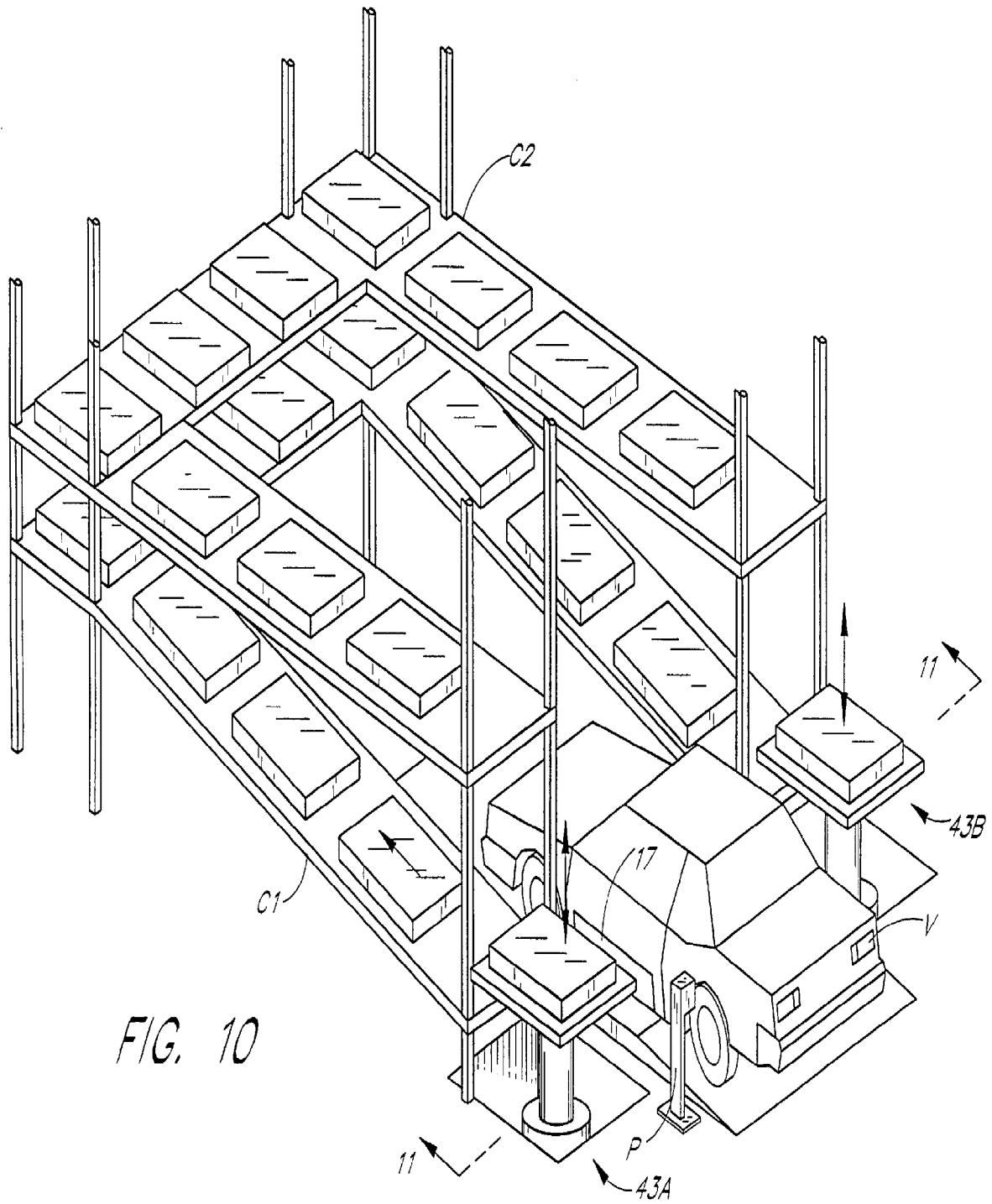


FIG. 5B





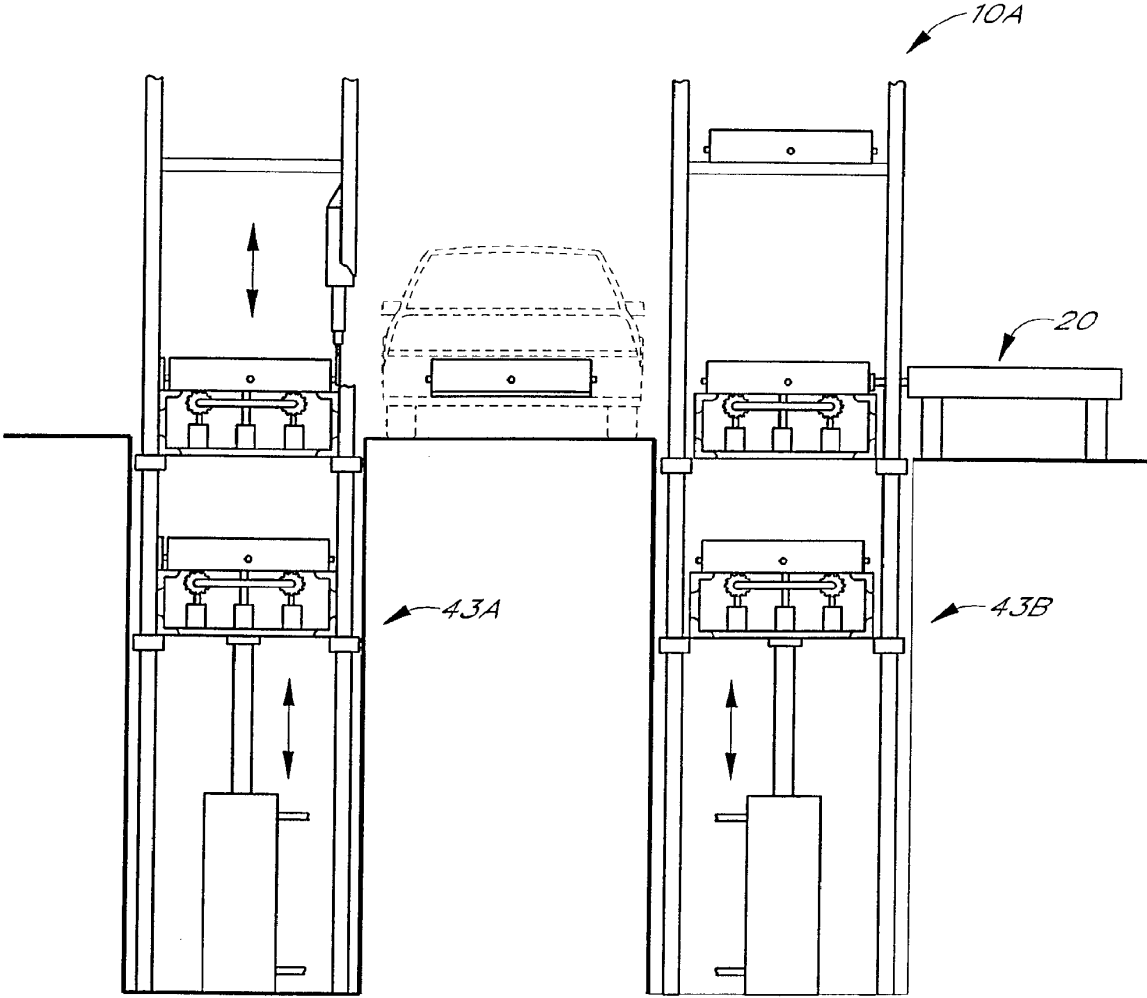


FIG. 11

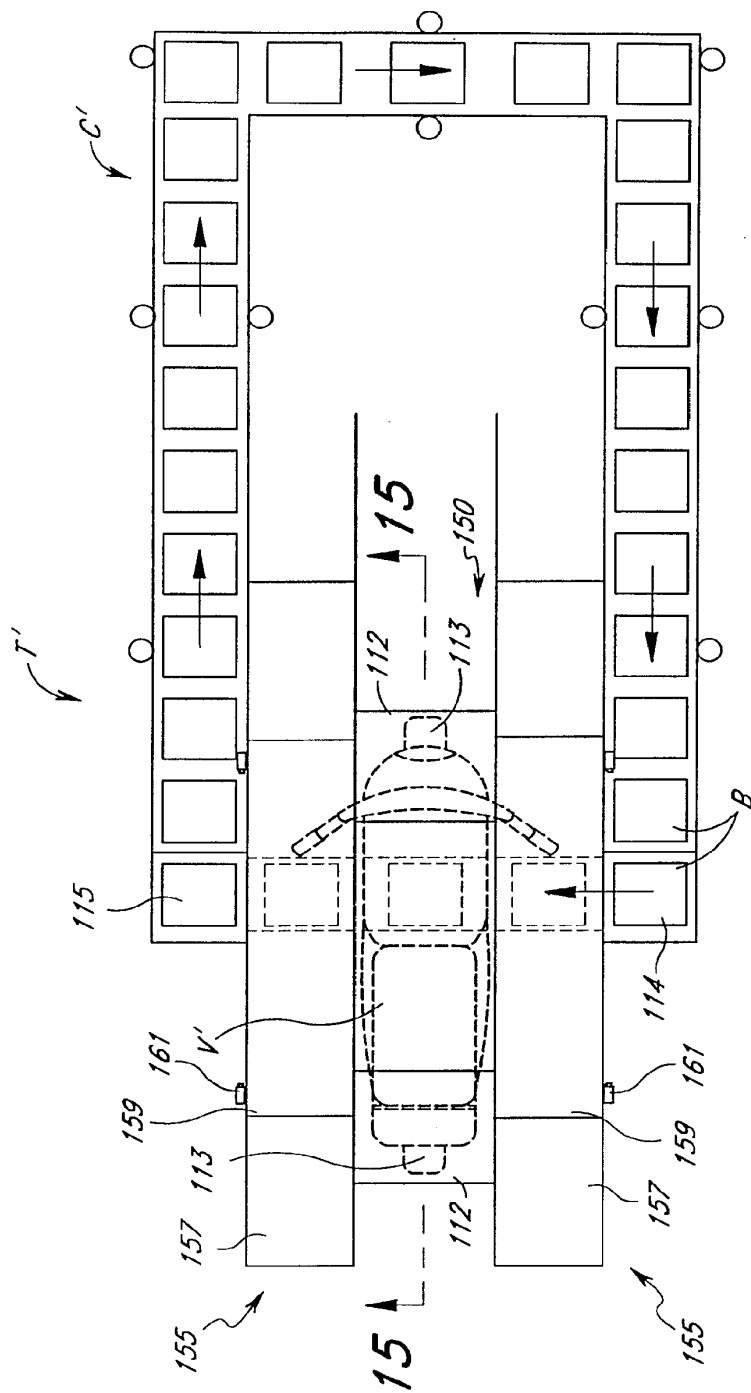


FIG. 13

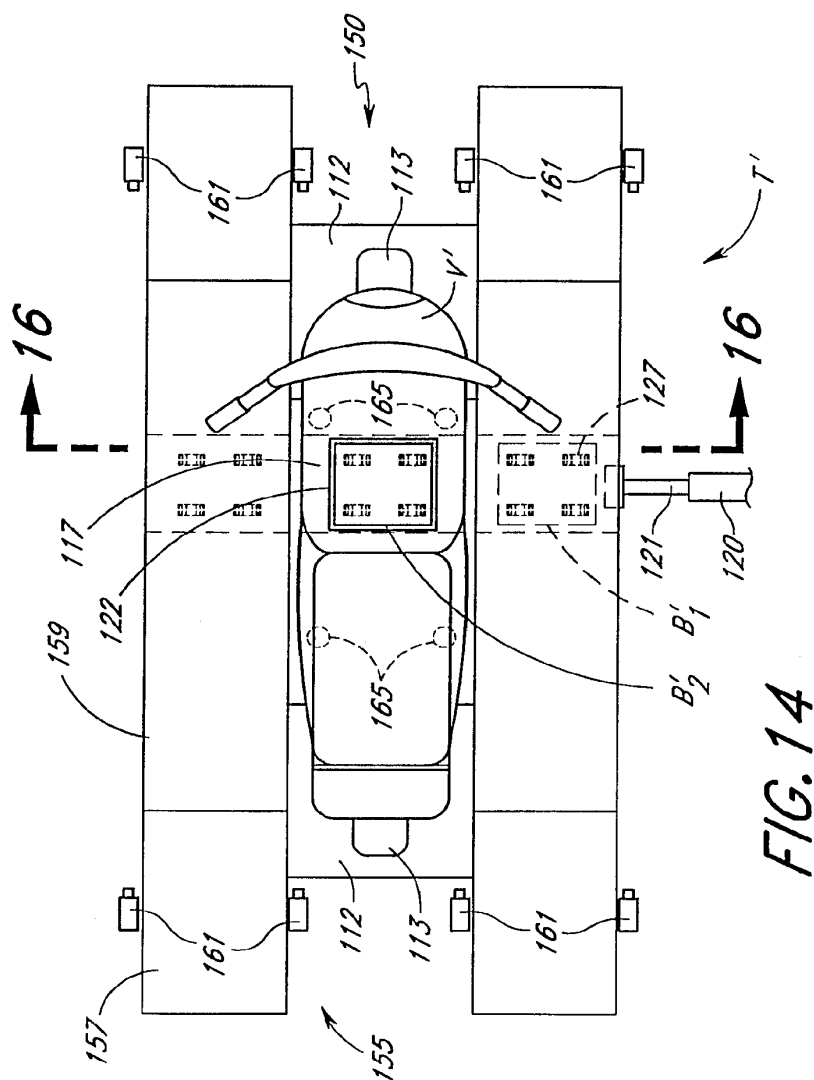


FIG. 14

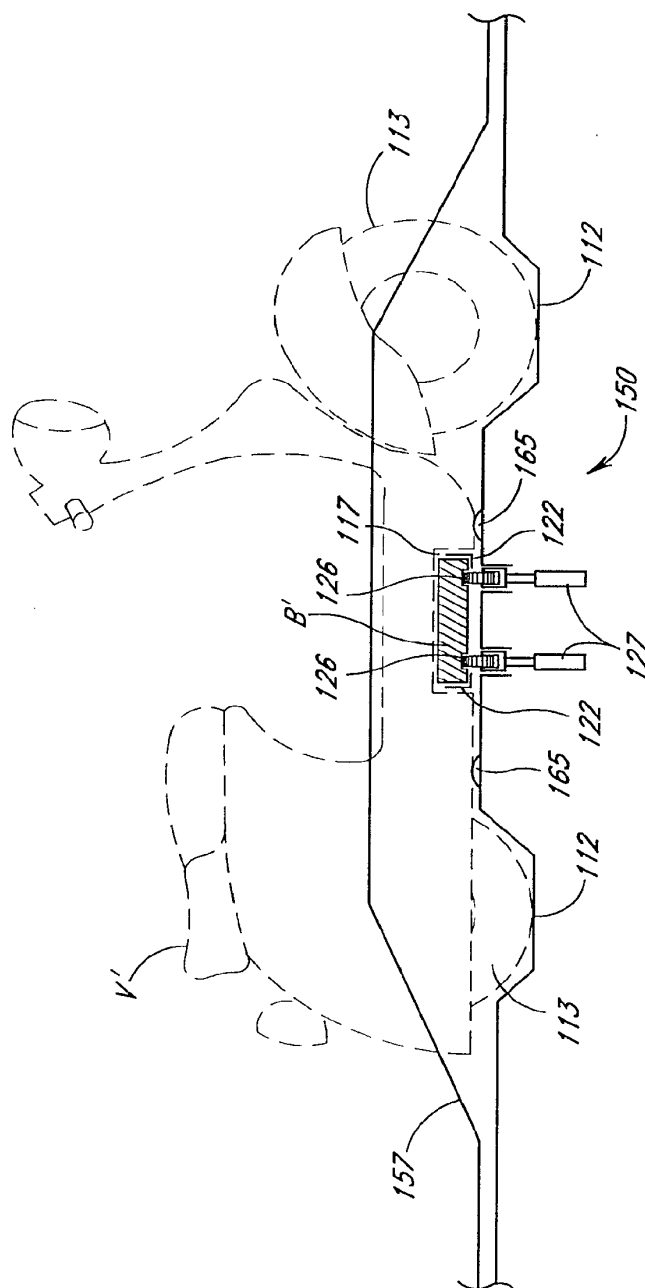


FIG. 15

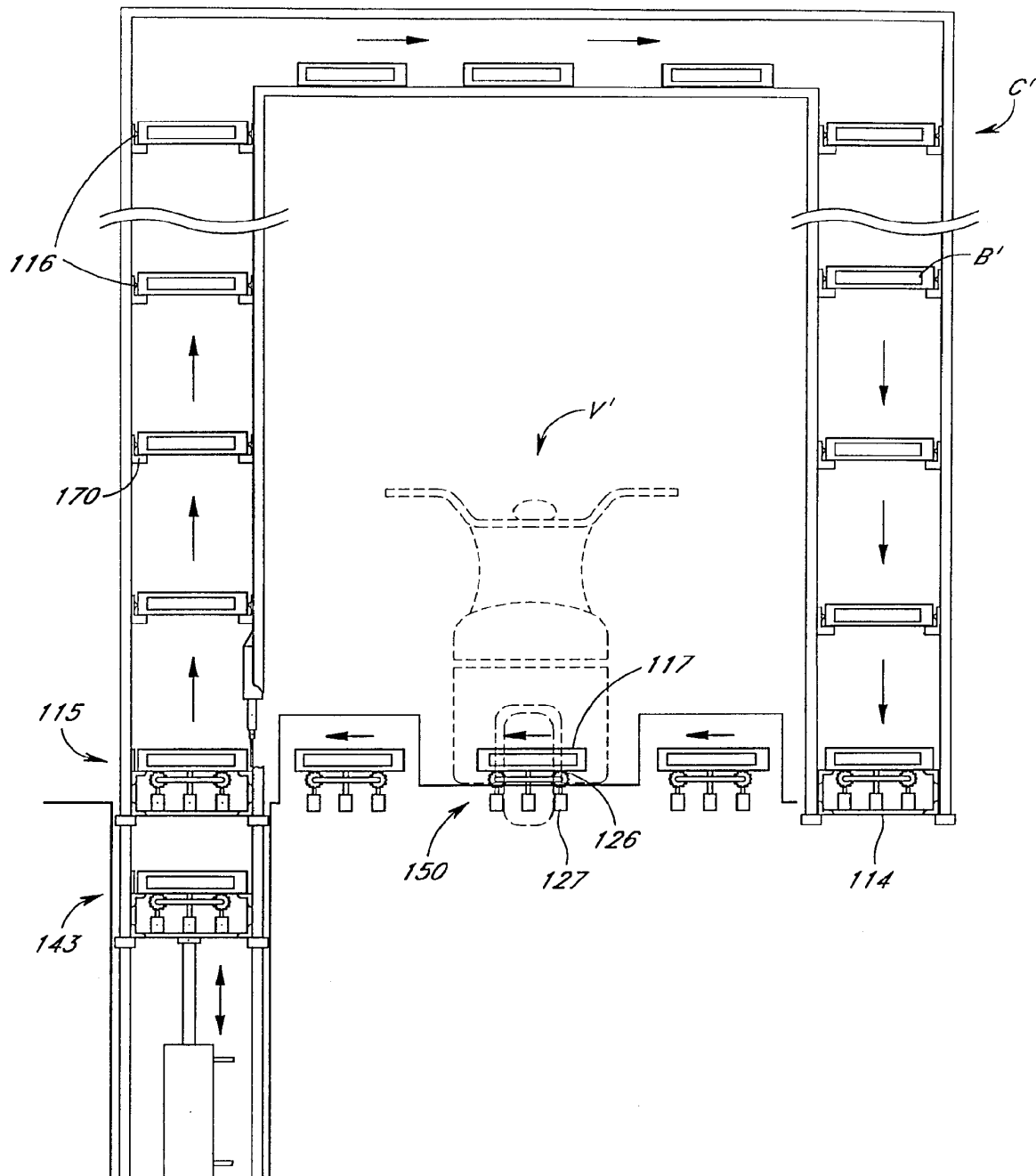


FIG. 16

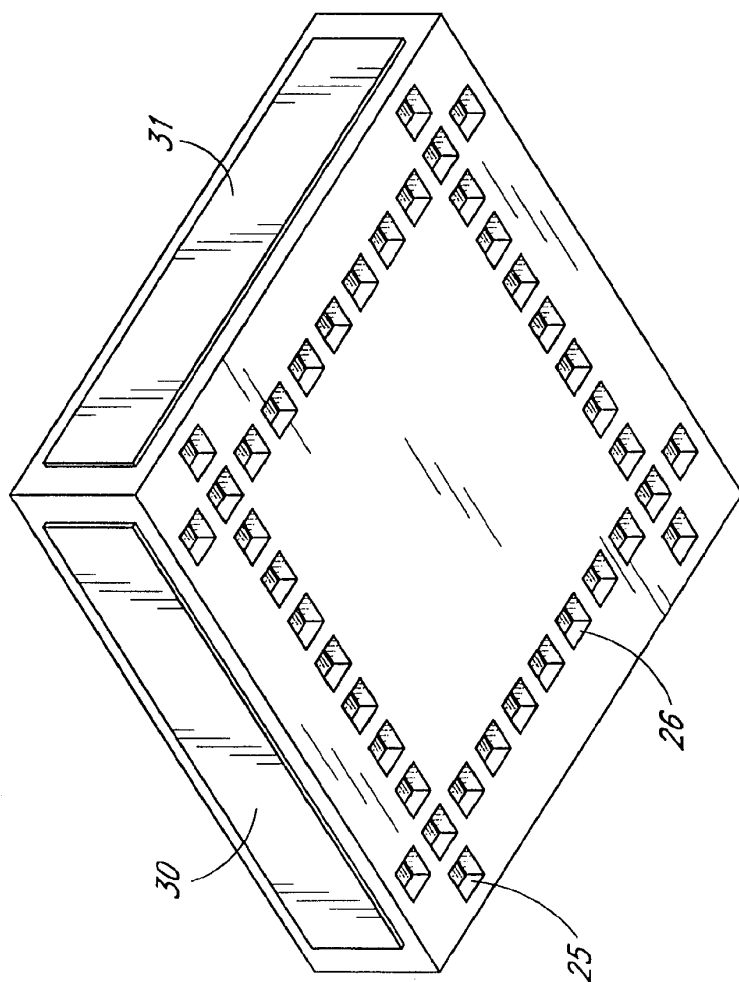


FIG. 17

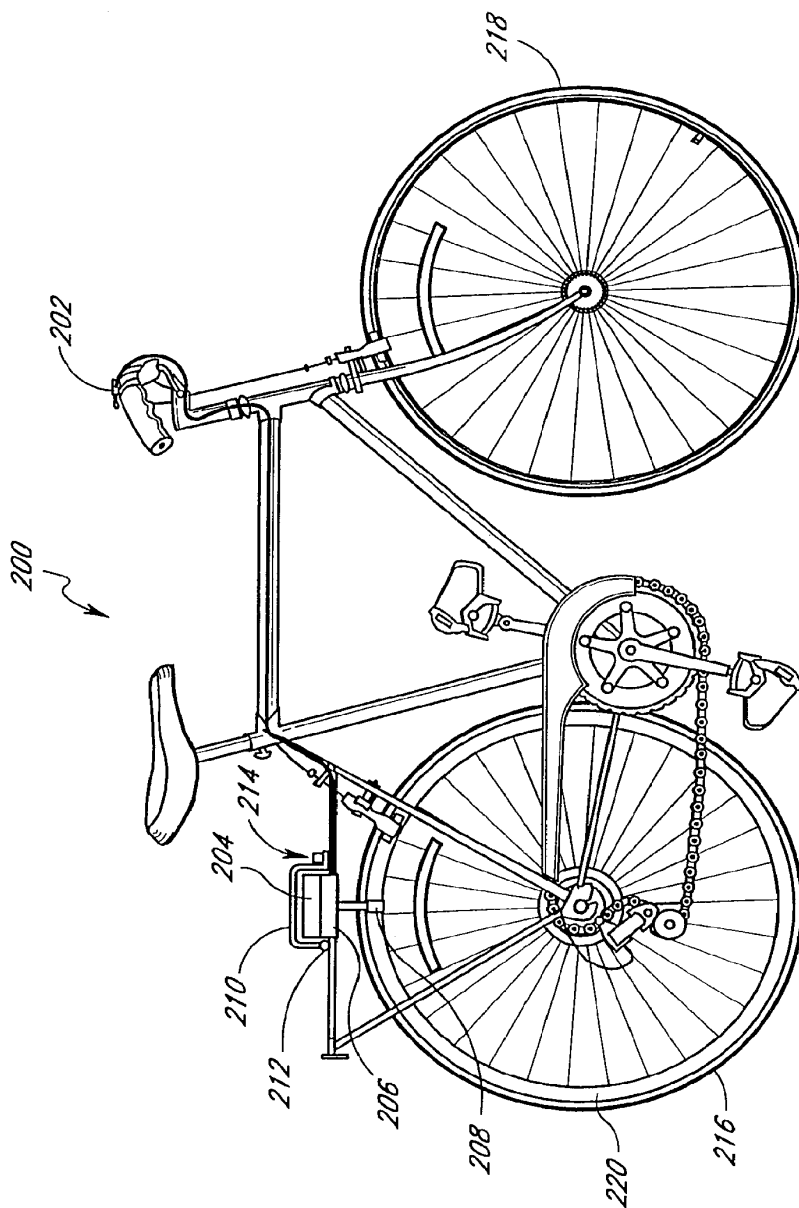
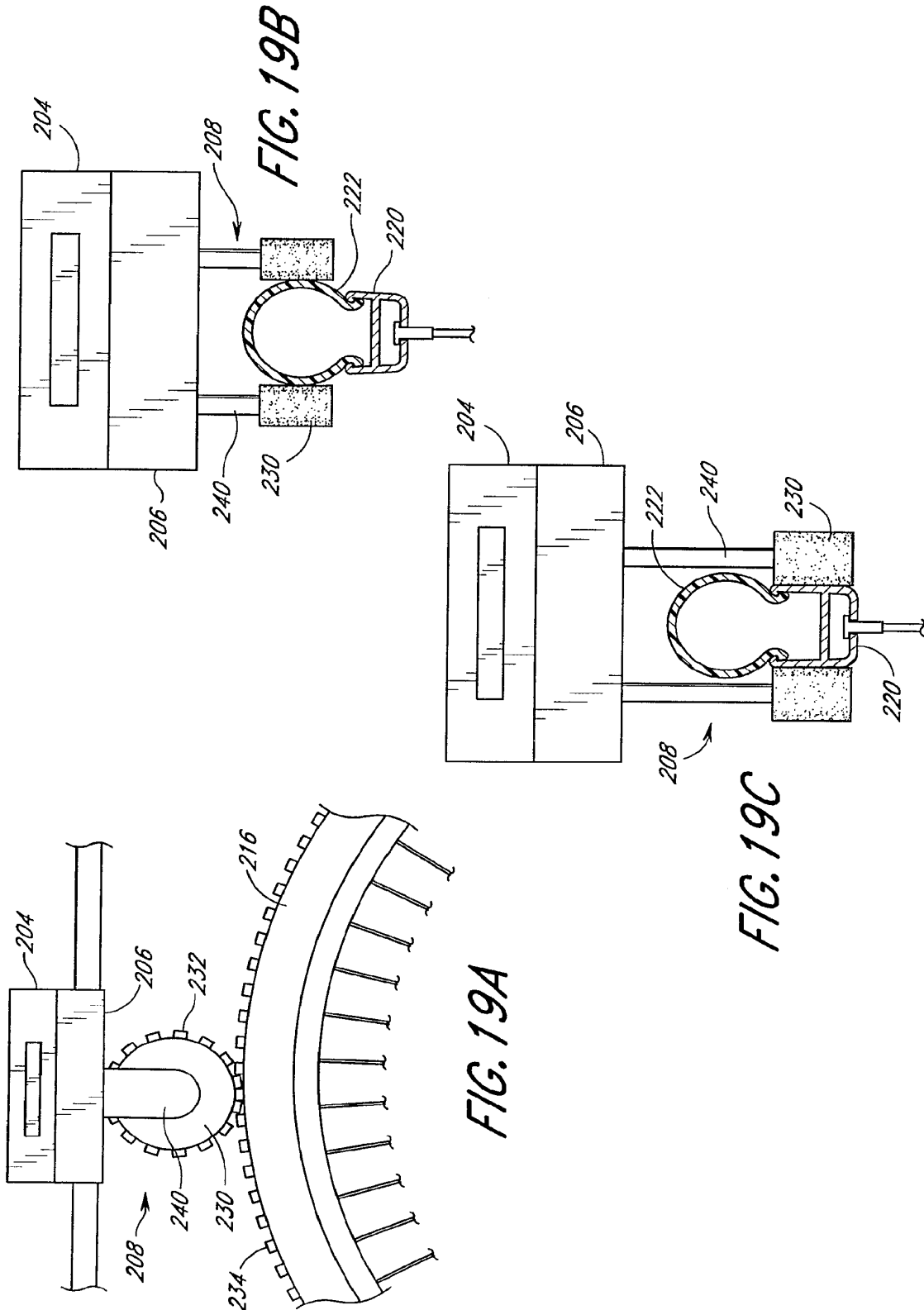


FIG. 18



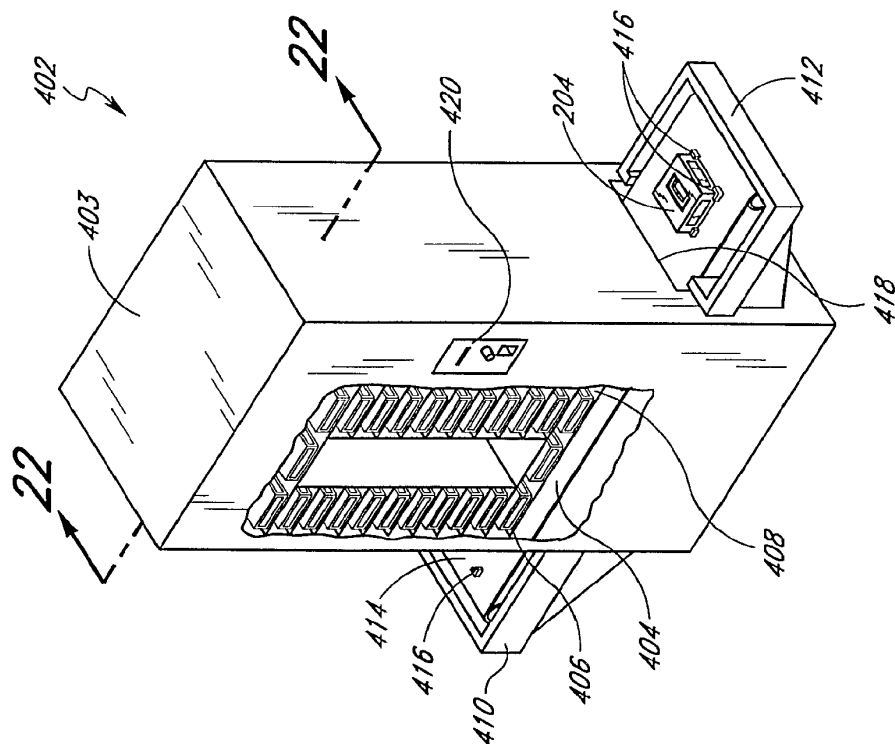


FIG. 21

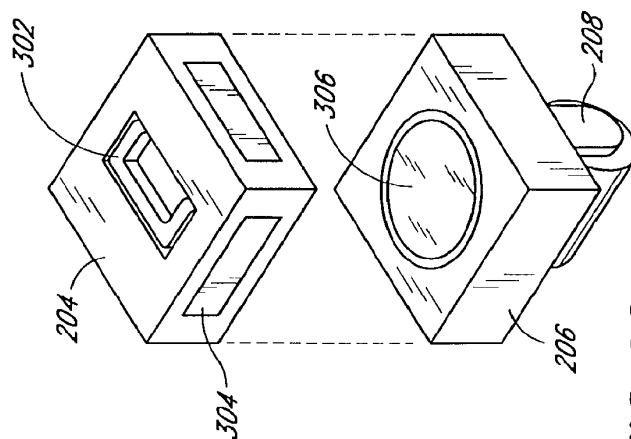
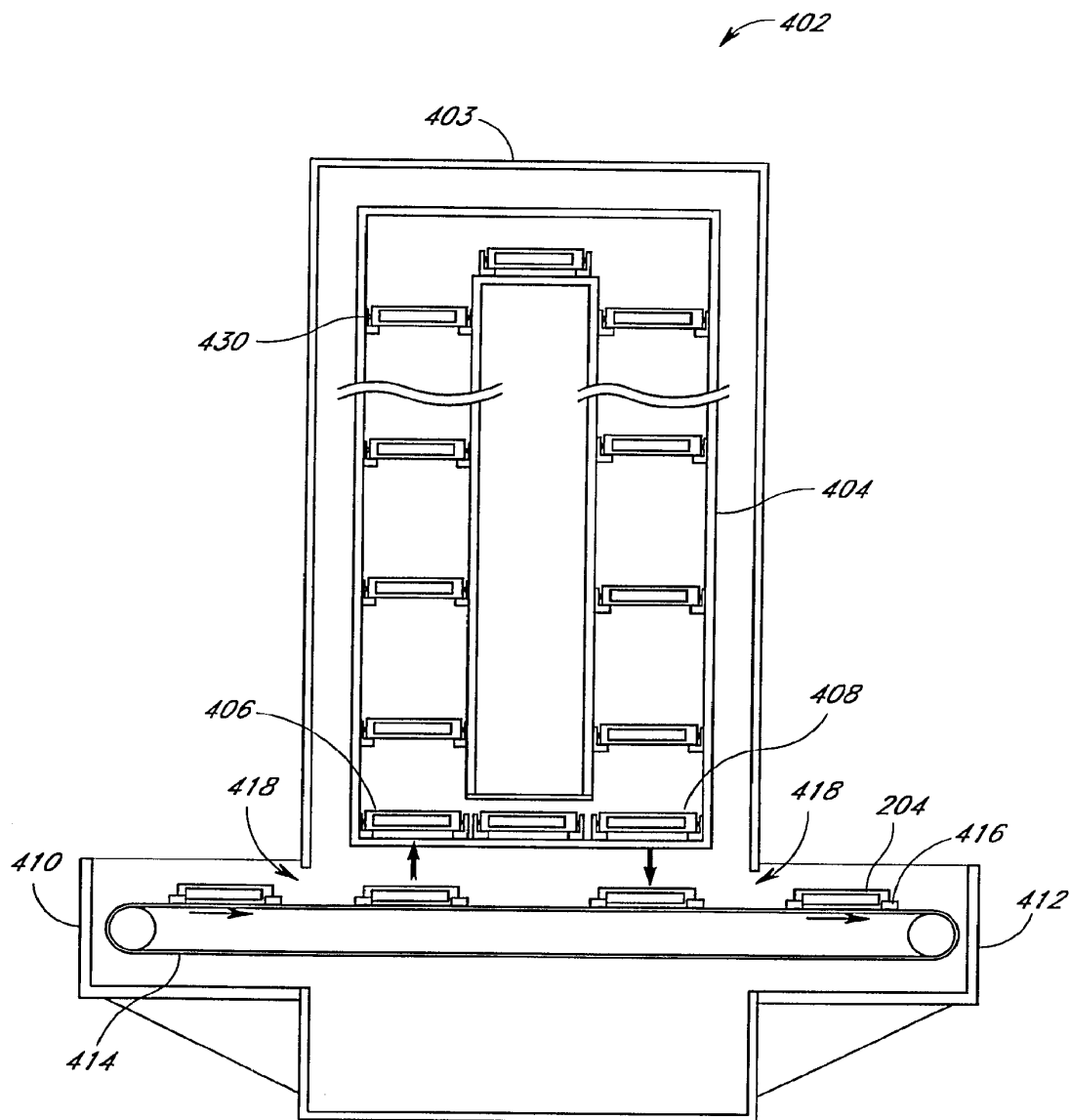


FIG. 20

*FIG. 22*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/20691**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :B65G 67/00

US CL :Please See Extra Sheet.

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)

U.S. : Please See Extra Sheet.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,983,903 A (BAE et al) 08 January 1991, see entire document.	1-42
Y	US 4,342,533 A (HANE) 03 August 1982, see entire document.	1-42
Y	US 4,896,024 A (MORELLO et al) 23 January 1990, see entire document.	1-42
A	US 4,334,819 A (HAMMERSLAG) 15 June 1982, see entire document.	
A	US 4,450,400 A (GWYN) 22 May 1984, see entire document.	
A	US 3,838,745 A (KAPPEI) 01 October 1974, see entire document.	

☒ 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 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 06 MARCH 1998	Date of mailing of the international search report 17 APR 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>Frank E. Werner</i> Frank E. Werner Telephone No. (703) 308-1140

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/20691

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 93,796 A (HASHIMOTO) 04 April 1990, see entire document.	

Form PCT/ISA/210 (continuation of second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/20691

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B. FIELDS SEARCHED

Minimum documentation searched

Classification System: U.S.

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(54) Title: ELECTRIC VEHICLE NETWORK

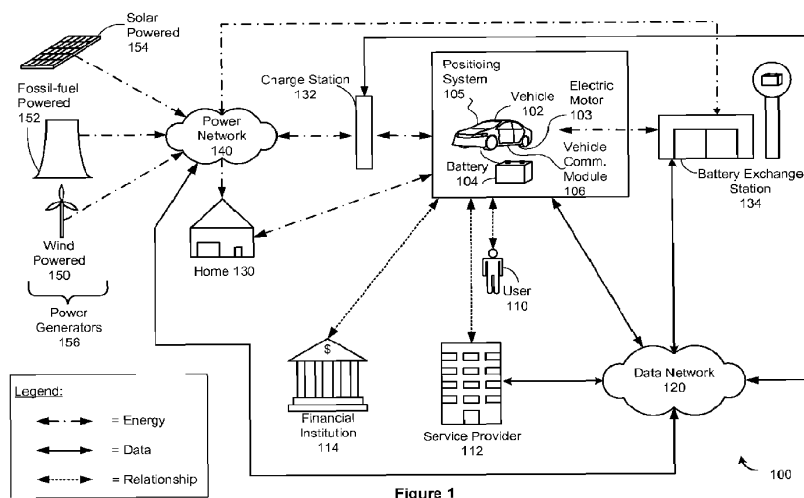


Figure 1

(57) Abstract: An electric vehicle that includes an electric motor that drives one or more wheels of the vehicle and is powered by a battery. The electric vehicle determines a status of a battery of the vehicle and a geographic location of the vehicle. The electric vehicle then identifies at least one battery service station that the vehicle can reach based on the charge status of the battery of the vehicle and the geographic location of the vehicle. The electric vehicle displays the at least one battery service station to a user of the vehicle.

ELECTRIC VEHICLE NETWORK

TECHNICAL FIELD

[0001] The disclosed embodiments relate generally to electric vehicles. In particular, the disclosed embodiments relate to an electric vehicle network and the relationships between a vehicle's user, a service provider, a power provider, and/or a financial institution.

BACKGROUND

[0002] The vehicle (*e.g.*, cars, trucks, planes, boats, *etc.*) is an integral part of the modern economy. Unfortunately, fossil fuels, like oil, used to power automobiles have numerous drawbacks including: a dependence on limited foreign sources for these fossil fuels, pollution, and climate change. One solution to these problems is to increase the fuel economy of automobiles. Recently, gasoline-electric hybrid vehicles have been introduced, which have fuel economies that are substantially higher than the fuel economy of their traditional non-hybrid counterparts. However, hybrid vehicles do not eliminate the need for fossil fuels.

[0003] Another solution to these problems is to use clean engine technologies such as engines powered by fuel cells or batteries. However, many of these clean engine technologies are not yet practical. For example, fuel cell vehicle are still in the development stage and are expensive. Similarly, battery technology has not advanced to the point where batteries can power electric vehicles for long distances. Batteries are costly and may add as much as 40% to the cost of a vehicle. Furthermore, batteries can take many hours to recharge.

[0004] Accordingly, it would be highly desirable to provide a vehicle that addresses the above described drawbacks.

SUMMARY

[0005] In order to overcome the above described drawbacks, some embodiments provide an electric vehicle that includes a battery that can be quickly exchanged. In doing so, a spent (or partially spent) battery can be exchanged for a charged battery. Thus, the long battery recharge time is no longer required by a user of the electric vehicle who is traveling

long distances. Furthermore, the cost of the electric vehicle can be substantially reduced because the battery of the electric vehicle is no longer an integral part of the vehicle. Thus, the battery can be owned by a party other than the user of the vehicle. For example, a financial institution or a service provider may own the battery and charge the user based on the battery services (*e.g.*, charging the battery, exchanging the battery, *etc.*) that are provided. Finally, since the electric vehicle is powered by a battery, the dependence on foreign sources of fossil fuels can be eliminated. Furthermore, the energy required to charge the battery can be generated by renewable and/or clean resources (*e.g.*, solar power, wind power, hydroelectric power, *etc.*).

[0006] Some embodiments provide a network of battery service stations that can exchange and/or charge batteries of a vehicle. The term “battery service station” is used herein to refer to battery exchange stations, which exchange spent (or partially spent) batteries of the vehicle for charged batteries, and/or charge stations, which provide energy to charge the battery of the vehicle. Furthermore, the term “charge spot” can refer to a “charge station.”

[0007] Some embodiments provide a method, a computer readable storage medium, and a system for providing information about battery service stations to vehicles. The vehicle includes an electric motor that drives one or more wheels of the vehicle, wherein the electric motor receives energy from the battery. In these embodiments, a system including hardware and/or software (*e.g.*, a vehicle operating system) provides an interface between the user and a service provider and between the vehicle and the vehicle-area network. In some embodiments, the vehicle operating system is integrated with the vehicle controller-area network (CAN) and multimedia head unit. The vehicle operating system may provide energy management, navigation, charge management, support service and other media and content services and can integrate network services within the vehicle sending information between the vehicle and the network, multimedia components, and other services. The vehicle operating system can determine a status of a battery of the vehicle. The vehicle operating system then determines a geographic location of the vehicle. The vehicle operating system displays the geographic location of the vehicle relative to battery service stations on a map in the user interface of a positioning system of the vehicle. In some embodiments, the vehicle operating system then identifies the battery service stations that the vehicle can reach based on the status of the battery of the vehicle and the geographic location of the vehicle and displays these battery service stations on the map.

[0008] Some embodiments provide a method, a computer readable storage medium, and a system for providing information about battery service stations to vehicles. A service provider receives a status of a battery of the vehicle and a geographic location of the vehicle from a vehicle over a data network. Note that a service provider is also referred to as a
5 “service control center.” The vehicle includes an electric motor that drives one or more wheels of the vehicle, wherein the electric motor receives energy from the battery. The service provider then determines from the status of the battery that the battery needs to be recharged. The service provider determines battery service stations based at least in part on the status of the battery and the geographic location of the vehicle. The service provider then
10 transmits information about the battery service stations to the vehicle over the data network.

[0009] In some embodiments, the information about the battery service stations is displayed on a map in a user interface of a positioning system of the vehicle.

[0010] In some embodiments, determining from the status of the battery that the battery needs to be recharged includes determining whether a charge level of the battery is
15 below a specified threshold.

[0011] In some embodiments, the battery service stations are selected from the group consisting of: charge stations that recharge the one or more batteries of the vehicle; battery exchange stations that replace a spent battery of the vehicle with a charged battery; and any combination of the aforementioned battery service stations.

[0012] In some embodiments, the battery is not owned by the user of the vehicle. In these embodiments, the user of the vehicle is selected from the group consisting of: a user that has legal title to the vehicle; and a user that has legal possession of the vehicle as part of a financing agreement for the vehicle.

[0013] In some embodiments, prior to receiving the status of the battery of the vehicle and the geographic location of the vehicle from the vehicle over the data network, the service
25 provider requests the status of the battery of the vehicle from the vehicle over the data network and requests the geographic location of the vehicle from the vehicle over the data network.

[0014] In some embodiments, the service provider periodically transmits information
30 about battery service stations to the vehicle over the data network.

[0015] In some embodiments, the service provider receives a selection of a battery service station from the user of the vehicle over the data network and reserves time at the battery service station for the vehicle.

5 [0016] In some embodiments, determining battery service stations based at least in part on the status of the battery and the geographic location of the vehicle includes: determining a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle and selecting the battery service stations within the maximum distance from the geographic location of the vehicle.

10 [0017] In some embodiments, the information of a respective battery service station is selected from the group consisting of: a number of charge stations of the respective battery service station that are occupied, a number of charge stations of the respective battery service station that are free, a number of battery exchange bays of the respective battery service station that are occupied, a number of battery exchange bays of the respective battery service station that are free, a location of the battery service station, and any combination of the
15 aforementioned statuses.

[0018] Some embodiments provide a method, a computer readable storage medium, and a system for providing information about battery service stations to vehicles. A vehicle determines a status of a battery of the vehicle and a geographic location of the vehicle. The vehicle includes an electric motor that drives one or more wheels of the vehicle, wherein the
20 electric motor receives energy from the battery. The vehicle then determines from the status of the battery that the battery needs to be recharged. The vehicle determines battery service stations based at least in part on the status of the battery and the geographic location of the vehicle. The vehicle then obtains information about the battery service stations at least in part from a service provider over a data network.

25 [0019] In some embodiments, the vehicle displays the information about the battery service stations on a map in a user interface of a positioning system of the vehicle.

[0020] In some embodiments, the vehicle determines from the status of the battery that the battery needs to be recharged includes determining whether a charge level of the battery is below a specified threshold.

30 [0021] In some embodiments, the battery service stations are selected from the group consisting of: charge stations that recharge the one or more batteries of the vehicle, battery

exchange stations that replace a spent battery of the vehicle with a charged battery, and any combination of the aforementioned battery service stations.

5 [0022] In some embodiments, the battery is not owned by the user of the vehicle. In these embodiments, the user of the vehicle is selected from the group consisting of: a user that has legal title to the vehicle, and a user that has legal possession of the vehicle as part of a financing agreement for the vehicle.

[0023] In some embodiments, the vehicle obtains information about the battery service stations also includes obtaining information about the battery service stations from a positioning system of the vehicle.

10 [0024] In some embodiments, the vehicle periodically receives information about battery service stations from the service provider over the data network.

[0025] In some embodiments, the vehicle receives a selection of a battery service station from a user of the vehicle and transmits a request to the service provider to reserve time at the battery service station for the vehicle.

15 [0026] In some embodiments, determining battery service stations based at least in part on the status of the battery and the geographic location of the vehicle includes: determining a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle; and selecting the battery service stations within the maximum distance from the geographic location of the vehicle.

20 [0027] In some embodiments, the information of a respective battery service station is selected from the group consisting of: a number of charge stations of the respective battery service station that are occupied, a number of charge stations of the respective battery service station that are free, a number of battery exchange bays of the respective battery service station that are occupied, a number of battery exchange bays of the respective battery service station that are free, a location of the battery service station, and any combination of the
25 aforementioned statuses.

[0028] Some embodiments provide a method, a computer readable storage medium, and a system for monitoring battery service stations in a vehicle-area network. A service provider periodically requests a status of a battery service station over a data network. The
30 service provider receives the status of the battery service station over the data network and

updates a database that includes information about battery service stations within the vehicle-area network with the status of the battery service station.

[0029] In some embodiments, the battery service station is selected from the group consisting of: a charge station that recharges the one or more batteries of the vehicle, a
5 battery exchange station that replaces a spent battery of the vehicle with a charged battery, and any combination of the aforementioned battery service stations.

[0030] In some embodiments, the status of the battery service station is selected from the group consisting of: a number of charge stations of the battery service station that are occupied, a number of charge stations of the battery service station that are free, a number of
10 battery exchange bays of the battery service station that are occupied, a number of battery exchange bays of the battery service station that are free, a location of the battery service station, and any combination of the aforementioned statuses.

[0031] In some embodiments, the service provider distributes at least a portion of the database that includes information about battery service stations to a vehicle in the vehicle-
15 area network over the data network.

[0032] In some embodiments, the at least a portion of the database that includes information about battery service stations is selected based on selection criteria selected from the group consisting of: a geographic location of the vehicle, a charge level of a battery of the vehicle, and any combination of the aforementioned selection criteria.

[0033] In some embodiments, periodically requesting the status of the battery service station includes periodically transmitting a query to the battery service station over the data network, wherein the query requests the status of the battery service station.

[0034] Some embodiments provide a method, a computer readable storage medium, and a system for reporting a status of a battery service station in a vehicle-area network. A
25 battery service station periodically receives a request for a status of the battery service station from a service provider over a data network. The battery service station determines the status of the battery service station and sends the status of the battery service station to the service provider over the data network.

[0035] Some embodiments provide a method, a computer readable storage medium, and a system for providing a vehicle with energy at a battery service station. A battery
30 service station receives a status of a user's account of the vehicle from a service provider over

a data network. The battery service station then determines whether the status of the account indicates that the user's account is in good standing. If the status of the account indicates that the user's account is in good standing, the battery service station provides the vehicle with energy at the battery service station. The battery service station then bills the user's account
5 for the energy provided at the battery service station.

[0036] In some embodiments, prior to receiving the status of the user's account of the vehicle, the battery service station queries the service provider to determine the account status for the user of the vehicle.

[0037] In some embodiments, if the status of the account indicates that the user's
10 account is not in good standing, the battery service station provides options to the user to place the account in good standing.

[0038] In some embodiments, the options are selected from the group consisting of: subscribing to a monthly service plan, subscribing to a yearly service plan, subscribing to a mileage-based service plan, subscribing to an energy-consumption-based service plan,
15 subscribing to a pay-per-use plan, and any combination of the aforementioned plans.

[0039] In some embodiments, the battery service station is selected from the group consisting of: a charge station that recharges the one or more batteries of the vehicle, a battery exchange station that replaces a spent battery of the vehicle with a charged battery, and any combination of the aforementioned battery service stations.

[0040] In some embodiments, determining whether the status of the account indicates that the user's account is in good standing includes one selected from the group consisting of: determining whether a subscription associated with the account is active, determining whether a funding source associated with the account is valid, determining whether a fee for a subscription associated with the account have been paid, and any combination of the
25 aforementioned operations.

[0041] In some embodiments, providing the vehicle with energy at the battery service station includes one selected from the group consisting of: providing the vehicle with energy to recharge a battery of the vehicle, and exchanging a spent battery of the vehicle with a charged battery.

[0042] Some embodiments provide a method, a computer readable storage medium, and a system for providing account information associated with a vehicle to facilitate

providing the vehicle with energy at a battery service station. A service provider receives a query to determine a status of an account of a user of a vehicle from a battery service station over a data network. The service provider then determines the status of the account of the user and sends the status of the account of the user to the battery service station over the data network.

[0043] Some embodiments provide a method, a computer readable storage medium, and a system for providing access to battery service stations in a vehicle-area network. A plurality of subscription options for access to battery service stations in a vehicle-area network is provided to a user of a vehicle. The vehicle includes an electric motor that drives one or more wheels of the vehicle, wherein the electric motor receives energy from a battery of the vehicle. Furthermore, the battery is not owned by the user of the vehicle. A selection of a subscription option is received from the user. A contract is entered with the user under terms of the subscription option selected by the user. Information about battery service stations in the vehicle-area network is provided to the user of the vehicle.

[0044] In some embodiments, the plurality of subscription options include: subscribing to a monthly service plan, subscribing to a yearly service plan, subscribing to a mileage-based service plan, subscribing to an energy-consumption-based service plan, subscribing to a pay-per-use plan, and any combination of the aforementioned plans.

[0045] In some embodiments, access to a battery service station is provided to the user of the vehicle.

[0046] In some embodiments, the user is billed for the access to the battery service station based on the contract and services provided at the battery service station.

[0047] In some embodiments, the battery service stations are selected from the group consisting of: charge stations that recharge the one or more batteries of the vehicle, battery exchange stations that replace a spent battery of the vehicle with a charged battery, and any combination of the aforementioned battery service stations.

[0048] In some embodiments, the user of the vehicle is selected from the group consisting of: a user that has legal title to the vehicle, and a user that has legal possession of the vehicle as part of a financing agreement for the vehicle.

[0049] Some embodiments provide a method, a computer readable storage medium, and a system for distributing energy in a power network. Energy from one or more power

plants is generated. The energy is distributed through a power network. The energy is stored in batteries of vehicles. A respective vehicle includes a respective electric motor that drives one or more wheels of the respective vehicle, wherein the respective electric motor receives energy from a respective battery of the vehicle. The energy stored in the batteries of the vehicles is extracted when energy production from the one or more power plants is below the demand placed on the power network. The energy extracted from the batteries of the vehicles is distributed to the power network.

[0050] In some embodiments, the one or more power plants is selected from the group consisting of: coal power plants, solar power plants, biofuel power plants, nuclear power plants, wind power plants, wave power plants, geothermal power plants, natural gas power plants, fossil fuel power plants, hydroelectric power plants, and any combination of the aforementioned power plants.

[0051] In some embodiments, users of vehicles are compensated for the energy extracted from the batteries of the vehicles.

[0052] In some embodiments, users of vehicles are charged for the energy stored in the batteries of the vehicles.

[0053] Some embodiments provide a vehicle that includes one or more drive wheels, an electric motor, and a battery. The electric motor is coupled to one or more drive wheels of the vehicle, wherein the electric motor is configured to drive the one or more drive wheels. The battery is electrically and mechanically attached to the vehicle, wherein the battery is configured to provide energy to drive the electric motor. In these embodiments, the battery is not owned by the user of the vehicle. Furthermore, the vehicle is owned by a first party and the battery is owned by a second party.

[0054] In some embodiments, the user of the vehicle is selected from the group consisting of: a user that has legal title to the vehicle, and a user that has legal possession of the vehicle as part of a financing agreement for the vehicle.

[0055] In some embodiments, the first party is selected from the group consisting of: the user of the vehicle, a financial institution, and a service provider.

[0056] In some embodiments, the second party is selected from the group consisting of: a financial institution and a service provider.

[0057] In some embodiments, the vehicle includes a communications module configured to communicate with a third party.

[0058] In some embodiments, the third party provides information about battery service stations to the vehicle.

- 5 [0059] In some embodiments, the owner of the communication module is selected from the group consisting of: a financial institution a service provider.

BRIEF DESCRIPTION OF THE DRAWINGS

[0060] Figure 1 illustrates an electric vehicle network, according to some embodiments.

- 10 [0061] Figure 2 is a flow diagram of a process for providing information about battery service stations to a user of a vehicle, according to some embodiments.

[0062] Figure 3 is a flow diagram of another process for providing information about battery service stations to a user of a vehicle, according to some embodiments.

- 15 [0063] Figure 4 is a flow diagram of another process for providing information about battery service stations to a user of a vehicle, according to some embodiments.

[0064] Figure 5 is a flow diagram of a process for monitoring battery service stations in a vehicle-area network, according to some embodiments.

[0065] Figure 6 is a flow diagram of a process for providing a vehicle with energy at a battery exchange station, according to some embodiments.

- 20 [0066] Figure 7 is a flow diagram of a process for providing a vehicle with energy at a charge station, according to some embodiments.

[0067] Figure 8 is a flow diagram of a process for providing access to battery service stations in a vehicle-area network, according to some embodiments.

- 25 [0068] Figure 9 is a flow diagram of a process for distributing energy in a power network, according to some embodiments.

[0069] Figure 10 is a flow diagram of a process for establishing a relationship between a user of a vehicle and a service provider, according to some embodiments.

[0070] Figure 11 is a flow diagram of a process for establishing a relationship between a user of a vehicle, a service provider, and a financial institution, according to some embodiments.

5 [0071] Figure 12 is a flow diagram of another process for establishing a relationship between a user of a vehicle and a service provider, according to some embodiments.

[0072] Figure 13 is a flow diagram of another process for establishing a relationship between a user of a vehicle, a service provider, and a financial institution, according to some embodiments.

10 [0073] Figure 14 is a flow diagram of another process for establishing a relationship between a user of a vehicle, a service provider, and a financial institution, according to some embodiments.

[0074] Figure 15 is a flow diagram of a process for establishing a relationship between a user of a vehicle and a financial institution, according to some embodiments.

15 [0075] Figure 16 is a flow diagram of another process for establishing a relationship between a user of a vehicle and a financial institution, according to some embodiments.

[0076] Figure 17 is a block diagram illustrating a vehicle, according to some embodiments.

[0077] Figure 18 is a block diagram illustrating a service provider, according to some embodiments.

20 [0078] Figure 19 is a block diagram illustrating a battery exchange station, according to some embodiments.

[0079] Figure 20 is a block diagram illustrating a charge station, according to some embodiments.

25 [0080] Figure 21 illustrates an exemplary user interface of a positioning system of a vehicle, according to some embodiments.

[0001] Like reference numerals refer to corresponding parts throughout the drawings.

DESCRIPTION OF EMBODIMENTS**Electric Vehicle Network**

[0081] Figure 1 illustrates an electric vehicle network 100, according to some embodiments. The electric vehicle network 100 includes a vehicle 102 and a battery 104. In some embodiments, the battery 104 includes any device capable of storing electric energy such as batteries (*e.g.*, lithium ion batteries, lead-acid batteries, nickel-metal hydride batteries, *etc.*), capacitors, reaction cells (*e.g.*, Zn-air cell), *etc.*

[0082] In some embodiments, the vehicle 102 includes an electric motor 103 that drives one or more wheels of the vehicle. In these embodiments, the electric motor 103 receives energy from a battery (*e.g.*, the battery 104) that is electrically and mechanically attached to the vehicle (shown separate from the vehicle for the ease of explanation). The battery 104 of the vehicle 102 may be charged at a home 130 of a user 110. Alternatively, the battery 104 of the vehicle 102 may be charged at one or more charge stations 132. For example, a charge station 132 may be located in a shopping center parking lot. Furthermore, in some embodiments, the battery 104 of the vehicle 102 can be exchanged for a charged battery at one or more battery exchange stations 134. Thus, if a user is traveling a distance beyond the range of a single charge of the battery of the vehicle, the spent (or partially spent) battery can be exchanged for a charged battery so that the user can continue with his/her travels without waiting for the battery to be recharged. The term “battery service station” is used herein to refer to battery exchange stations, which exchange spent (or partially spent) batteries of the vehicle for charged batteries, and/or charge stations, which provide energy to charge the battery of the vehicle. Furthermore, the term “charge spot” can refer to a “charge station.”

[0083] In some embodiments, the vehicle 102 includes a communication module 106, including hardware and software, that is used to communicate with a service provider 112 of a vehicle-area network. Note that the term “vehicle-area network” is used herein to refer to a network of vehicles, batteries, battery exchange stations, charge stations, and a data network. In some embodiments, the vehicle communication module 106 is owned by the user 110 of the vehicle 102, a financial institution 114, and/or the service provider 112.

[0084] In some embodiments, the vehicle 102 includes a positioning system 105. For example, the positioning system can include: a satellite positioning system, a radio tower positioning system, a Wi-Fi positioning system, and any combination of the aforementioned

positioning systems. Furthermore, the positioning system 105 may include a navigation system that generates routes and/or guidance between a geographic location and a destination.

[0085] In some embodiments, the battery is not owned by the user 110 of the vehicle 102. In these embodiments, the user 110 of the vehicle 102 is a user that has legal title to the vehicle or a user that has legal possession of the vehicle, such as when in possession as part of a financing agreement for the vehicle (*e.g.*, a loan or a lease).

[0086] Figure 17 is a block diagram illustrating a vehicle 1700 in accordance with some embodiments. For example, the vehicle 1700 can be the vehicle 102 in Figure 1. The vehicle 1700 typically includes one or more processing units (CPU's) 1702, one or more network or other communications interfaces 1704 (*e.g.*, antennas, I/O interfaces, *etc.*), memory 1710, a battery control unit that controls the charging of a battery of the vehicle and/or the exchanging of a partially spent battery for a charged battery, a motor control unit 1762 that manages the electric motor 103, a positioning system 1764 (*e.g.*, the positioning system 105 in Figure 1), a battery charge sensor that determines the status of the battery 104 as described herein, and one or more communication buses 1709 for interconnecting these components. The communication buses 1709 may include circuitry (sometimes called a chipset) that interconnects and controls communications between system components. The vehicle 1700 optionally may include a user interface 1705 comprising a display device 1706 and input devices 1708 (*e.g.*, a mouse, a keyboard, a touchpad, a touch screen, *etc.*). Memory 1710 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM or other random access solid state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid state storage devices. Memory 1710 may optionally include one or more storage devices remotely located from the CPU(s) 1702. Memory 1710, or alternately the non-volatile memory device(s) within memory 1710, comprises a computer readable storage medium. In some embodiments, memory 1710 stores the following programs, modules and data structures, or a subset thereof:

- an operating system 1712 that includes procedures for handling various basic system services and for performing hardware dependent tasks;
- a communication module 1714 (*e.g.*, the vehicle communication module 106) that is used for connecting the vehicle 1700 to other computers via the one or more

communication network interfaces 1704 (wired or wireless) and one or more communication networks, such as the Internet, other wide area networks, local area networks, metropolitan area networks, and so on;

- 5 • a user interface module 1716 that receives commands from the user via the input devices 1708 and generates user interface objects in the display device 1706;
- a positioning module 1718 that determines the position of the vehicle 1700 using a positioning system as described herein, and that includes a destination 1744 that is selected by the user of the vehicle;
- a battery status module 1720 that determines the status of a battery of a vehicle;
- 10 • a battery control module 1722 that controls the charging of a battery of the vehicle and/or the exchanging of a partially spent battery for a charged battery, wherein the battery control module includes handshaking and encryption functions that are used during communication between the vehicle 1700 and battery service stations and/or the service provider 112;
- 15 • an account module 1724 that manages account information for the user of the vehicle;
- a database module 1726 that interfaces with database in the vehicle 1700;
- battery status database 1740 that includes present and/or historical information about the status of the battery of the vehicle;
- 20 • a geographic location database 1742 of the vehicle that stores the present location and/or historical locations and addresses;
- a battery service station database 1746 that includes information about battery service stations; and
- account data 1748 that includes account information for the user of the vehicle.

[0087] Note that the positioning system 105 (and the positioning system 1764), the vehicle communication module 106, the user interface module 1716, the positioning module 1718, the battery status module 1720, the battery control module 1722, the account module 1724, the database module 1726, the battery status database 1740, the geographic location database 1742, and the battery service station database 1746 can be referred to as the “vehicle operating system.”

[0088] Each of the above identified elements may be stored in one or more of the previously mentioned memory devices, and corresponds to a set of instructions for performing a function described above. The set of instructions can be executed by one or more processors (*e.g.*, the CPUs 1702). The above identified modules or programs (*i.e.*, sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory 1710 may store a subset of the modules and data structures identified above. Furthermore, memory 1710 may store additional modules and data structures not described above.

10 [0089] Note that although a single vehicle is discussed herein, the methods and systems can be applied to a plurality of vehicles.

[0090] In some embodiments, the service provider 112 provides information regarding battery service stations via the vehicle communication module 106. The service provider 112 also provides access to the battery service stations to the vehicle 102. The service provider 112 obtains information about the vehicles and/or battery service stations by sending queries through a data network 120 to the vehicle 102, the charge station 132, and/or the battery exchange station 134. For example, the service provider 112 can query the vehicle 102 to determine a geographic location of the vehicle and a status of a battery of the vehicle. Similarly, the service provider 112 can query the charge station 132 (and/or the battery exchange station 134) to determine the status of the charge station 132 (and/or the battery exchange station 134). The status of a battery service station can include: a number of charge stations of the respective battery service station that are occupied, a number of charge stations of the respective battery service station that are free, an estimated time until charge completion for respective vehicles charging at respective charge stations, a number of battery exchange bays of the respective battery service station that are occupied, a number of battery exchange bays of the respective battery service station that are free, a number of charged batteries available at the respective battery service station, a number of spent batteries at the respective battery service station, types of batteries available at the respective battery service station, an estimated time until a respective spent battery is recharged, an estimated time until a respective exchange bay will become free, a location of the battery service station, and any combination of the aforementioned statuses. The service provider 112 can also send information and/or commands through the data network to the vehicle 102,

the charge station 132, and/or the battery exchange station 134. For example, the service provider 112 can send information about a status of an account of a user, the locations of battery service stations, and/or a status of the battery service stations.

[0091] Figure 18 is a block diagram illustrating a service provider 1800 in accordance with some embodiments. For example, the service provider 1800 can be the service provider 112 in Figure 1. The service provider 1800 can be a computer system of a service provider. The service provider 1800 typically includes one or more processing units (CPU's) 1802, one or more network or other communications interfaces 1804 (*e.g.*, antennas, I/O interfaces, *etc.*), memory 1810, a positioning system 1860 that tracks the position of vehicles and battery service stations using a positioning system, and one or more communication buses 1809 for interconnecting these components. The communication buses 1809 are similar to the communication buses 1709 described above. The service provider 1800 optionally may include a user interface 1805 comprising a display device 1806 and input devices 1808 (*e.g.*, a mouse, a keyboard, a touchpad, a touch screen, *etc.*). Memory 1810 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM or other random access solid state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid state storage devices. Memory 1810 may optionally include one or more storage devices remotely located from the CPU(s) 1802. Memory 1810, or alternately the non-volatile memory device(s) within memory 1810, comprises a computer readable storage medium. In some embodiments, memory 1810 stores the following programs, modules and data structures, or a subset thereof:

- an operating system 1812 that includes procedures for handling various basic system services and for performing hardware dependent tasks;
- a communication module 1814 that is used for connecting the service provider 1800 to other computing devices via the one or more communication network interfaces 1804 (wired or wireless) and one or more communication networks, such as the Internet, other wide area networks, local area networks, metropolitan area networks, and so on;
- a user interface module 1816 that receives commands from the user via the input devices 1808 and generates user interface objects in the display device 1806;

- a positioning module 1818 that tracks the position of vehicles and battery service stations using a positioning system as described herein;
- a battery status module 1820 that determines the status of a battery of a vehicle;
- a battery service station module 1822 that tracks the status of battery service stations;
- 5 • an account module 1824 that manages account information for the user of the vehicle;
- a database module 1826 that interfaces with database in the service provider 1800;
- a vehicle location database 1840 that includes the present and/or historical locations of vehicles in the vehicle-area network;
- a battery status database 1842 that includes the status of batteries in the vehicle-area network;
- 10 • a battery service station database 1844 that includes the status of battery service stations in the vehicle-area network; and
- account data 1846 that includes account information for the user of the vehicle.

[0092] Each of the above identified elements may be stored in one or more of the previously mentioned memory devices, and corresponds to a set of instructions for performing a function described above. The set of instructions can be executed by one or more processors (*e.g.*, the CPUs 1802). The above identified modules or programs (*i.e.*, sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-

20 arranged in various embodiments. In some embodiments, memory 1810 may store a subset of the modules and data structures identified above. Furthermore, memory 1810 may store additional modules and data structures not described above.

[0093] In some embodiments, the battery exchange station 134 exchanges a spent (or a partially spent) battery (*e.g.*, the battery 104) of a vehicle (*e.g.*, the vehicle 102) with a charged battery. In these embodiments, instead of charging the battery of the vehicle, the

25 battery is swapped-out for a fully charged battery. After extracting the battery from the vehicle, the battery exchange station 134 may recharge the partially spent battery. Thus, just as a gasoline station can quickly refill the gas tank of a gasoline-powered vehicle, the battery exchange station 134 can quickly swap-out a depleted or partially spent battery of the vehicle

30 for a charged battery.

[0094] Figure 19 is a block diagram illustrating a battery exchange station 1900 in accordance with some embodiments. For example, the battery exchange station 1900 can be the battery exchange station 134 in Figure 1. The battery exchange station 1900 can be a computer system of a battery exchange station. The battery exchange station 1900 typically includes one or more processing units (CPU's) 1902, one or more network or other communications interfaces 1904 (*e.g.*, antennas, I/O interfaces, *etc.*), memory 1910, a battery exchange unit 1960 that exchanges batteries of vehicles, a battery control unit 1962 that manages the charging of spent batteries that are extracted from vehicle, sensors 1964 that determine the status of the battery exchange station 1900, a positioning module 1966 that determines and/or reports the position of the battery exchange station 1900, and one or more communication buses 1909 for interconnecting these components. The communication buses 1909 are similar to the communication buses 1709 described above. The battery exchange station 1900 optionally may include a user interface 1905 comprising a display device 1906 and input devices 1908 (*e.g.*, a mouse, a keyboard, a touchpad, a touch screen, *etc.*). Memory 1910 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM or other random access solid state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid state storage devices. Memory 1910 may optionally include one or more storage devices remotely located from the CPU(s) 1902. Memory 1910, or alternately the non-volatile memory device(s) within memory 1910, comprises a computer readable storage medium. In some embodiments, memory 1910 stores the following programs, modules and data structures, or a subset thereof:

- an operating system 1912 that includes procedures for handling various basic system services and for performing hardware dependent tasks;
- a communication module 1914 that is used for connecting the battery exchange station 1900 to other computers via the one or more communication network interfaces 1904 (wired or wireless) and one or more communication networks, such as the Internet, other wide area networks, local area networks, metropolitan area networks, and so on;
- a user interface module 1916 that receives commands from the user via the input devices 1908 and generates user interface objects in the display device 1906;

- a positioning module 1918 that determines (*e.g.*, via a positioning system as described herein, via user input, *etc.*) and/or reports the position of a battery exchange station using a positioning system as described herein;
- a battery status module 1920 that determines the status of batteries located at the battery exchange station;
- a battery exchange module 1922 that determines and reports the status of the battery exchange station 1900 and performs operations related to exchange batteries of vehicles as described herein;
- an account module 1924 that manages account information of users of vehicles;
- a database module 1926 that interfaces with database in the battery exchange station 1900;
- a battery status database 1940 that includes the status of batteries in the battery exchange station;
- a battery exchange database 1942 that includes the status of batteries and/or battery exchange bays in the battery exchange station; and
- account data 1944 that includes account information of users of vehicles.

[0095] Each of the above identified elements may be stored in one or more of the previously mentioned memory devices, and corresponds to a set of instructions for performing a function described above. The set of instructions can be executed by one or more processors (*e.g.*, the CPUs 1902). The above identified modules or programs (*i.e.*, sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory 1910 may store a subset of the modules and data structures identified above. Furthermore, memory 1910 may store additional modules and data structures not described above.

[0096] In some embodiments, the charge station 132 provides energy to the vehicle to charge the battery 104 of the vehicle 102. Charge stations can be placed at locations where vehicles may be parked. For example, the charge stations can be located in a parking lots and/or street parking spots. In some embodiments, a charge station can be located at a home of a user (*e.g.*, the home 130). In some embodiments, the charge station 132 may charge the

battery 104 of the vehicle 102 at different rates. For example, the charge station 132 may charge the battery 104 of the vehicle 102 using a quick-charge mode or a trickle charge mode.

[0097] Figure 20 is a block diagram illustrating a charge station 2000 in accordance with some embodiments. For example, the charge station 2000 can be the charge station 132 in Figure 1. The charge station 2000 can be a computer system of a charge station. The charge station 2000 typically includes one or more processing units (CPU's) 2002, one or more network or other communications interfaces 2004 (*e.g.*, antennas, I/O interfaces, *etc.*), memory 2010, a positioning system 2060 that determines and/or reports the position of the charge station 2000, a battery control unit 2062 that charges batteries at the charge station 2000, sensors 2064 that determine the status of the charge station 2000, and one or more communication buses 2009 for interconnecting these components. The communication buses 2009 are similar to the communication buses 1709 described above. The charge station 2000 optionally may include a user interface 2005 comprising a display device 2006 and input devices 2008 (*e.g.*, a mouse, a keyboard, a touchpad, a touch screen, *etc.*). Memory 2010 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM or other random access solid state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid state storage devices. Memory 2010 may optionally include one or more storage devices remotely located from the CPU(s) 2002. Memory 2010, or alternately the non-volatile memory device(s) within memory 2010, comprises a computer readable storage medium. In some embodiments, memory 2010 stores the following programs, modules and data structures, or a subset thereof:

- an operating system 2012 that includes procedures for handling various basic system services and for performing hardware dependent tasks;
- a communication module 2014 that is used for connecting the charge station 2000 to other computers via the one or more communication network interfaces 2004 (wired or wireless) and one or more communication networks, such as the Internet, other wide area networks, local area networks, metropolitan area networks, and so on;
- a user interface module 2016 that receives commands from the user via the input devices 2008 and generates user interface objects in the display device 2006;

- a positioning module 2018 that determines (*e.g.*, via a positioning system as described herein, via user input, *etc.*) and/or reports the position of a battery exchange station using a positioning system as described herein;
- a battery control module 2020 that determines and reports the status of the charge station 2000 and that performs operations related to charging batteries at a charge station as described herein; and
- an account module 2022 that manages account information of users of vehicles.

[0098] Each of the above identified elements may be stored in one or more of the previously mentioned memory devices, and corresponds to a set of instructions for performing a function described above. The set of instructions can be executed by one or more processors (*e.g.*, the CPUs 2002). The above identified modules or programs (*i.e.*, sets of instructions) need not be implemented as separate software programs, procedures or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory 2010 may store a subset of the modules and data structures identified above. Furthermore, memory 2010 may store additional modules and data structures not described above.

[0099] Although Figures 17-20 each show a respective computer system, Figures 17-20 are intended more as functional description of the various features which may be present in a set of computer systems than as a structural schematic of the embodiments described herein. In practice, and as recognized by those of ordinary skill in the art, items shown separately could be combined and some items could be separated. For example, some items shown separately in Figures 17-20 could be implemented on single computer systems and single items could be implemented by one or more computer systems. The actual number of computer systems used to implement a respective computer system and how features are allocated among them will vary from one implementation to another, and may depend in part on the amount of data traffic that the system must handle during peak usage periods as well as during average usage periods.

[00100] The electric vehicle network 100 shown in Figure 1 also includes the data network 120 and a power network 140.

[00101] The data network 120 may include any type of wired or wireless communication network capable of coupling together computing nodes. This includes, but is

not limited to, a local area network, a wide area network, or a combination of networks. In some embodiments, the data network 120 is a wireless data network including: a cellular network, a Wi-Fi network, a WiMAX network, an EDGE network, a GPRS network, an EV-DO network, an RTT network, a HSPA network, a UTMS network, a Flash-OFDM network, an iBurst network, and any combination of the aforementioned networks. In some
5 embodiments, the data network 120 includes the Internet.

[00102] As illustrated in Figure 1, the data network 120 is coupled to the vehicle 102, the service provider 112, the charge station 132, and the battery exchange station 134. Note that for the sake of clarity, only one vehicle, one battery, one charge station and one battery
10 exchange station is illustrated, but the electric vehicle network 100 may include any number of vehicles, batteries, charge stations, and/or battery exchange stations, *etc.* Furthermore, the electric vehicle network 100 may include zero or more charge stations and/or battery exchange stations. For example, the electric vehicle network 100 may only include charge stations. On the other hand, the electric vehicle network 100 may only include battery
15 exchange stations. In some embodiments, any of the vehicle 102, the service provider 112, the charge station 132, and/or the battery exchange station 134 includes a communication module that can be used to communicate with each other through the data network 120.

[00103] The power network 140 can include power generators 156, power transmission lines, power substations, transformers, *etc.*, which facilitate the generation and
20 transmission. The power generators 156 may include any type of energy generation plants, such as wind-powered plants 150, fossil-fuel powered plants 152, solar powered plants 154, biofuel powered plants, nuclear powered plants, wave powered plants, geothermal powered plants, natural gas powered plants, hydroelectric powered plants, and a combination of the aforementioned power plants or the like. The energy generated by the one or more power
25 generators 156 may be distributed through the power network 140 to homes 130, charge stations 132, and/or battery exchange stations 134. The power network 140 can also include batteries such as the battery 104 of the vehicle 102, batteries at battery exchange stations, and/or batteries that are not associated with vehicles. Thus, energy generated by the power generators 156 can be stored in these batteries and extracted when energy demand exceed
30 energy generation.

[00104] As illustrated in Figure 1, a number of relationships exist between the vehicle 102, the battery 104, the user 110, the service provider 112, the financial institution 114, and

the power network 140. In some embodiments, the financial institution 114 may own the vehicle 102, the battery 104, and/or a vehicle-area network. In some embodiments, the service provider 112 owns the vehicle 102, the battery 104, and/or the vehicle-area network. In some embodiments, the user 110 owns the vehicle 102, but does not own the battery 104.

5 In some embodiments, the user 110 owns both the vehicle 102 and the battery 104. In some embodiments, the user does not own either the battery 104 or the vehicle 102. In these embodiments, the user can lease/rent the vehicle from the service provider 112 and/or the financial institution 114. These relationships are described in more detail below with respect to Figures 10-16.

10 **Providing Information about Battery Service Stations**

[00105] In the methods described in Figures 2-16, the respective methods may be governed by instructions that are stored in a computer readable storage medium and that are executed by one or more processors of one or more computer systems. Each of the operations shown in Figures 2-16, respectively, may correspond to instructions stored in a computer memory or computer readable storage medium. The computer readable storage medium may include a magnetic or optical disk storage device, solid state storage devices such as Flash memory, or other non-volatile memory device or devices. The computer readable instructions stored on the computer readable storage medium are in source code, assembly language code, object code, or other instruction format that is interpreted by one or more processors.

[00106] Figure 2 is a flowchart representing a method 200 for providing information about battery service stations to a user of a vehicle, according to some embodiments. In some embodiments, the method 200 is performed at the vehicle. The method 200 begins when the battery status module 1720 of the vehicle determines (202) a status of a battery of the vehicle.

25 In some embodiments, determining the status of the battery of the vehicle includes determining a charge level of the battery, determining an age of the battery, determining the number of charge/discharge cycles of the battery, and a combination of the aforementioned operations. In some embodiments, the vehicle periodically transmits (216) the status of the battery of the vehicle to a service provider over a data network.

30 [00107] The positioning module 1718 of the vehicle then determines (204) a geographic location of the vehicle. In some embodiments, the positioning system includes: a satellite positioning system, a radio tower positioning system, a Wi-Fi positioning system,

and any combination of the aforementioned positioning systems. In some embodiments, the vehicle periodically transmits (218) the geographic location of the vehicle to a service provider over a data network.

[00108] The user interface module 1716 of the vehicle then displays (206) the geographic location of the vehicle relative to battery service stations on a map in the user interface 1705 of the positioning system 1764 of the vehicle. As mentioned above, the battery service stations include: charge stations that recharge the one or more batteries of the vehicle, battery exchange stations that replace a spent battery of the vehicle with a charged battery, and any combination of the aforementioned battery service stations. For example, Figure 21 illustrates an exemplary user interface 2100 of the positioning system 1764 of the vehicle 102, according to some embodiments. As illustrated in Figure 21, a highlighted area 2102 indicates an area that the vehicle 102 can reach based on the charge status of the battery 104. The shaded area 2106 indicates areas which the vehicle 102 cannot reach based on the charge status of the battery 104. A number of charge stations 132 and battery exchange stations 2108 are displayed in the user interface 2100.

[00109] The positioning module 1718 in the vehicle identifies (208) the battery service stations that the vehicle can reach based on the status of the battery of the vehicle and the geographic location of the vehicle. In some embodiments, identifying the battery service stations that the vehicle can reach based on the status of the battery of the vehicle includes: determining (212) a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle and determining (214) the battery service stations that are within the maximum distance from the geographic location of the vehicle. In some embodiments, the maximum distance includes a specified safety factor (*e.g.*, a 20% margin is added to the maximum distance). In some embodiments, the battery service stations are identified by a service provider and/or the positioning module 1718 of the vehicle.

[00110] In some embodiments, the positioning system notifies the user of the battery service stations that the vehicle can reach. For example, the user interface 1705 of the positioning system 1764 in the vehicle may display (210) the battery service stations that the vehicle can reach on the map.

[00111] In some embodiments, the positioning module 1718 of the vehicle determines (224) a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle and displays (226) an area of the map that is within the maximum distance of the geographic location of the vehicle. For example, the area that the vehicle can reach can be highlighted, circled, *etc.* Alternatively or in addition, the area that the vehicle cannot reach may be shaded.

[00112] The user of the vehicle may then select a particular battery service station from those displayed to have the battery of the vehicle recharged or exchanged. Thus, in some embodiments, the vehicle receives (220) a selection of a battery service station from a user of the vehicle and reserves (222) time at the battery service station for the vehicle. The positioning module 1718 of the vehicle may then generate a route from the geographic location of the vehicle to the selected battery service station.

[00113] In some embodiments, the vehicle periodically receives (228) the status of the one or more battery service stations from the service provider over the data network. The status of a respective battery service station can include: a number of charge stations of the respective battery service station that are occupied, the number of charge stations of the respective battery service station that are available or free, an estimated time until charge completion for respective vehicles charging at respective charge stations, the number of battery exchange bays of the respective battery service station that are occupied, the number of battery exchange bays of the respective battery service station that are unoccupied or free, the number of charged batteries available at the respective battery service station, whether a suitable/compatible battery is available at the respective battery service station, an estimated time until a respective spent battery is recharged, an estimated time until a respective exchange bay will become free, a location of the battery service station, and any combination of the aforementioned statuses.

[00114] Figure 3 is a flowchart representing a method 300 for providing information about battery service stations to a user of the vehicle 102, according to some embodiments. The method 300 begins when the service provider 112 receives (314) a status of a battery of the vehicle 102 and a geographic location of the vehicle 102 from the vehicle 102 over the data network 120.

[00115] In some embodiments, prior to receiving the status of the battery of the vehicle 102 and the geographic location of the vehicle 102 from the vehicle 102 over the data network 120, the service provider 112 requests (306) the status of the battery of the vehicle 102 and/or the geographic location from the vehicle 102 over the data network 120. The vehicle 102 receives (308) the request for the status of the battery and/or the geographic location of the vehicle 102. The battery status module 1720 of the vehicle 102 then determines (310) the status of the battery and/or the positioning module 1718 determines the geographic location of the vehicle (*e.g.*, using the positioning systems described above). The vehicle 102 then sends (312) the status of the battery and/or the geographic location of the vehicle 102 to the service provider 112.

[00116] In some embodiments, the battery status module 1820 of the service provider 112 updates (316) the battery status database 1842, which includes information about the status of batteries, with the status of the battery and/or the positioning module 1818 of the service provider 112 updates the vehicle location database 1840, which includes the geographic locations of vehicles within a vehicle-area network, with the geographic location of the vehicle 102.

[00117] The battery status module 1820 of the service provider 112 then determines from the status of the battery that the battery needs to be recharged. For example, the battery status module 1820 of the service provider 112 can determine (318) whether a charge level of the battery is below a specified threshold. If the battery does not need to be recharged (320, No), the service provider 112 waits (342) a specified time period before the method returns to step 306. If the battery needs to be recharged (320, Yes), the positioning module 1818 of the service provider 112 determines (322) suitable battery service stations based at least in part on the status of the battery and the geographic location of the vehicle 102. In some embodiments, determining battery service stations based at least in part on the status of the battery and the geographic location of the vehicle includes: determining a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle, and selecting the battery service stations within the maximum distance from the geographic location of the vehicle.

[00118] The service provider 112 then transmits (324) information about the battery service stations to the vehicle 102 over the data network 120. In some embodiments, the service provider 112 periodically transmits information about battery service stations to the

vehicle 102 over the data network 120. The vehicle 102 receives (326) the information about the battery service stations from the service provider 112 and displays (328) the information about the battery service stations to the user on the user interface 1705 of the positioning system 1764. In some embodiments, the information about the battery service stations is displayed on a map in a user interface 1705 of the positioning system 1764 of the vehicle 102.

[00119] The vehicle 102 can then receive (330) a selection of a battery service station from the user of the vehicle 102. The vehicle 102 transmits (332) a request to the service provider 112 to reserve time at the battery service station for the vehicle 102. The service provider 112 receives (334) a selection of a battery service station from the user of the vehicle 102 over the data network and reserves (336) a time slot or time at the battery service station for the vehicle 102.

[00120] The vehicle 102 then generates (338) a route to the selected battery service station and displays (340) the route to the user. In some embodiments, the positioning module 1718 of the vehicle 102 guides the user to the selected battery service station. For example, visual and/or audio route guidance can be provided by the positioning module 1718 of the vehicle 102.

[00121] Figure 4 is a flowchart representing a method 400 for providing information about battery service stations to a user of a vehicle, according to some embodiments. The method 400 begins when the battery status module 1720 of the vehicle 102 determines (406) a status of a battery of the vehicle and the positioning module 1718 of the vehicle 102 determines a geographic location of the vehicle.

[00122] The battery status module 1720 of the vehicle 102 then determines from the status of the battery that the battery needs to be recharged. For example, the battery status module 1720 of the vehicle 102 can determine (408) whether a charge level of the battery is below a specified threshold. If the battery does not need to be recharged (410, No), the vehicle 102 waits a specified time period (412) before the method 400 returns to step 406. If the battery needs to be recharged (410, Yes), the positioning module 1718 of the vehicle 102 determines (414) battery service stations based at least in part on the status of the battery and the geographic location of the vehicle 102. In some embodiments, determining battery service stations based at least in part on the status of the battery and the geographic location

of the vehicle includes: determining a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle, and selecting the battery service stations within the maximum distance from the geographic location of the vehicle.

[00123] In some embodiments, the vehicle 102 obtains (416 and 432) information
5 about the battery service stations at least in part from the service provider 112 over the data network 120. In some embodiments, the vehicle 102 periodically receives information about battery service stations from the service provider 112 over the data network 120. In some embodiments, the vehicle 102 also obtains information about the battery service stations from the positioning module 1718 of the vehicle 102. The vehicle 102 displays (418) the
10 information about the battery service stations on a map in the user interface 1705 of the positioning module 1718 of the vehicle 102.

[00124] In some embodiments, the vehicle 102 then receives (420) a selection of a battery service station from the user of the vehicle 102 and transmit (422) a request to the service provider 112 to reserve (422) a time slot or time at the battery service station for the
15 vehicle. The service provider 112 receives (424) the request to reserve time at the battery service station for the vehicle 102 and reserves (426) time at the battery service station for the vehicle 102.

[00125] The positioning module 1718 of the vehicle 102 may generate (428) a route to the selected battery service station and displays (430) the route to the user on the user
20 interface 1705 of the positioning system 1764 of the vehicle 102. In some embodiments, the vehicle 102 guides the user to the selected battery service station. For example, visual and/or audio route guidance can be provided by the positioning module 1718 of the vehicle 102.

Monitoring Battery Service Stations

[00126] In order to provide information about battery service stations to vehicles in a
25 vehicle-area network, some embodiments monitor the status of battery service stations. The method 500 begins when the battery service station module 1822 of the service provider 112 periodically requests (508) a status of a battery service station over the data network 120. In some embodiments, periodically requesting the status of the battery service station includes periodically transmitting a query to the battery service station over the data network, wherein
30 the query requests the status of the battery service station. The battery service station

periodically receives (510) the request for the status of the battery service station and determines (512) the status of the battery service station. For example, the battery exchange module 1922 can determine the status of the battery exchange station 134. Similarly, the battery control module 2020 can determine the status of the charge station 132. The battery service station then sends (514) the status of the battery service station 514 to the service provider 112. In some embodiments, the battery service station may periodically send the status of the battery service station without a request from the service provider 112.

[00127] The service provider 112 receives (516) the status of the battery service station over the data network 120 and updates (518) the battery status database 1842 that includes information about battery service stations within the vehicle-area network with the status of the battery service station.

[00128] In some embodiments, the service provider 112 distributes (520) at least a portion of the battery service station database 1844 database that includes information about battery service stations to the vehicle 102 in the vehicle-area network over the data network 120. In some embodiments, the at least a portion of the database that includes information about battery service stations is selected based on: a geographic location of the vehicle, a charge level of a battery of the vehicle, and any combination of the aforementioned selection criteria. Furthermore, the service provider 112 may distribute (522) the whole battery service station database 1844 or only new or updated information. The vehicle 102 receives (522) the at least a portion of the battery service station database 1844.

Providing Energy to Vehicles at a Battery Service Station

[00129] Figure 6 is a flowchart representing a method 600 for providing a vehicle with energy at a battery exchange station, according to some embodiments. The method 600 begins when the vehicle 102 requests (608) a charged battery from a battery exchange station 134. The battery exchange station 134 receives (610) the request for a charged battery and queries (612) a service provider 602 to determine an account status of the user 110 of the vehicle 102. The service provider 112 receives (614) the query to determine the account status of the user 110 of the vehicle 102 and the account module 1824 of the service provider 112 determines (616) the account status of the user 110 of the vehicle 102. The service provider 112 then sends (618) the account status to the battery exchange station 134.

[00130] The battery exchange station 134 receives (620) the status of the account of the user 110 of the vehicle 102 from the service provider 112 over the data network 120. The account module 1924 of the battery exchange station 134 then determines (622) whether the status of the account indicates that the user's account is in good standing. In some
5 embodiments, determining whether the status of the account indicates that the user's account is in good standing includes: determining whether a subscription associated with the account is active, determining whether a funding source associated with the account is valid, determining whether a fee for a subscription associated with the account have been, and any combination of the aforementioned operations.

10 [00131] If the status of the account indicates that the user's account is in good standing (624, Yes), the battery control module 1722 of the vehicle 102 releases (628) the partially spent battery from the vehicle 102 and the battery exchange module 1922 of the battery exchange station 134 extracts (626) the partially spent battery from the vehicle 102. The battery exchange module 1922 of the battery exchange station 134 installs (630 and 632) a
15 charged battery in the vehicle 102 and the account module 1924 of the battery exchange station 134 bills (630) the user's account for the service provided at the battery exchange station 604. In some embodiments, when released from the vehicle 102, the battery 104 is located on an adapter that includes an interfacing face to the battery exchange unit 1960 and an interfacing face to the battery 104. The face interfacing the battery 104 may be unique per
20 battery pack type. The face interfacing the battery exchange unit 1960 devices may be common to all adapters.

[00132] If the status of the account indicates that the user's account is not in good standing (624, No), the battery exchange station 134 provides (634) options to the user to place the account in good standing and the method returns to step 612. In some
25 embodiments, the options include: subscribing to a monthly service plan, subscribing to a yearly service plan, subscribing to a mileage-based service plan, subscribing to an energy-consumption-based service plan, subscribing to a pay-per-use plan, and any combination of the aforementioned plans.

[00133] Figure 7 is a flowchart representing a method 700 for providing a vehicle with
30 energy at a battery service station, according to some embodiments. The method 700 begins when a vehicle 102 requests (708) energy from a charge station 132. The charge station 132 receives (710) the request for energy and the account module 2022 of the charge station 132

queries (712) the service provider 112 to determine an account status of the user of the vehicle. The service provider 112 receives (714) the query to determine the account status of the user 110 of the vehicle 102 and the account module 1824 of the service provider 112 determines (716) the account status of the user of the vehicle. The service provider 112 then
5 sends (718) the account status to the charge station 132.

[00134] The charge station 132 receives (720) the status of the user's account of the vehicle 102 from the service provider 112 over the data network 120. The account module 2022 of the charge station 132 then determines (722) whether the status of the account indicates that the user's account is in good standing. In some embodiments, determining
10 whether the status of the account indicates that the user's account is in good standing includes: determining whether a subscription associated with the account is active, determining whether a funding source associated with the account is valid, determining whether a fee for a subscription associated with the account have been, and any combination of the aforementioned operations.

15 [00135] If the status of the account indicates that the user's account is in good standing (724, Yes), the battery control module 2020 of the charge station 132 provides (726 and 728) energy to the vehicle 102 and bills (726) the user's account for the service provided at the charge station 132.

[00136] If the status of the account indicates that the user's account is not in good
20 standing (724, No), the charge station 132 provides (730) options to the user to place the account in good standing and the method returns to step 712. In some embodiments, the options include: subscribing to a monthly service plan, subscribing to a yearly service plan, subscribing to a mileage-based service plan, subscribing to an energy-consumption-based service plan, subscribing to a pay-per-use plan, and any combination of the aforementioned
25 plans.

[00137] Note that "providing the vehicle with energy" can refer to recharging a battery of a vehicle and/or exchanging a spent battery of the vehicle with a charged battery.

[00138] Figure 8 is a flowchart representing a method 800 for providing access to battery service stations in a vehicle-area network, according to some embodiments. The
30 method 800 begins when a plurality of subscription options for access to battery service stations in a vehicle-area network is provided (802) to the user 110 of the vehicle 102. In

some embodiments, the plurality of subscription options include: subscribing to a monthly service plan, subscribing to a yearly service plan, subscribing to a mileage-based service plan, subscribing to an energy-consumption-based service plan, subscribing to a pay-per-use plan, and any combination of the aforementioned plans.

5 **[00139]** A selection of a subscription option is then received (804) from the user 110. A contract with the user 110 is entered (806) under terms of the subscription option selected by the user 110. Information about battery service stations in the vehicle-area network is provided (808) to the user 110 of the vehicle 102.

10 **[00140]** The user 110 of the vehicle 102 can then be provided (810) with access to a battery service station. The user is then billed (812) for the access to the battery service station based on the contract and services provided at the battery service station.

Distributing Energy in a Power Network

15 **[00141]** Figure 9 is a flowchart representing a method 900 for distributing energy in a power network, according to some embodiments. The method 900 begins when the power generators 156 generate (908) energy from one or more power plants.

20 **[00142]** The energy is then distributed (910) through the power network 140. The vehicle 102 may then receive (912) the energy from the power network 140. The vehicle 102 charges (914) the battery 104 of the vehicle 102 using the energy. In doing so, the vehicle 102 stores energy in the battery 104 of the vehicle 102. In some embodiments, the user 110 of the vehicle 102 is charged for the energy stored in the battery 104 of the vehicle 102.

25 **[00143]** The vehicle 102 provides (916) energy stored in the battery 104 of the vehicle 102 when energy production from the one or more power plants is below the demand placed on the power network and provides (918) the energy extracted from the battery to the power network 140. The energy extracted from the battery 104 of the vehicle 102 (or in some embodiments, batteries of a plurality of vehicles) is then distributed (920) to the power network 140. In some embodiments, the user 110 of the vehicle 102 is compensated (922) for the energy extracted from the battery 104 of the vehicle 102.

[00144] Note that the process described in Figure 9 can also be applied to batteries that are located at battery exchange stations and/or batteries not associated with vehicles.

30 **Relationships Between Users, Service Providers, and Financial Institutions**

[00145] Figures 10-16 describe a number of relationships between users, service providers, and financial institutions, according to some embodiments. In some embodiments, the financial institution can take on the role and/or the services provided by the service provider as described above, or vice versa. In some embodiments, a financial institution
5 owns the battery service stations and/or the vehicle-area network. In some embodiments, a service provider owns the battery service stations and/or the vehicle-area network.

[00146] Figure 10 is a flowchart representing a method 1000 for establishing a relationship between a user of a vehicle and a service provider, according to some embodiments. The method 1000 begins when the user 110 enters (1006 and 1008) into a
10 contract with the service provider 112 to obtain the vehicle 102, the battery 104, and/or access to vehicle-area network services. The service provider 112 provides (1010) and the user 110 receives (1012) the vehicle 102, the battery 104, and/or access to the vehicle-area network services. Thus, in the relationship described in Figure 10, the service provider 112 owns the vehicle 102, the battery 104, and the vehicle-area network services.

15 [00147] The user 110 can then periodically request (1014), and the service provider 112 can periodically provide (1016), the vehicle-area network services.

[00148] Figure 11 is a flowchart representing a method 1100 for establishing a relationship between a user of a vehicle, a service provider, and a financial institution, according to some embodiments. The method 1100 begins when the user 110 enters (1108
20 and 1110) into a contract with the financial institution 114 to finance the vehicle 102 and the battery 104. For example, the financing can include a loan or a lease. The financial institution 114 provides (1112) and the user 110 receives (1114) financing for the vehicle 102 and the battery 104.

[00149] In some embodiments, the financial institution 114 provides (1118) and the
25 user 110 obtains (1116) the vehicle 102 and the battery 104. Alternatively, the user 110 can obtain the vehicle 102 and the battery 104 from a third party (e.g., a car dealer).

[00150] The user 110 enters into a contract with the service provider 112 to obtain (1120 and 1122) access to vehicle-area network services. The service provider 112 then provides (1124) and the user 110 receives (1126) access to the vehicle-area network services.

[00151] Thus, in the relationship described in Figure 11, the financial institution 114 owns the vehicle 102 and the battery 104, and the service provider 112 owns the vehicle-area network services.

5 [00152] The user 110 can then periodically request (1128) and the service provider 112 can periodically provide (1130) access to the vehicle-area network services.

[00153] Figure 12 is a flowchart representing a method 1200 for establishing a relationship between a user of a vehicle and a service provider, according to some embodiments. The method 1200 begins when the user 110 obtains (1208) the vehicle 102. For example, the user 110 can obtain the vehicle 102 from a third party (*e.g.*, a car dealer).
10 The user 110 enters (1210 and 1212) into a contract with the service provider 112 to obtain the battery 104 and/or access to vehicle-area network services. The service provider 112 provides (1214) and the user 110 receives (1216) the battery 104 and/or access to the vehicle-area network services.

15 [00154] Thus, in the relationship described in Figure 12, the user 110 owns the vehicle 102 and the service provider owns the battery 104 and the vehicle-area network services.

[00155] The user 110 can then periodically request (1218) and the service provider 112 can periodically provide (1220) the vehicle-area network services.

[00156] Figure 13 is a flowchart representing a method 1300 for establishing a relationship between a user of a vehicle, a service provider, and a financial institution, according to some embodiments. The method 1300 begins when the user 110 obtains (1308) a vehicle. For example, the user 110 can obtain a vehicle from a third party (*e.g.*, a car dealer). The user 110 enters (1310 and 1312) into a contract with the financial institution 114 to finance the battery 104. For example, the financing can include a loan or a lease. The financial institution 114 provides (1314) and the user 110 receives (1316) financing for the
20 battery.
25

[00157] In some embodiments, the financial institution 114 provides (1320) and the user 110 obtains (1320) the battery 104. Alternatively, the user 110 can obtain the battery from a third party.

[00158] The user 110 enters (1322 and 1324) into a contract with the service provider 112 to obtain access to vehicle-area network services. The service provider 112 provides (1424) and the user 110 receives (1326) access to the vehicle-area network services.

5 [00159] Thus, in the relationship described in Figure 13, the user 110 owns the vehicle 102, the financial institution 114 owns the battery 104, and the service provider 112 owns the vehicle-area network services.

[00160] The user 1302 can then periodically request and the service provider 1304 can periodically provide access to the vehicle-area network services (1330 and 1332).

10 [00161] Figure 14 is a flowchart representing a method 1400 for establishing a relationship between a user of a vehicle, a service provider, and a financial institution, according to some embodiments. The method 1400 begins when the user 110 enters (1408 and 1410) into a contract with the financial institution 114 to finance the vehicle 102. For example, the financing can include a loan or a lease. The financial institution 114 provides (1412) and the user 110 receives (1414) financing for the vehicle 102.

15 [00162] In some embodiments, the financial institution 114 provides (1418) and the user 110 obtains (1416) the vehicle. Alternatively, the user 110 can obtain the vehicle 102 from a third party.

[00163] The user 110 enters (1420 and 1422) into a contract with the service provider 112 to obtain a battery and access to vehicle-area network services. The service provider 112
20 provides (1424) and the user 110 receives (1426) the battery 104 and access to the vehicle-area network services.

[00164] Thus, in the relationship described in Figure 14, the financial institution 114 owns the vehicle 102, the service provider 112 owns the battery 104 and the vehicle-area network services.

25 [00165] The user 110 can then periodically request (1428) and the service provider 112 can periodically provide (1430) access to the vehicle-area network services.

[00166] Figure 15 is a flowchart representing a method 1500 for establishing a relationship between a user of a vehicle and a financial institution, according to some embodiments. The method 1500 begins when the user 110 enters (1508 and 1510) into a
30 contract with the financial institution 114 to obtain the vehicle 102, the battery 104, and/or

access to vehicle-area network services. The financial institution 114 provides (1512) and the user 110 receives (1514) the vehicle 102, the battery 104, and/or access to the vehicle-area network services.

5 [00167] Thus, in the relationship described in Figure 15, the financial institution 114 owns the vehicle 102, the battery 104, and the vehicle-area network services.

[00168] The user 110 can then periodically request (1514) and the financial institution 114 can periodically provide (1516) the vehicle-area network services.

10 [00169] Figure 16 is a flowchart representing a method 1600 for establishing a relationship between a user of a vehicle and a financial institution, according to some embodiments. The method 1600 begins when the user 110 obtains (1608) the vehicle 102. For example, the user 110 can obtain the vehicle 102 from a third party (e.g., a car dealer). The user 110 enters (1610 and 1612) into a contract with the financial institution 114 to obtain the battery 104 and/or access to vehicle-area network services. The financial institution 114 provides (1614) and the user 110 receives (1616) the battery 104 and/or access
15 to the vehicle-area network services.

[00170] Thus, in the relationship described in Figure 16, the user 110 owns the vehicle 102 and the financial institution 114 owns the battery 104 and the vehicle-area network services.

20 [00171] The user 110 can then periodically request (1618) and the financial institution 114 can periodically provide (1620) the vehicle-area network services.

[00172] Each of the methods described herein may be governed by instructions that are stored in a computer readable storage medium and that are executed by one or more processors of one or more computer system. Each of the operations shown in Figures 2-16 may correspond to instructions stored in a computer memory or computer readable storage
25 medium.

[00173] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments
30 were chosen and described in order to best explain the principles of the invention and its practical applications, to thereby enable others skilled in the art to best utilize the invention

and various embodiments with various modifications as are suited to the particular use contemplated.

What is claimed is:

1. A method for providing information about battery service stations to an electric vehicle that includes an electric motor that drives one or more wheels of the vehicle and is powered by a battery, the method comprising:
 - 5 at a vehicle,
 - determining a status of a battery of the vehicle;
 - determining a geographic location of the vehicle;
 - identifying at least one battery service station that the vehicle can reach based on the charge status of the battery of the vehicle and the geographic
 - 10 location of the vehicle; and
 - notifying the user of the at least one battery service station to a user of the vehicle.
2. The method of claim 1, further comprising at the vehicle, displaying the geographic location of the vehicle relative to at least one battery service station on a map in a user
- 15 interface of a positioning system of the vehicle.
3. The method of claim 1, further comprising at the vehicle, marking the battery service stations that the vehicle can reach on the map.
4. The method of claim 1, wherein the at least one battery service station is a charge stations that recharges the battery of the vehicle or a battery exchange station that replaces an
- 20 at least partially spent battery of the vehicle with a charged battery.
5. The method of claim 1,
 - wherein the battery is not owned by the user, and
 - wherein the user of the vehicle is a user that has legal title to the vehicle, or a user that has legal possession of the vehicle.
- 25 6. The method of claim 1, further comprising:
 - receiving a selection of a battery service station from a user of the vehicle; and
 - making a reservation at the battery service station for the vehicle.
7. The method of claim 1, wherein determining the status of the battery of the vehicle includes one selected from the group consisting of:

determining a charge level of the battery;
determining an age of the battery;
determining the number of charge/discharge cycles of the battery; and
any combination of the aforementioned operations.

- 5 8. The method of claim 1, wherein identifying the battery service stations that the vehicle can reach based on the status of the battery of the vehicle includes:
determining a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle; and
determining the battery service stations that are within the maximum distance from
10 the geographic location of the vehicle.
9. The method of claim 8, wherein the maximum distance includes a specified safety factor.
10. The method of claim 1, including:
determining a maximum distance that the vehicle can travel before the battery can no
15 longer power the electric motor of the vehicle; and
marking in a user interface of a positioning system of the vehicle an area of a map that is within the maximum distance of the geographic location of the vehicle.
11. The method of claim 1, including periodically transmitting the status of the battery of the vehicle to a service provider over a data network.
- 20 12. The method of claim 1, including periodically transmitting the geographic location of the vehicle to a service provider over a data network.
13. The method of claim 1, including periodically receiving a status of the battery service stations from a service provider over a data network.
14. The method of claim 13, wherein the status of a respective battery service station is
25 selected from the group consisting of:
a number of charge stations of the respective battery service station that are occupied;
a number of charge stations of the respective battery service station that are free;
a number of battery exchange bays of the respective battery service station that are occupied;

a number of battery exchange bays of the respective battery service station that are free;

a location of the battery service station; and

and any combination of the aforementioned statuses.

5 15. A vehicle that includes an electric motor that drives one or more wheels of the vehicle and is powered by a battery, comprising:

one or more processors;

a memory; and

10 one or more programs stored in the memory, the one or more programs comprising instructions to:

determine a status of a battery of the vehicle;

determine a geographic location of the vehicle;

identify at least one battery service station that the vehicle can reach based on the charge status of the battery of the vehicle and the geographic location of the vehicle; and

15 notify the user of the at least one battery service station to a user of the vehicle.

16. The vehicle of claim 15, further comprising instructions to display the geographic location of the vehicle relative to at least one battery service station on a map in a user interface of a positioning system of the vehicle.

20 17. The vehicle of claim 15, further comprising instructions to mark the battery service stations that the vehicle can reach on the map.

18. The vehicle of claim 15, wherein the at least one battery service station is a charge station that recharge the battery of the vehicle, or a battery exchange station that replaces an at least partially spent battery of the vehicle with a charged battery.

25 19. The vehicle of claim 15,
wherein the battery is not owned by user, and
wherein the user of the vehicle a user that has legal title to the vehicle, or a user that has legal possession of the vehicle.

30 20. The vehicle of claim 15, further comprising instructions to:
receive a selection of a battery service station from a user of the vehicle; and
making a reservation at the battery service station for the vehicle.

21. The vehicle of claim 15, wherein the instruction to determine the status of the battery of the vehicle includes one selected from the group consisting of:
- instructions to determine a charge level of the battery;
 - instructions to determine an age of the battery;
 - 5 instructions to determine the number of charge/discharge cycles of the battery; and
 - any combination of the aforementioned instructions.
22. The vehicle of claim 15, wherein the instructions to identify the battery service stations that the vehicle can reach based on the status of the battery of the vehicle includes instruction to:
- 10 determine a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle; and
 - determine the battery service stations that are within the maximum distance from the geographic location of the vehicle.
23. The vehicle of claim 22, wherein the maximum distance includes a specified safety
- 15 factor.
24. The vehicle of claim 15, further comprising instructions to:
- determine a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle; and
 - mark in a user interface of a positioning system of the vehicle an area of a map that is
 - 20 within the maximum distance of the geographic location of the vehicle.
25. The vehicle of claim 15, including instruction to periodically transmit the status of the battery of the vehicle to a service provider over a data network.
26. The vehicle of claim 15, including instruction to periodically transmit the geographic location of the vehicle to a service provider over a data network.
- 25 27. The vehicle of claim 15, including instructions to periodically receive a status of the battery service stations from a service provider over a data network.
28. The vehicle of claim 27, wherein the status of a respective battery service station is selected from the group consisting of:
- a number of charge stations of the respective battery service station that are occupied;

- a number of charge stations of the respective battery service station that are free;
a number of battery exchange bays of the respective battery service station that are occupied;
a number of battery exchange bays of the respective battery service station that are
5 free;
a location of the battery service station; and
and any combination of the aforementioned statuses.
29. A computer readable storage medium storing one or more programs configured for execution by a computer, the one or more programs comprising instructions to:
10 determine a status of a battery of the vehicle, wherein the vehicle includes an electric motor that drives one or more wheels of the vehicle, wherein the electric motor receives energy from the battery;
determine a geographic location of the vehicle;
identify at least one battery service station that the vehicle can reach based on the
15 charge status of the battery of the vehicle and the geographic location of the vehicle; and
notify the user of the at least one battery service station to a user of the vehicle.
30. The computer readable storage medium of claim 29, further comprising instructions to display the geographic location of the vehicle relative to at least one battery service station on a map in a user interface of a positioning system of the vehicle.
- 20 31. The computer readable storage medium of claim 29, further comprising instructions to mark the battery service stations that the vehicle can reach on the map.
32. The computer readable storage medium of claim 29, wherein the at least one battery service station is a charge station that recharge the battery of the vehicle or a battery exchange station that replaces an at least partially spent battery of the vehicle with a charged
25 battery.
33. The computer readable storage medium of claim 29,
wherein the battery is not owned by the user, and
wherein the user of the vehicle is a user that has legal title to the vehicle, or a user that has legal possession of the vehicle.

34. The computer readable storage medium of claim 29, further comprising instructions to:

receive a selection of a battery service station from a user of the vehicle; and
making a reservation at the battery service station for the vehicle.

5 35. The computer readable storage medium of claim 29, wherein the instructions to determine the status of the battery of the vehicle includes one selected from the group consisting of:

instructions to determine a charge level of the battery;

instructions to determine an age of the battery;

10 instructions to determine the number of charge/discharge cycles of the battery; and
any combination of the aforementioned instructions.

36. The computer readable storage medium of claim 29, wherein the instructions to identify the battery service stations that the vehicle can reach based on the status of the battery of the vehicle includes instructions to:

15 determine a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle; and

determine the battery service stations that are within the maximum distance from the geographic location of the vehicle.

20 37. The computer readable storage medium of claim 36, wherein the maximum distance includes a specified safety factor.

38. The computer readable storage medium of claim 29, including instructions to:

determine a maximum distance that the vehicle can travel before the battery can no longer power the electric motor of the vehicle; and

25 mark in a user interface of a positioning system of the vehicle an area of a map that is within the maximum distance of the geographic location of the vehicle.

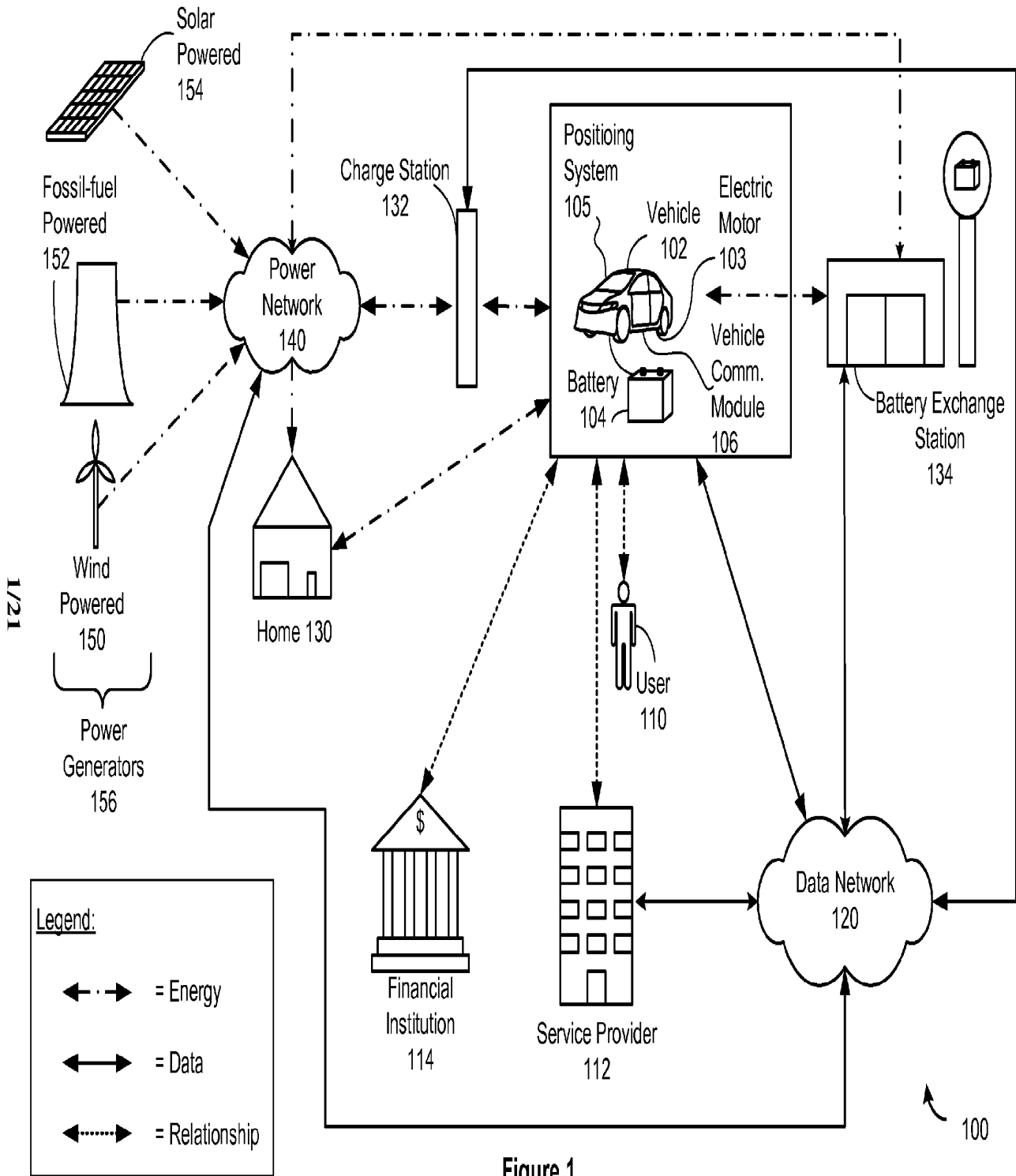
39. The computer readable storage medium of claim 29, including instructions to periodically transmit the status of the battery of the vehicle to a service provider over a data network.

40. The computer readable storage medium of claim 29, including instructions to periodically transmit the geographic location of the vehicle to a service provider over a data network.

41. The computer readable storage medium of claim 29, including instructions to
5 periodically receive a status of the battery service stations from a service provider over a data network.

42. The computer readable storage medium of claim 41, wherein the status of a respective battery service station is selected from the group consisting of:

- 10 a number of charge stations of the respective battery service station that are occupied;
- a number of charge stations of the respective battery service station that are free;
- a number of battery exchange bays of the respective battery service station that are occupied;
- a number of battery exchange bays of the respective battery service station that are free;
- 15 a location of the battery service station; and
- and any combination of the aforementioned statuses.



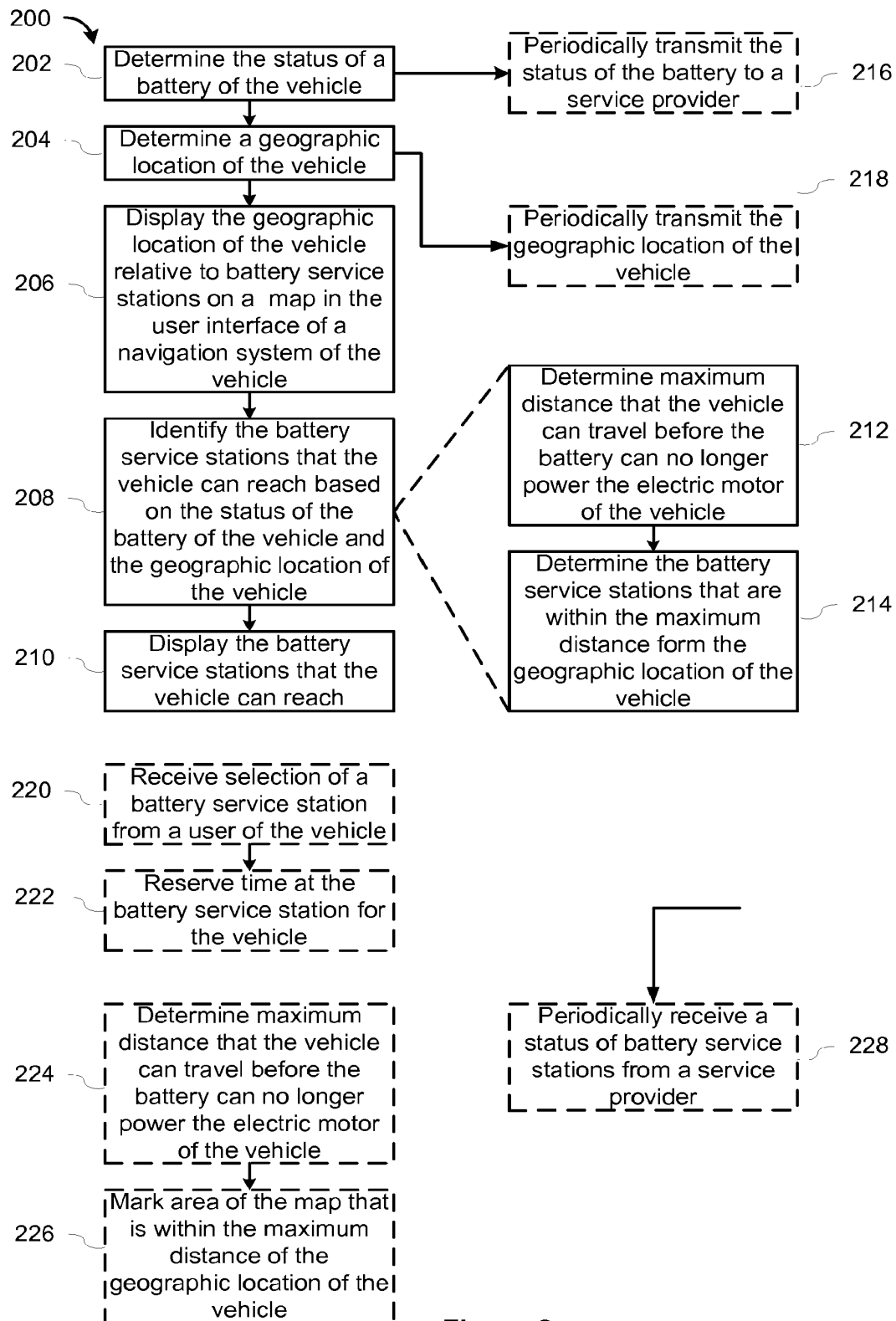


Figure 2

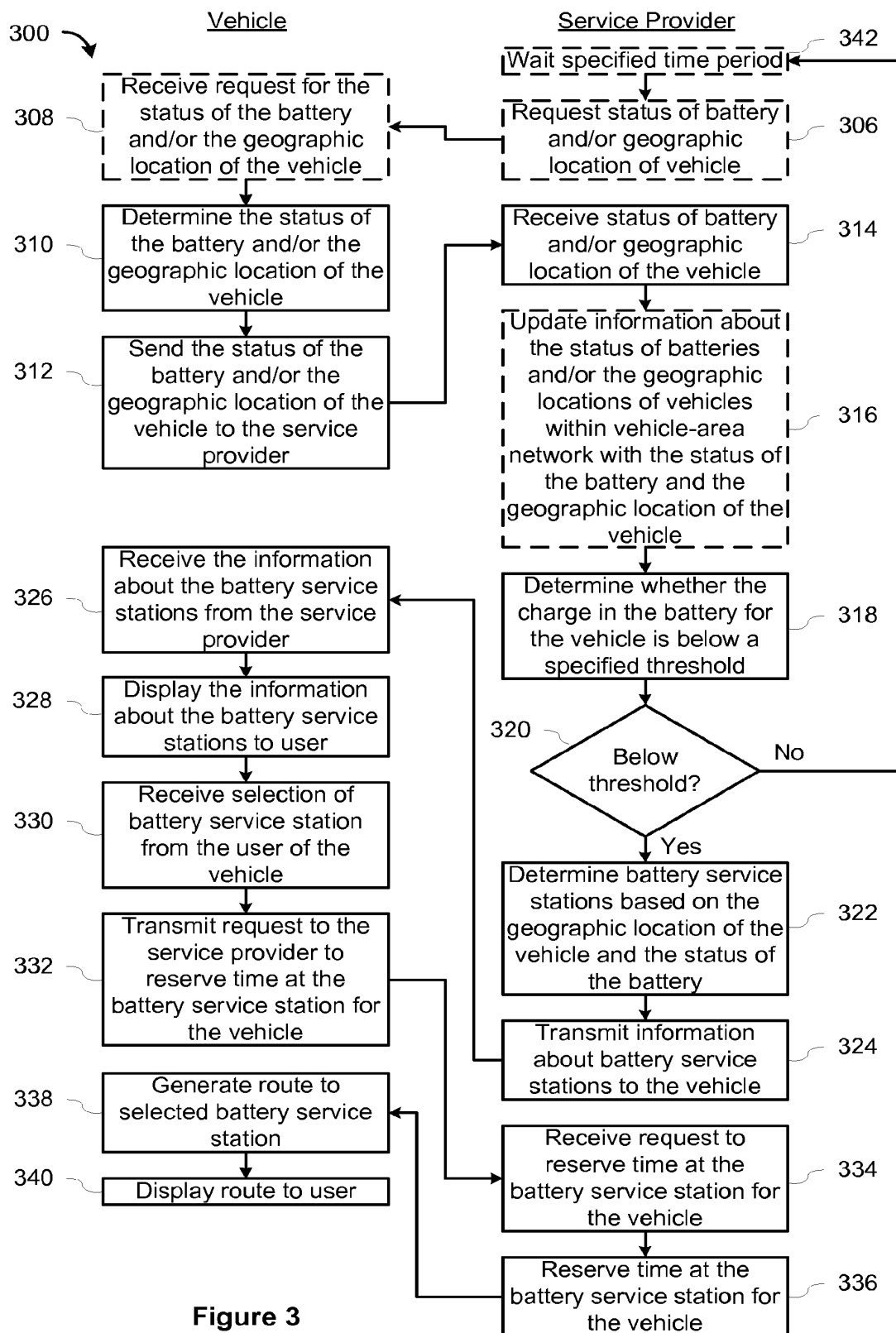


Figure 3

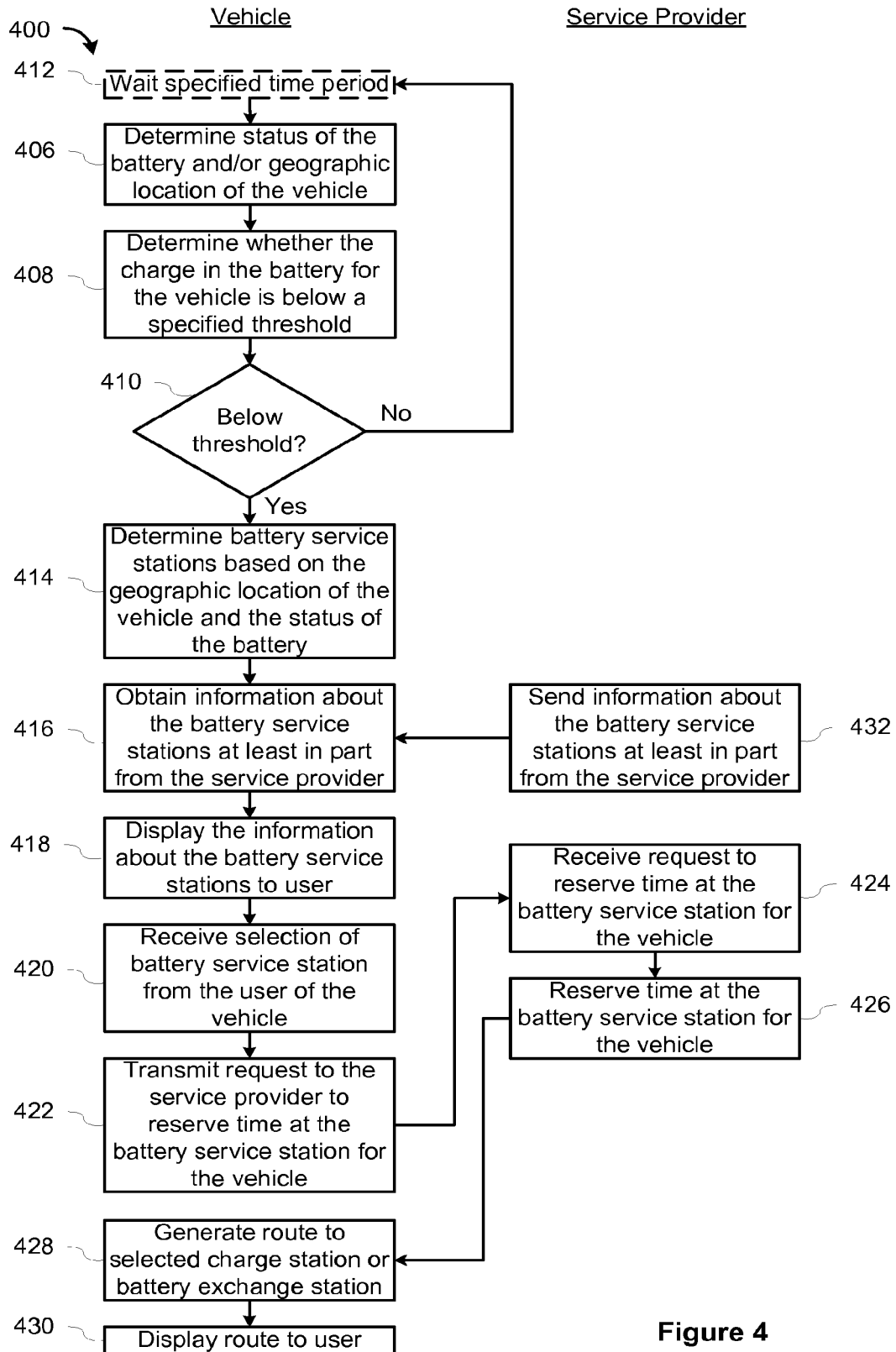


Figure 4

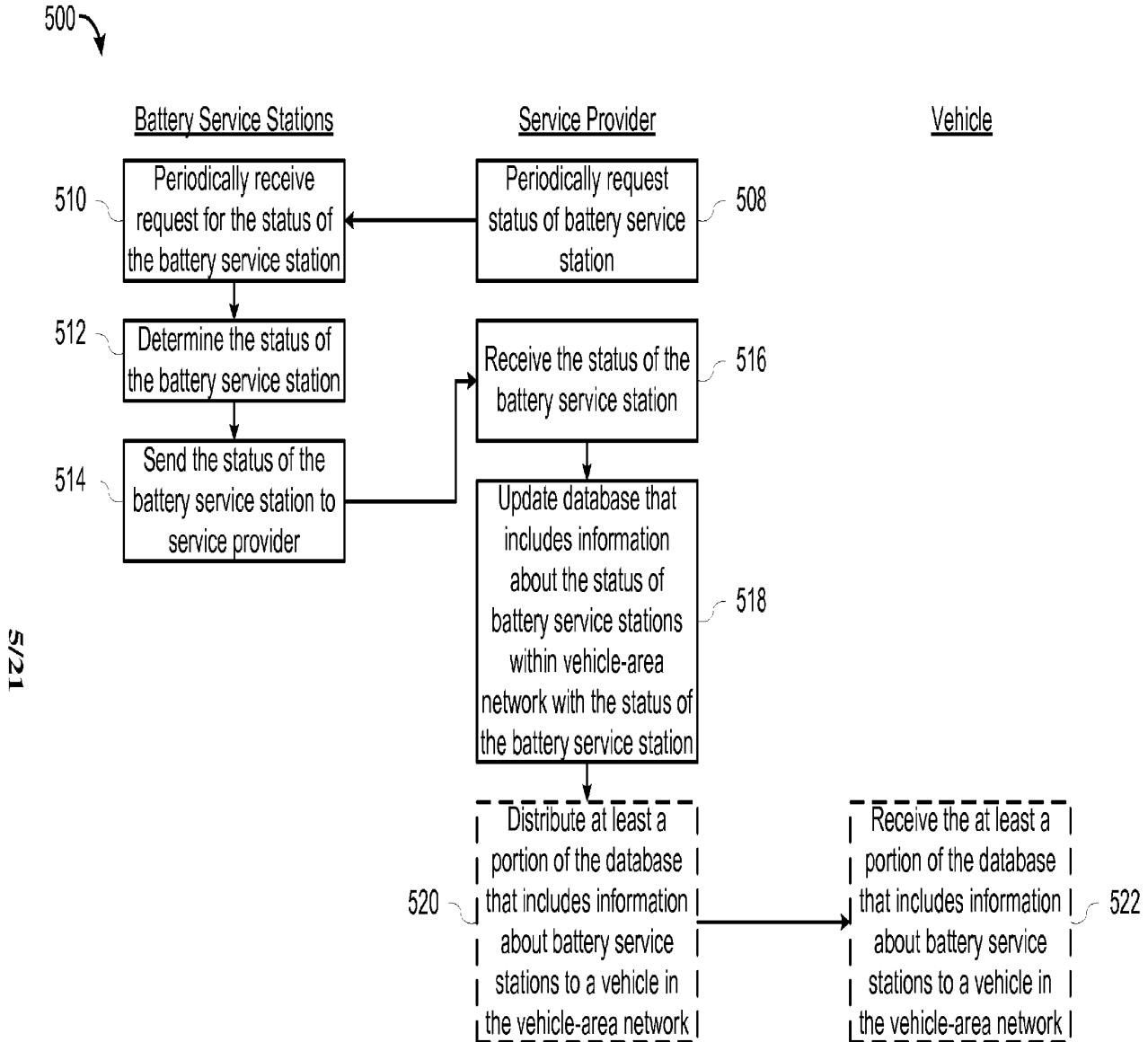


Figure 5

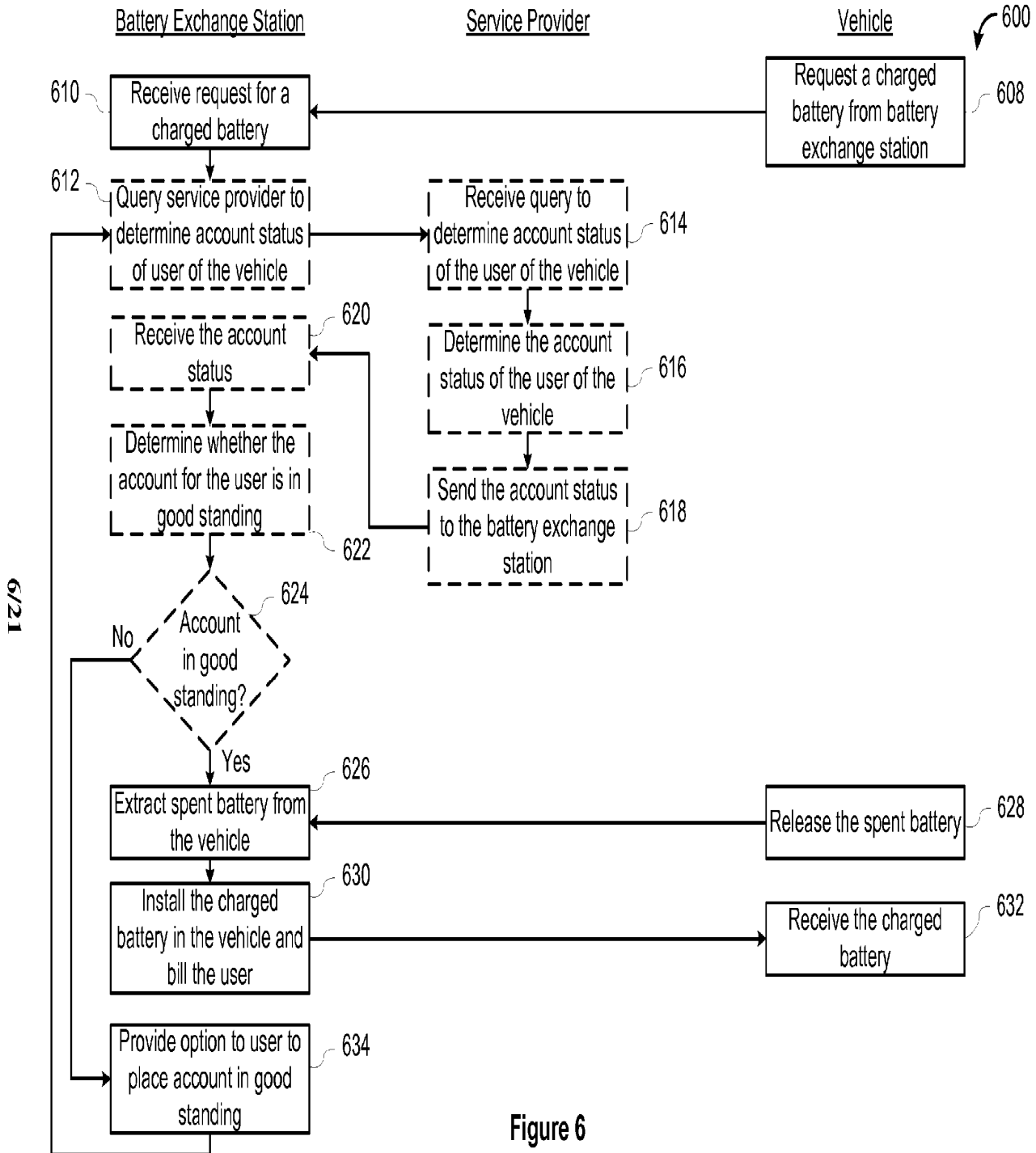


Figure 6

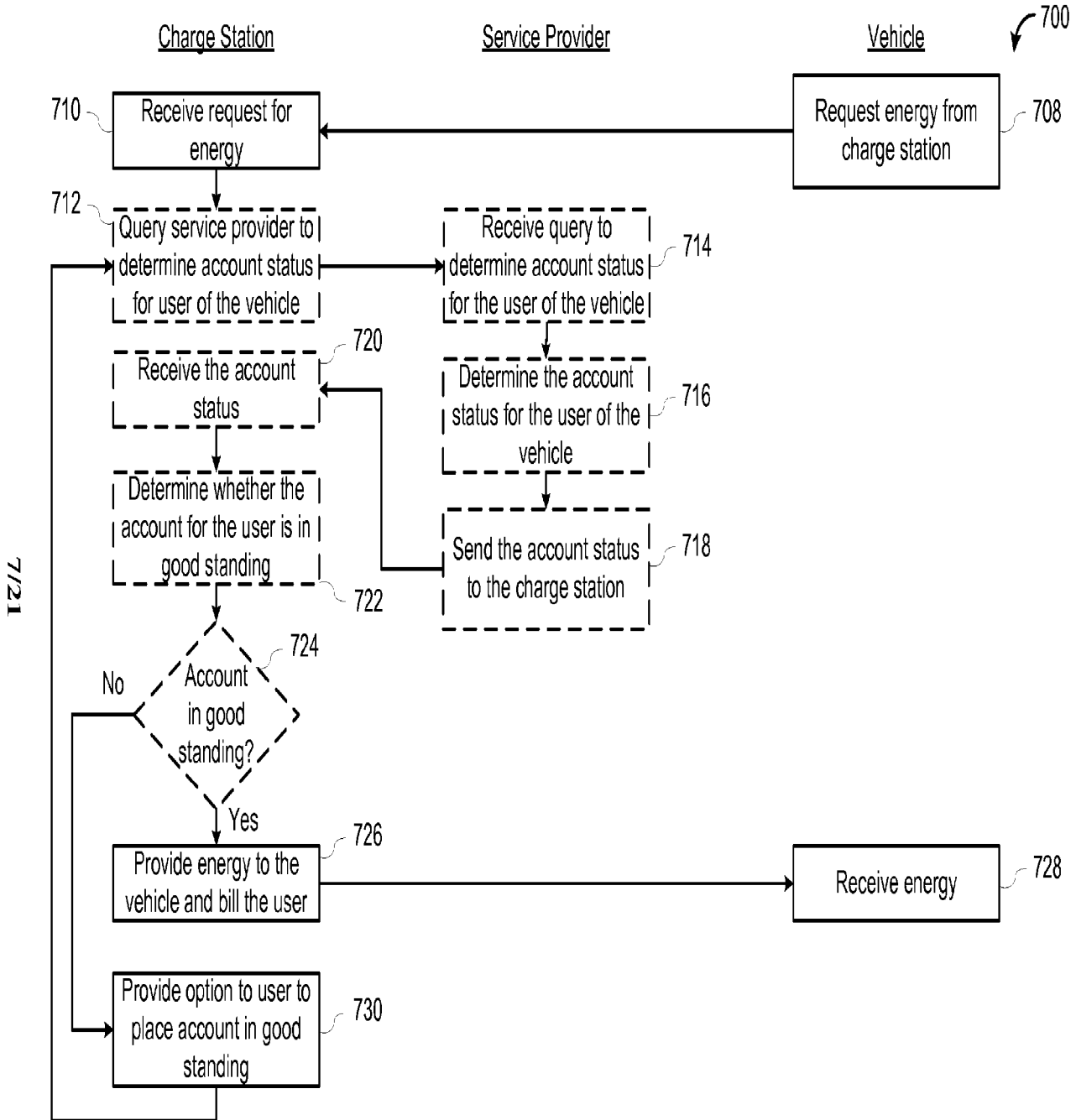
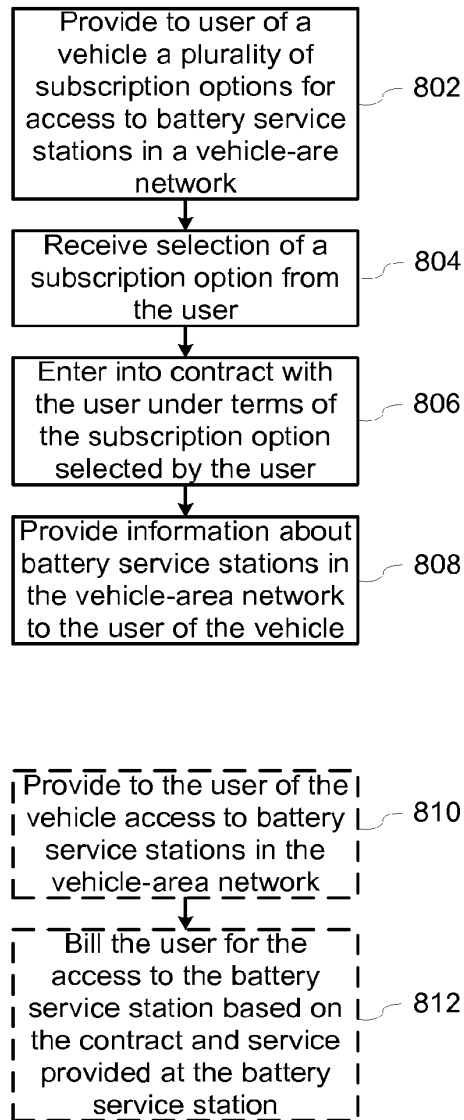


Figure 7

800 **Figure 8**

8/21

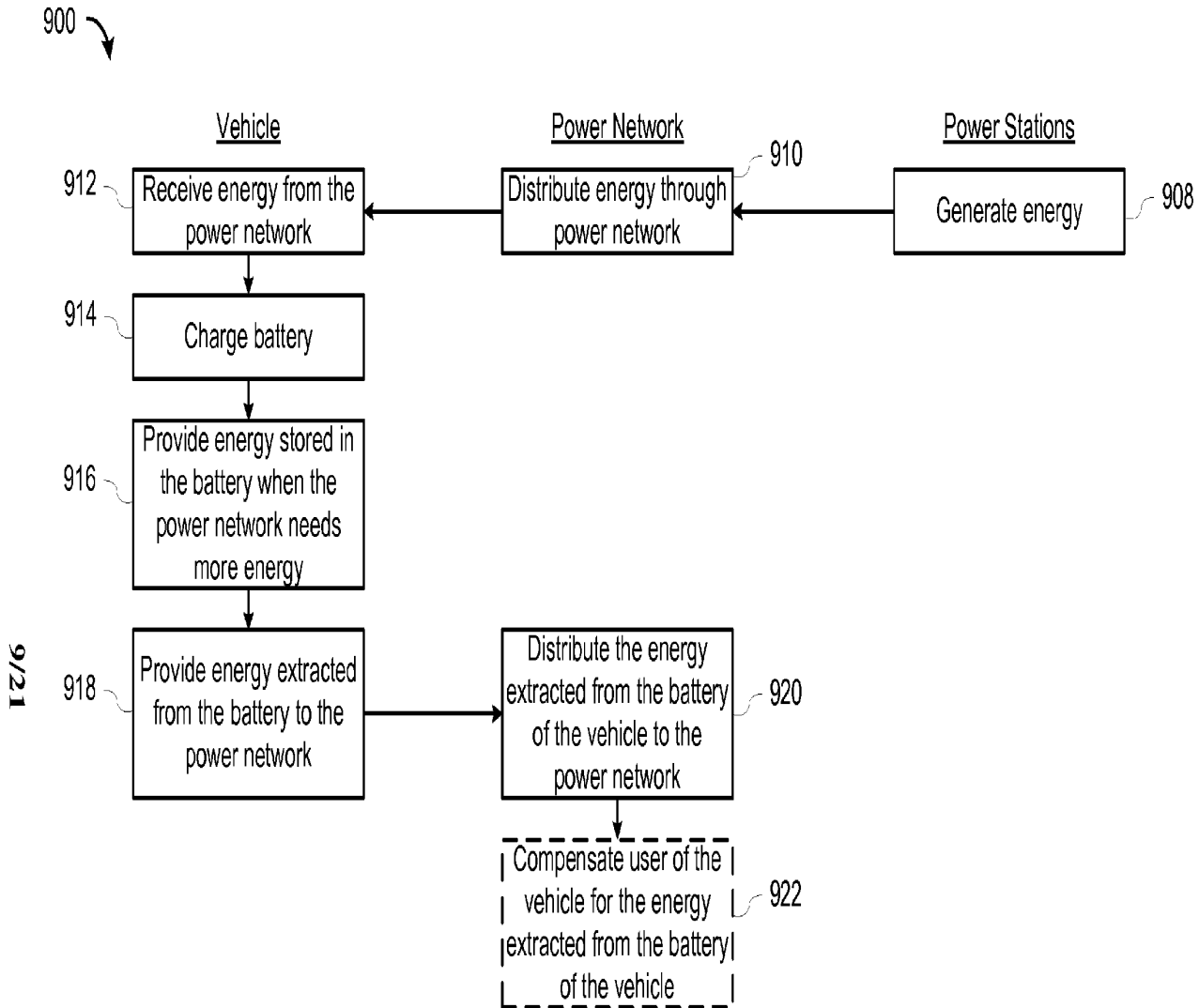


Figure 9

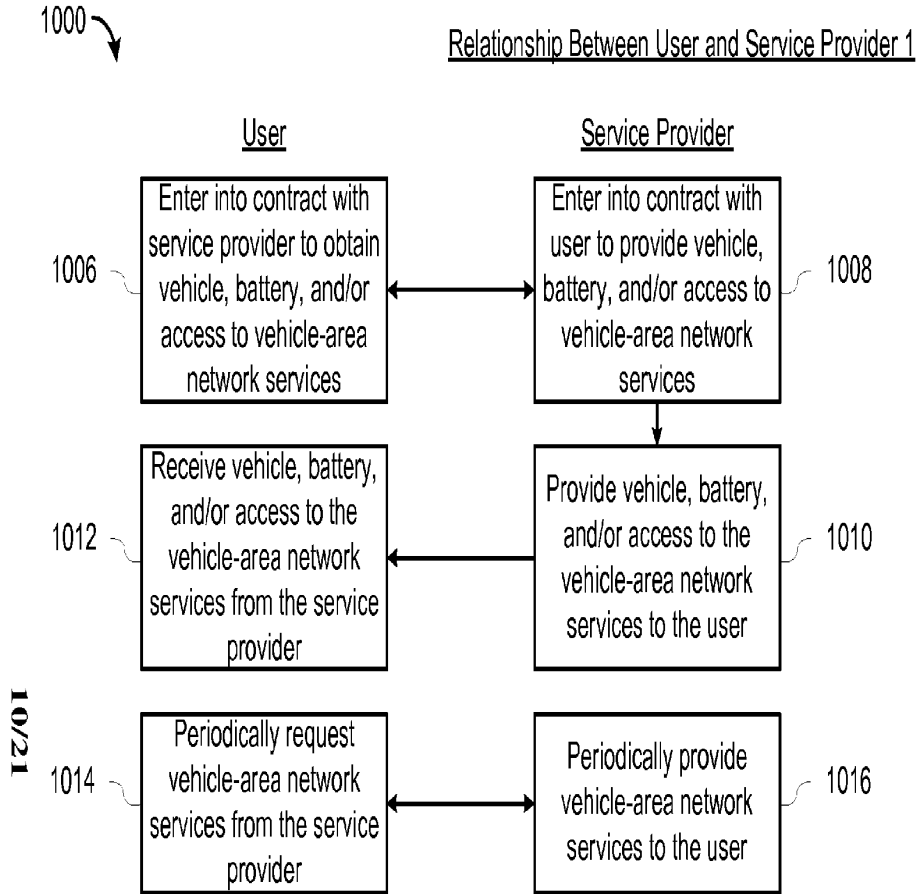


Figure 10

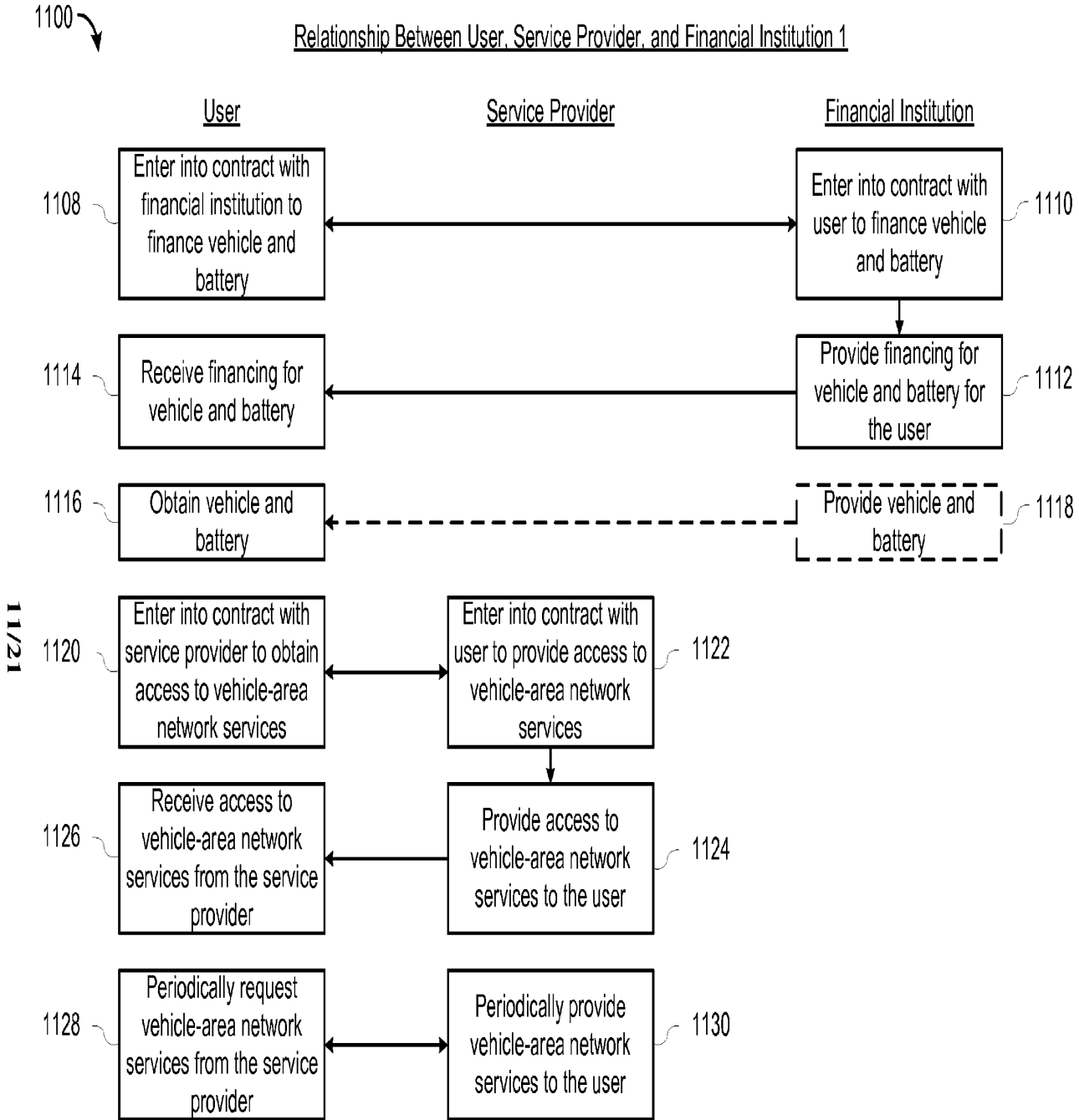


Figure 11

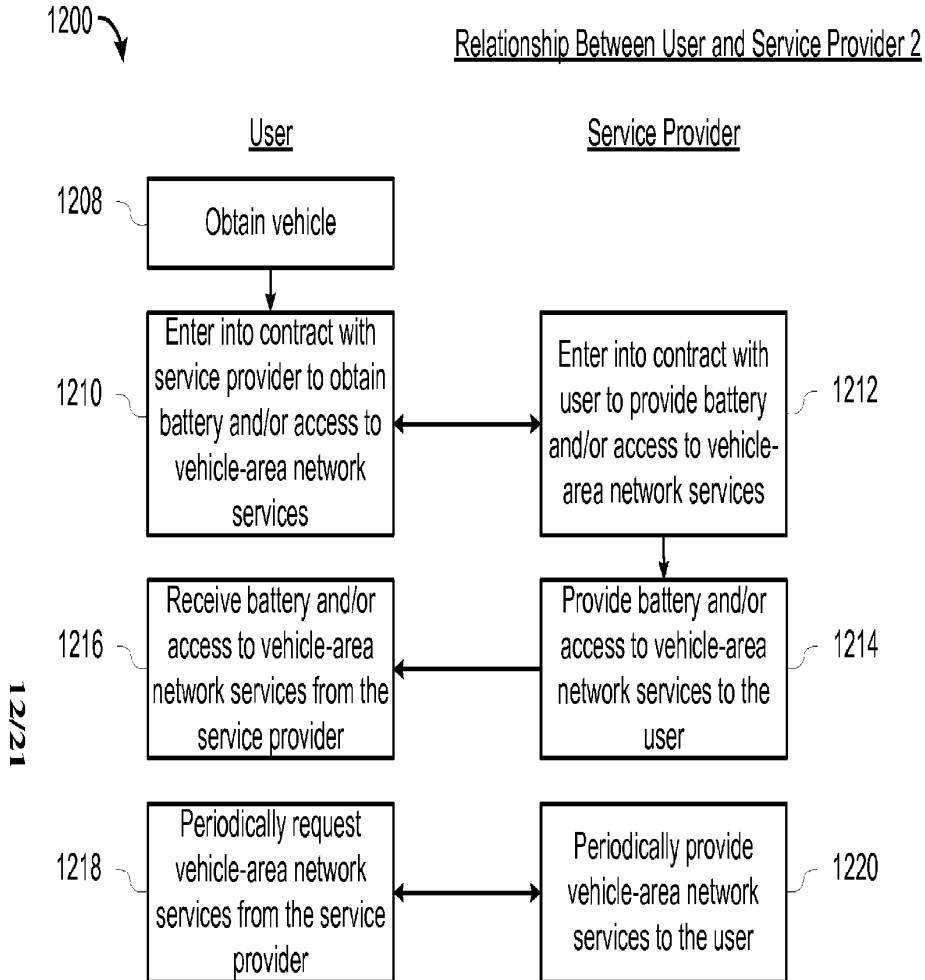


Figure 12

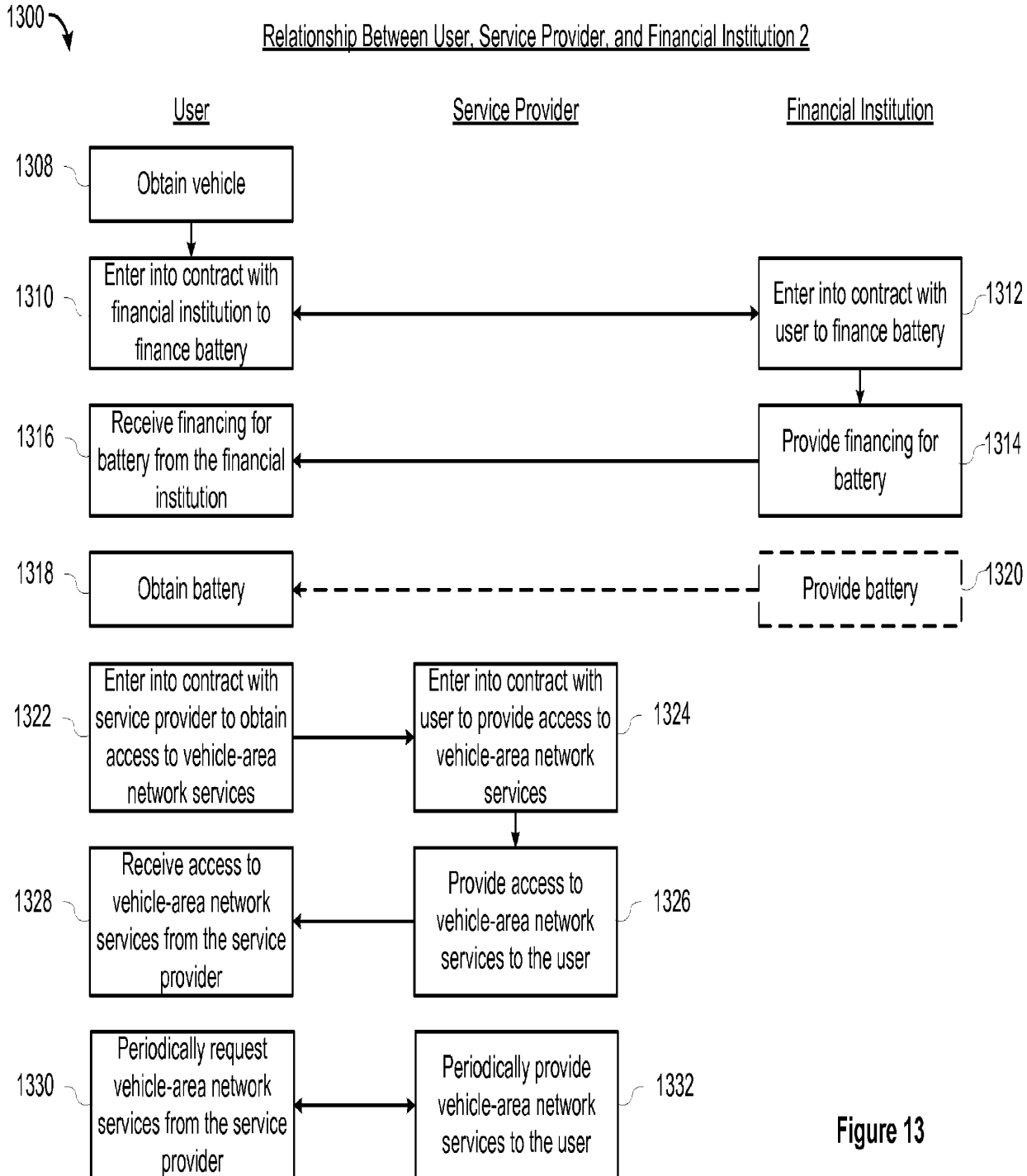


Figure 13

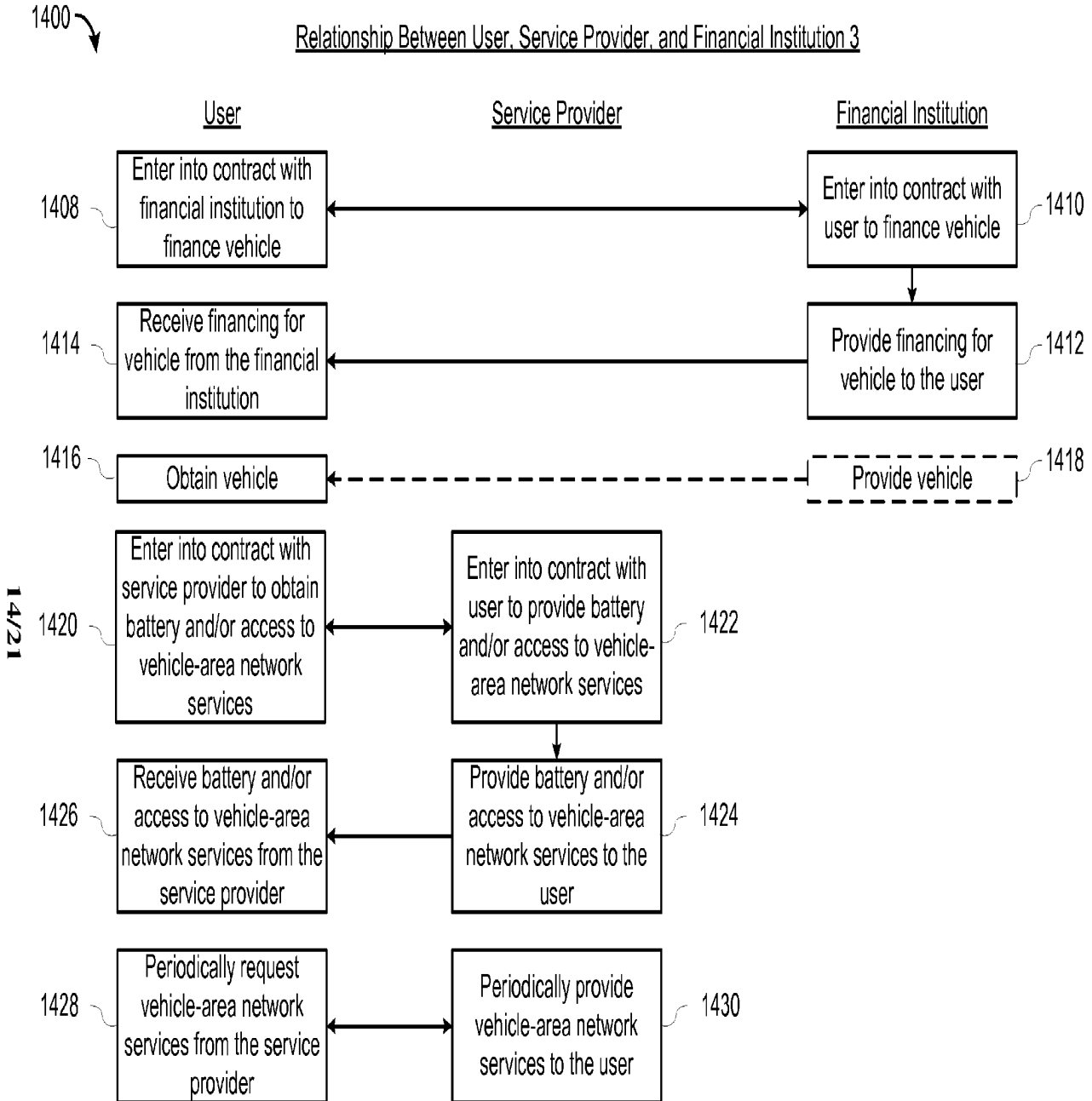


Figure 14

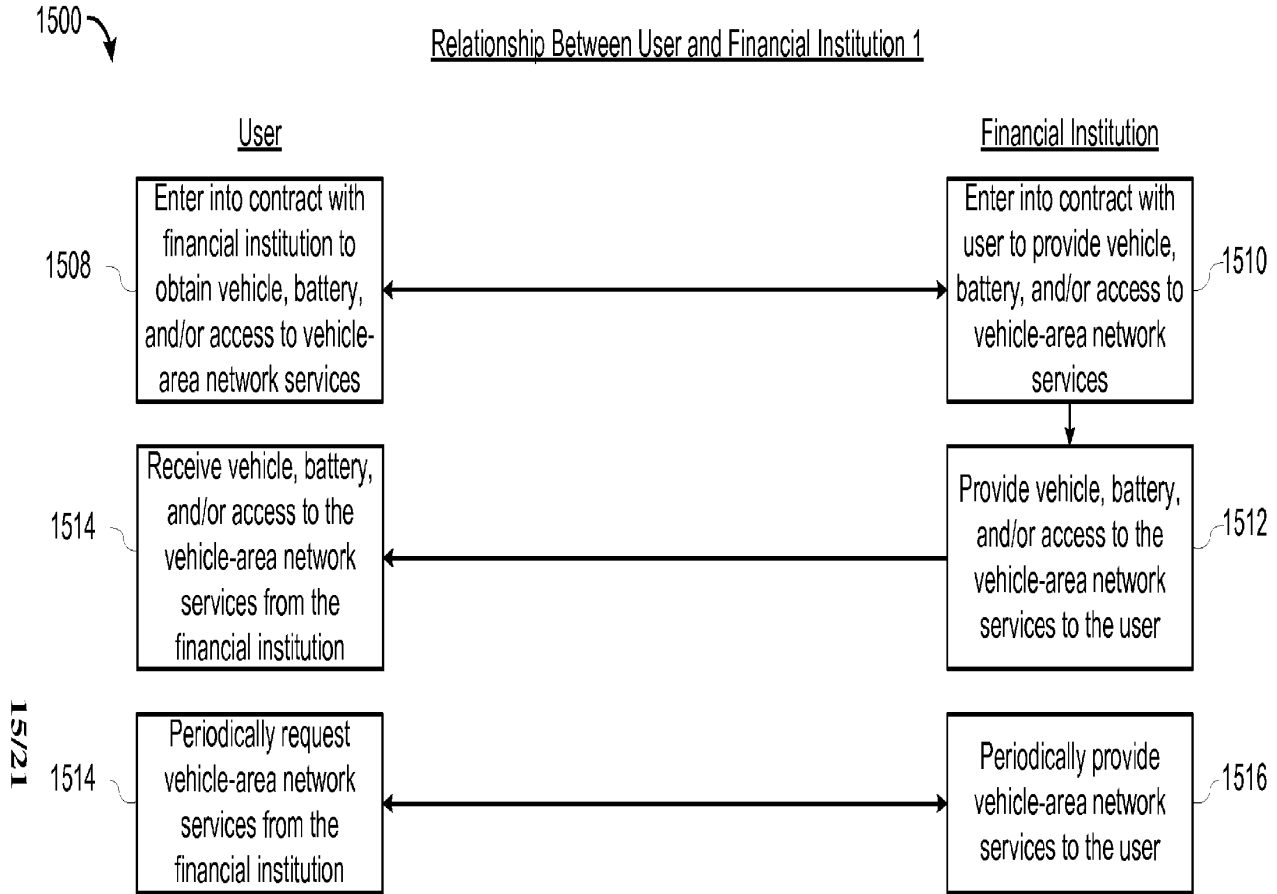


Figure 15

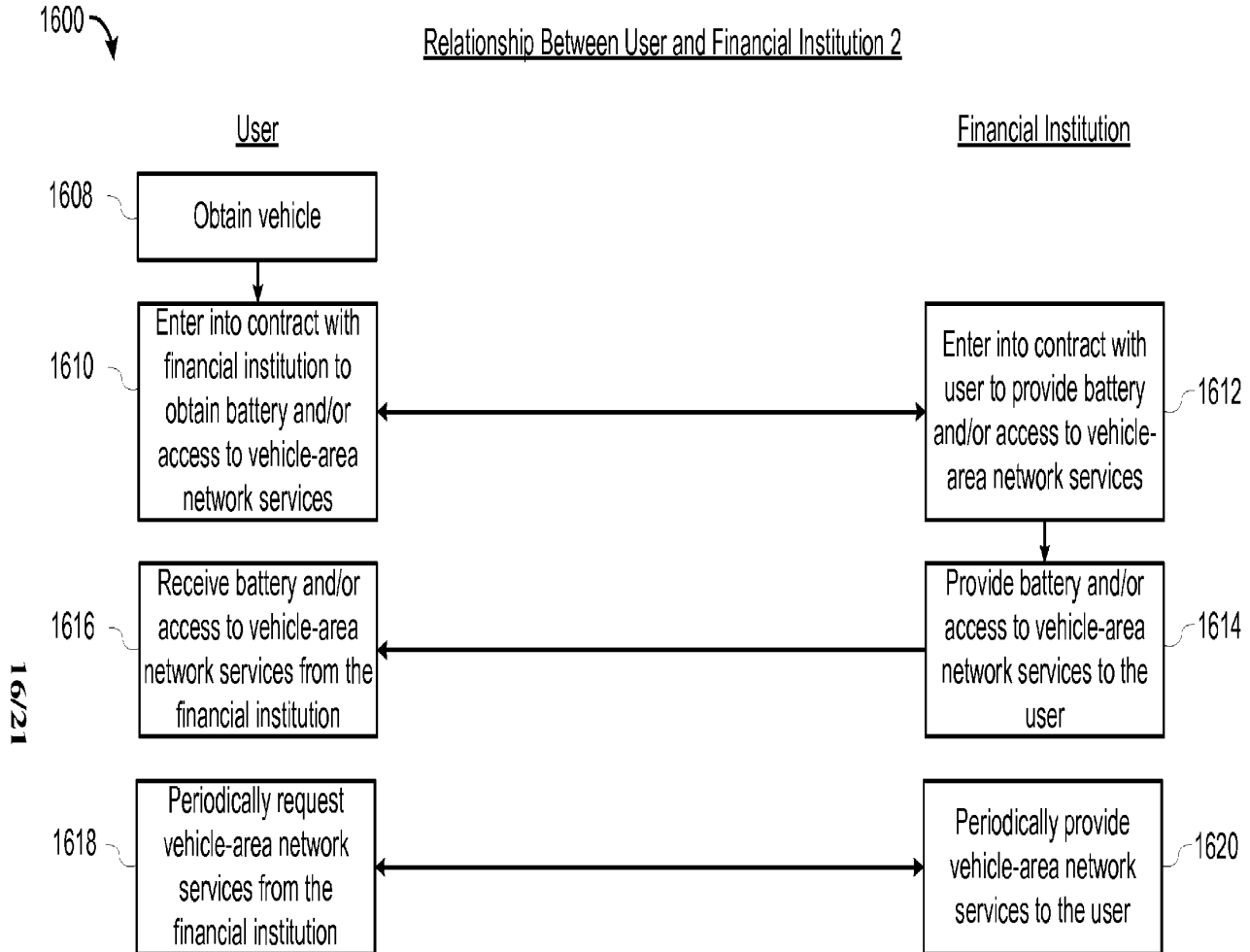


Figure 16

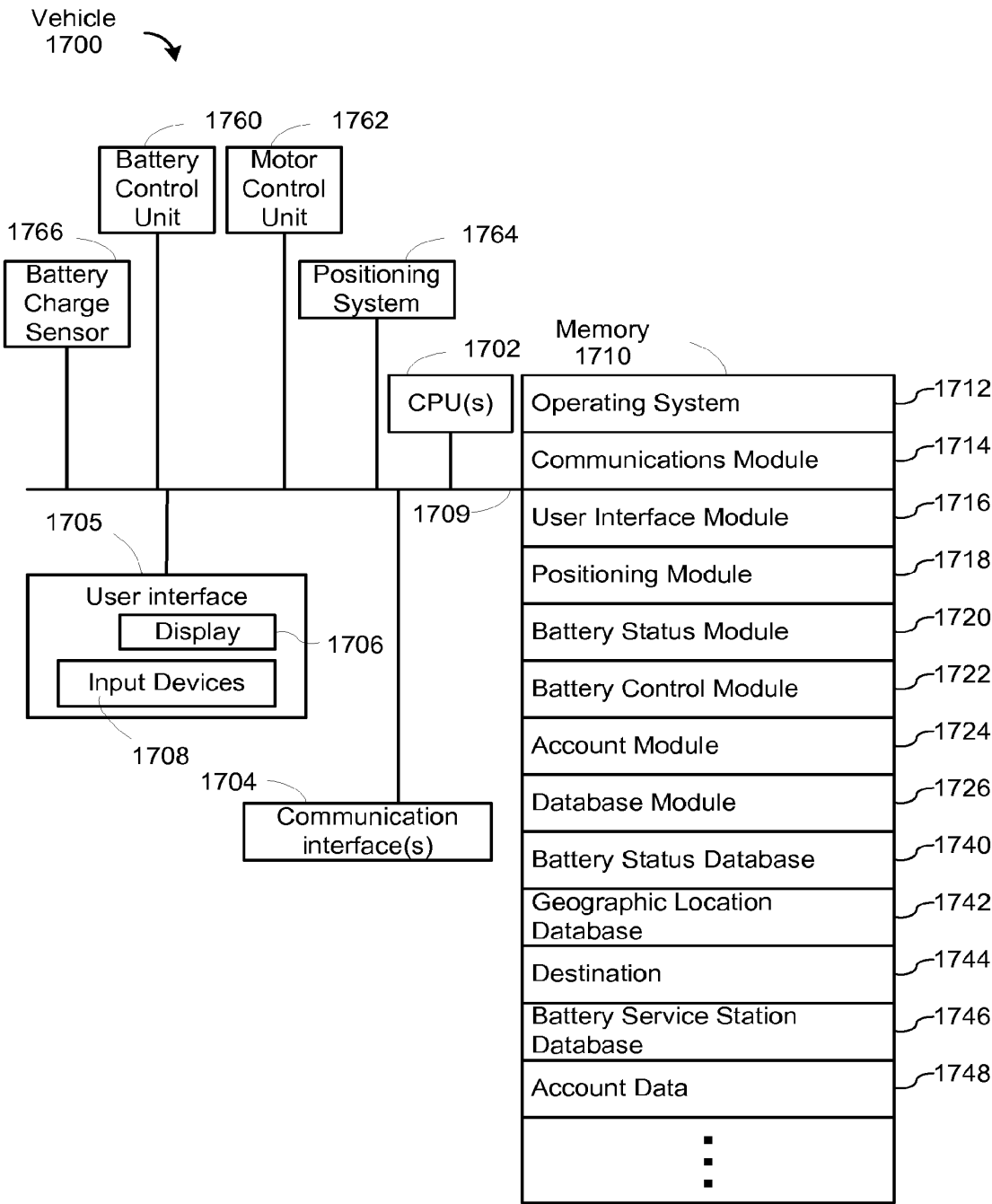


Figure 17
17/21

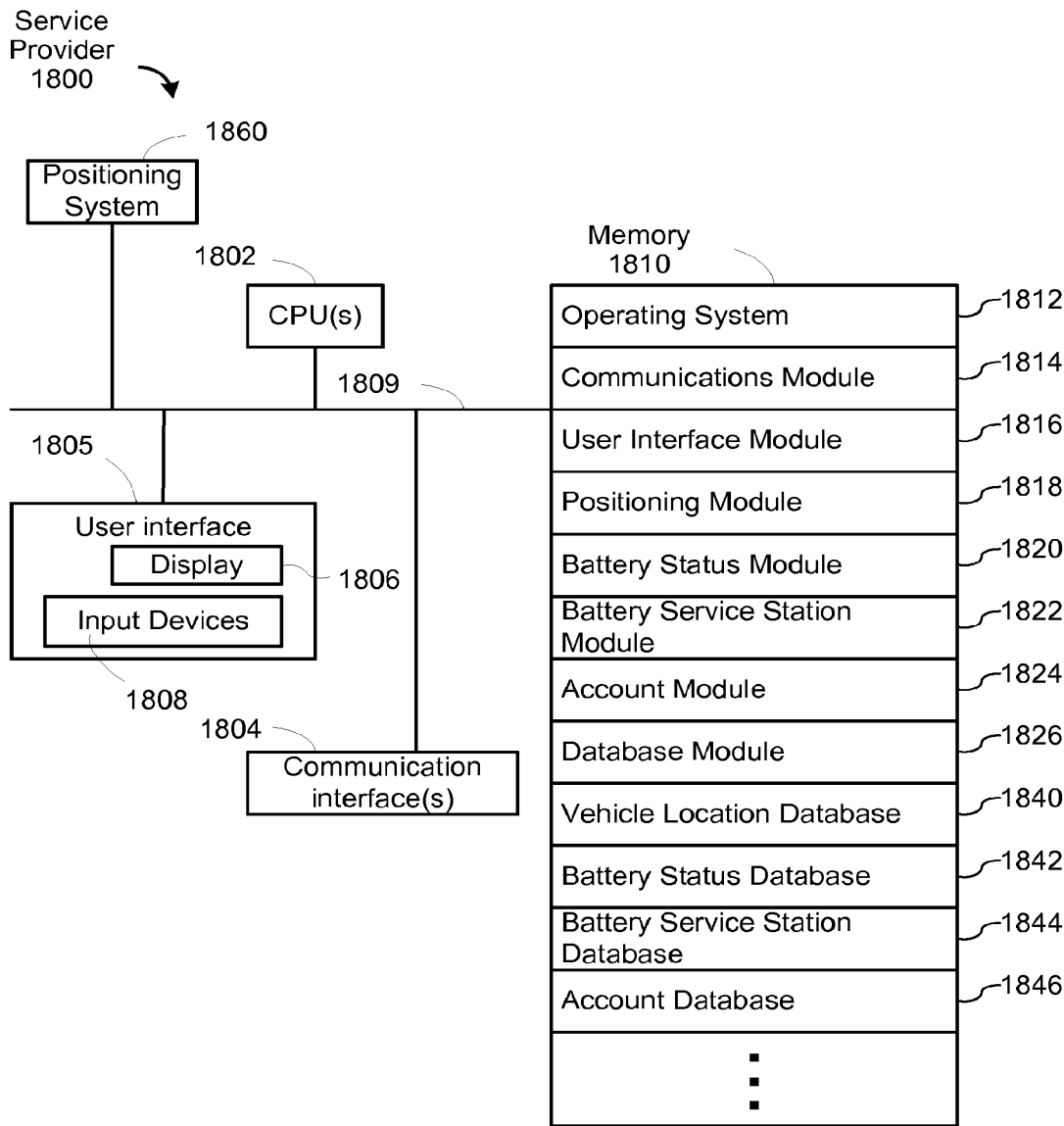


Figure 18
18/21

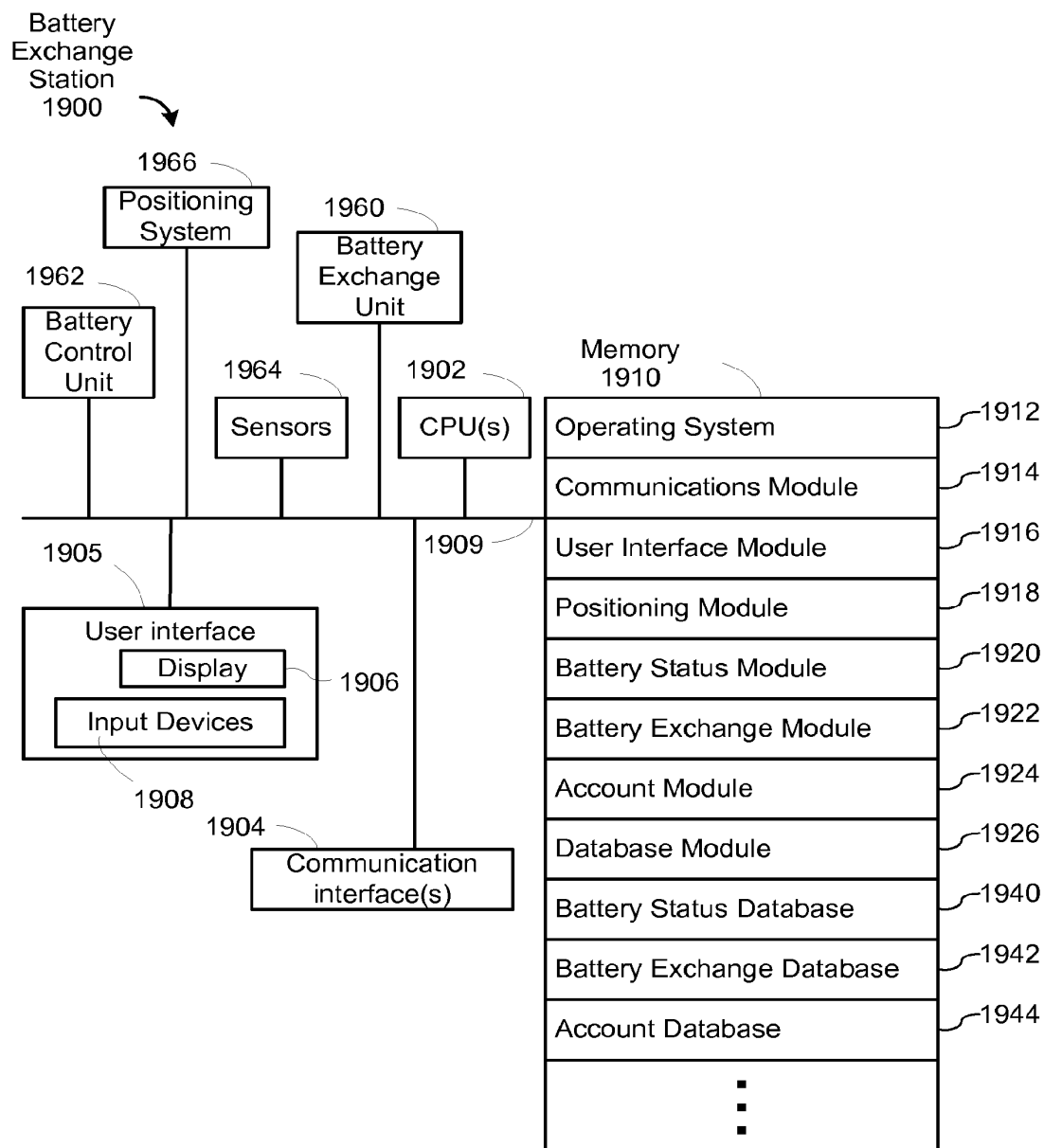


Figure 19

19/21

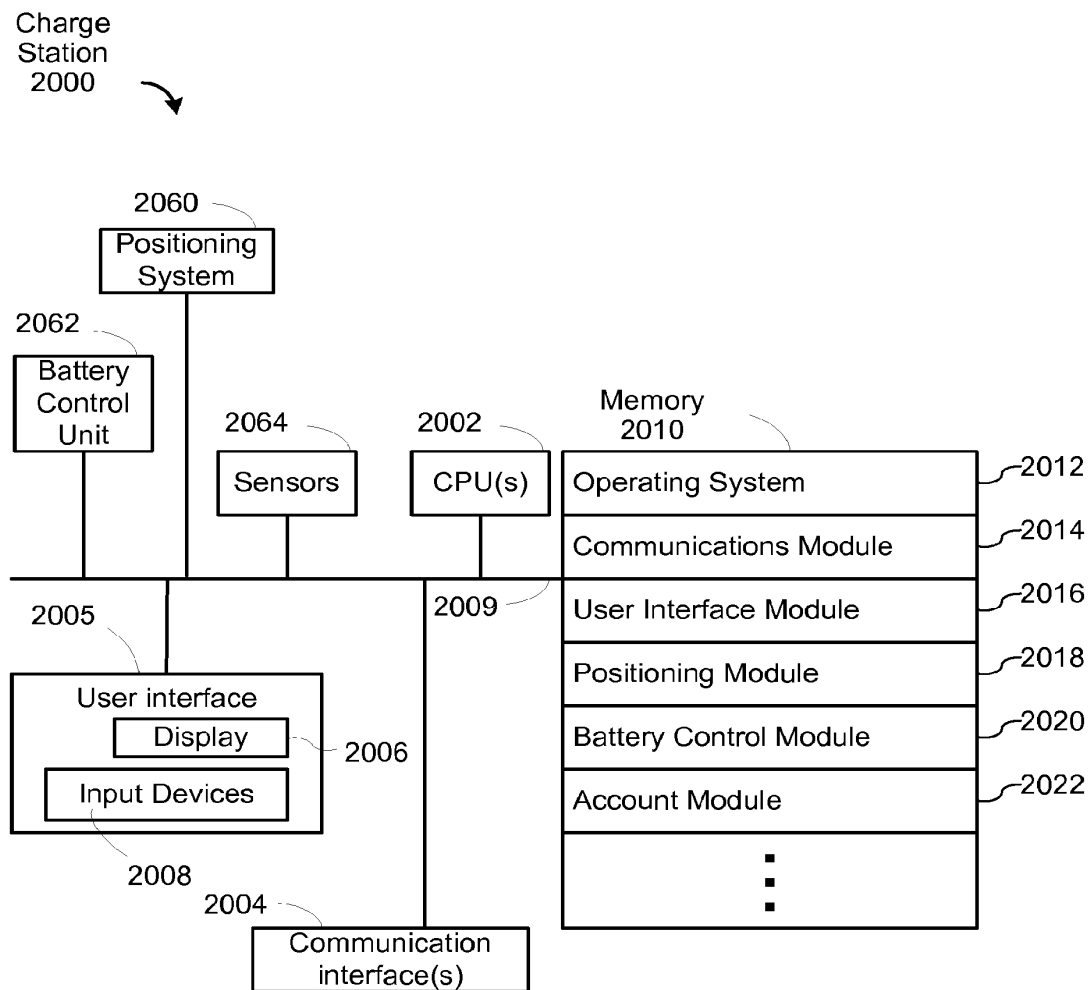


Figure 20
20/21



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/077132

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B60L 9/00 (2008.04)

USPC - 701/22

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)

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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)

PatBase, Google Patent Search, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---	US 6,014,597 A (KOCHANNECK) 11 January 2000 (11.01.2000) entire document	1, 4-9, 11-14 ----- 2, 3, 10, 19, 33
X ---	US 5,815,824 A (SAGA et al) 29 September 1998 (29.09.1998) entire document	15-18, 20-32, 34-42 ----- 2, 3, 10, 19, 33
Y		
A	US 6,487,477 B1 (WOESTMAN et al) 26 November 2002 (26.11.2002) entire document	1-42

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

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

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Date of the actual completion of the international search

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Date of mailing of the international search report

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(54) Title: METHOD AND GUIDANCE-UNIT FOR GUIDING BATTERY-OPERATED TRANSPORTATION MEANS TO RECONDITIONING STATIONS

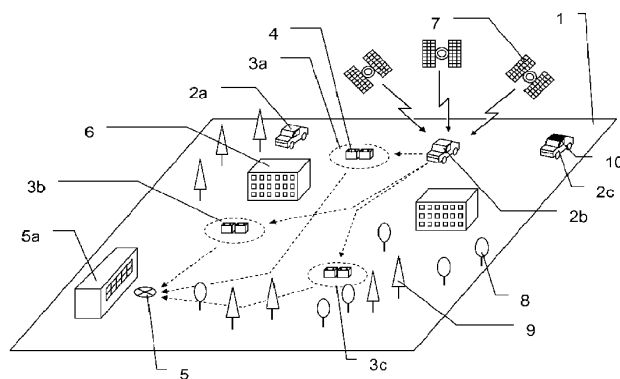


Fig. 1

(57) Abstract: The invention concerns a method, unit and a computer program product for guiding a mobile transportation means (2b) of a set of transportation means (2), which transportation means (2) have each associated a powering battery of a set of batteries (4), to a selected reconditioning station (3b) of a set of reconditioning stations (3), in a geographically distributed arrangement of the transportation means (2) and the reconditioning stations (3). It comprises the steps of determining a position of the battery, determining a condition of the battery, forecasting a consumption characteristic of the transportation means (2b), evaluating an achievable range of mobility of the transportation means (2b), assigning the selected reconditioning station (3a) of the set of reconditioning stations (3), to the transportation means (2b) for charge or substitution of the powering battery, which is located within the range of mobility of the transportation means (2b) along a path to a desired target (5) and guiding the transportation means (2b) to the selected reconditioning station (3b), wherein an optimisation of the assignment and/or the path is executed by a search algorithm for assigning the set of transportation means (2) to the set of reconditioning stations (3) and batteries (4), based on actual and/or forecasted information about multiple entities of the sets of transportation means (2), stations (3) and batteries (4) as well as their conditions.

METHOD AND GUIDANCE UNIT FOR GUIDING BATTERY-OPERATED TRANSPORTATION MEANS TO
RECONDITIONING STATIONS

5 The present invention relates generally to a method for guiding transportation means with batteries to reconditioning stations according to claim 1, a guidance-unit for the execution of the claimed methods according to claim 14 and a computer program product.

10 The expected shortage of fossil fuels, ecological problems, climate concerns and resulting pollution restrictions are likely to increase the demand for electrically powered transportation means, further also referred to as vehicles, in the near future.

15 In contrast to the existing and well functioning petrol supply system, new challenges will advance out of this, since in contrast to petrol tanks, the storages for electrical energy, further also referred to by the common terms energy cell, battery or accumulator, are expensive, have a limited lifetime and require careful handling.
20 Especially in the present state of development, in particular much longer time is needed for the regeneration of such a storage than for the refilling of a fuel tank of similar energy content. Another important drawback is the limited range, achievable with battery powered vehicles as the
25 stored energy per weight ratio of such storages is much lower than the one of fossil fuel, whereby a desired low weight of the accumulators does result in a limited range of activity of such a vehicle which can be overcome without regeneration or exchange of the storage.

The vehicles can be expected to be dominated by wheelers comparable to the presently used passenger cars, but also other transportation means such as lorries, trucks, tractors, public buses, scooters, motorcycles, electrically
5 powered bikes, crates, coaches or even construction machineries can in the future be equipped with electrical propulsions and therefore the herein described method and unit is also applicable on those.

To manage the consumption of energy and range of mobility
10 of the vehicles many, more or less sophisticated, methods and means that can be implemented into the vehicles are known in the prior art. Many of them involve the task of vehicle navigation similar to the navigation devices as included in fuel powered vehicles.

15 The words storage, battery or energy cell represent means, which are movable and capable of supplying electrical energy. This comprises advanced technologies such as liquid batteries as e.g. presented in US 2007/0154814, energy cells which are rechargeable by exchange of electrolytes or
20 liquid electrodes e.g. similar to the "liquid battery" presented in MIT's technology review magazine, No. 10, March/April 2009.

The storages can in general be primary cells as well as secondary cells, which signify that they do not necessarily
25 need to be rechargeable or regeneratable. They can as well just be exchangeable, replaceable or even consumable just once, with their remains disposable after usage. Therefore, the words storage, battery, energy cell, and accumulator are used in a synonymous way to describe those means.

30 The document JP 10170293 concerns the search of an optimum leading route to the destination, by considering the charge

of an on-vehicle battery on the basis of road map data which contains information on charging stations. A GPS receiver receives a GPS signal from a satellite and detects the present position, moving direction and moving velocity
5 of the vehicle. A memory stores road map data which includes information on the charging station such as its position and a residual capacity of an on-vehicle battery is measured. A controller searches an optimum leading route to the destination and displays the present position and
10 the leading route on a road map to guide a driver.

From the Japanese patent application JP 2006112932, a navigation system for an electric vehicle which can perform total time forecasting to a destination, including the charging time for a vehicle-mounted battery, is known. In
15 addition, the system is also capable of providing information on restaurant locations, tourist spots, leisure facilities, or the like in the vicinity of charging facilities. This is done by the navigation system for the electric vehicle which comprises a display, an input
20 section, a battery management section for measuring a remaining amount of the vehicle-mounted battery and a database section which stores position, information on charging performance and map information of the charging facilities.

25 An analysis section calculates charging time at the charging facility on the basis of the remaining amount of the vehicle-mounted battery, the energy consumption of the electric vehicle, the distance from the present position to the charging facility and the distance from the charging
30 facility to the destination. The time of arrival at the destination, including the charging time calculated by the analysis section, is displayed on the display section.

The document JP 1012802 discloses a system to prevent a battery-driven vehicle from stopping due to the consumption of the remaining capacity of a battery during travelling by an alternation of the destination to a charging position, 5 when the battery voltage arrives at a predetermined value. Therein a separate distance between the present travelling position of the battery-driven vehicle and a charging position for charging the battery is detected and a battery voltage allowable value according to the separate distance 10 signals is set. On the other hand, when the fact is detected that the remaining capacity of the battery arrives at a predetermined battery voltage allowable value, the designation is altered to a position instructed by a destination setter and a travel controller outputs a 15 command for the vehicle to travel to the charging position.

The therein presented method of changing the target of travel to a charging location when the battery level drops below a certain threshold might be acceptable if the recharging of the energy storage can be done within short 20 time or the vehicle is of a kind such as an autonomous electrical lawn mower, but it is not desirable for personal transportation and time consuming regeneration or charging processes, since the unpredictability of the system and the thereof resulting unknown time of travel and stopovers 25 would for sure not be accepted by a driver in many cases.

The publication DE 10 2008 017556 presents a navigation unit of a hydrid vehicle which records a charge-possible point and the history of travelling conditions near the charge-possible point. If a destination point on an optimum 30 route is the charge-possible point, the navigation unit determines a continuous section where the electrically powered travelling is possible up to the charge-possible

point, based on the history through state of a charge management plan preparation processing. The changing over between the hydrid powered and the electrically powered travelling is done according to this determination while
5 travelling.

Involving the recorded history of the travelling conditions on the chosen route, as presented in DE 10 2008 017556, allows an increase of the accuracy of the expected range that is achievable with the remaining charge of the
10 battery.

To overcome the drawback of the long regeneration or charging time, an exchange of the whole battery-package is a known solution, wherein the battery packages are charged at dedicated reconditioning locations for regeneration,
15 similar to today's filling stations. The publication WO 2009/039454 discloses an electric vehicle network comprising such battery exchange stations.

The vehicles will in this case drop off the whole battery package at the reconditioning station and replace it with
20 another, most likely, but not necessarily, one with a higher energy content than the previous one. The dropped off battery will be recharged at the location and then be put to another vehicle's disposal. The stopover time can thereby be reduced to the time needed for the replacement
25 of the battery, which can, in fact, be even shorter than the time needed to fuel a state of the art car.

It is also a known concept to recondition the storage by an exchange of only some parts of the battery like some electrolytes or electrodes, which are then regenerated (or
30 charged) at reconditioning stations instead of an exchange of the whole battery package. Thereby the longish charging

can be done at those stations and the time needed for reconditioning is reduced to e.g. pumping out the used, liquid electrolyte and pumping in the reconditioned one, whereby times similar to those of petrol fuelling stops can
5 be achieved.

Beside those dedicated public stations, also regeneration by sockets at public or private parking lots is possible, since electricity can be easily supplied without much effort by the often already present electrical networks.

10 But still, especially in case of longer distances, where the energy contained in one fully charged battery is not sufficient to reach the desired target, dedicated charge or exchange stations have to be considered in the planning of the best route or path of travel.

15 The stock of fully or partially charged batteries at such a station can only be limited and a single location can easily run out of charged batteries, while other batteries are lying around, unused for quite a while, at some other locations.

20 Therefore, a management of the usage of those regenerative storages and also of the availability of reconditioning stations and the stock and regeneration of the exchangeable storages is one of the challenges to overcome when the introduction of a wide-spread system for electrical
25 transportation means for private, public and/or business use should be achieved.

The resources of storages are a limited set, which entities can be associated to transportation means or reconditioning stations. Although in a global view their number is
30 sufficient to power the complete set of vehicles presently on the road, there can likely be a shortage of storages or

a queue for regeneration slots (storages and regeneration slots are further also referred to as resources) in one area, while in another area there is a huge stock of storages or lots of unused regeneration slots.

5 This results in a demand to manage the assignment or allocation of the energy cells to optimize their usage and avoid shortages. This can also be expressed as management of the assignment of transportation means to reconditioning stations, since the batteries or energy cells can in
10 general either be seen as associated to a transportation means or a reconditioning station, where they are consumed, charged or stocked.

It is therefore an object of the present invention to optimize the usage of a limited plurality of batteries and
15 reconditioning resources, especially in a global view of a plurality of transportation means on their way within a certain region.

A particular object of the invention is to provide an optimisation, comprising actual, at least partially online,
20 information about a plurality of eligible resources.

A further object of the invention is to improve the battery management for electrically powered vehicles comprising the guidance of the vehicles and to achieve a more accurate forecast of consumption and remaining range of the trans-
25 portation means with the residual charge of the battery.

These objects are achieved by realising the features of the independent claims. Features, which further develop the invention in an alternative or advantageous manner, are described in the dependent patent claims.

An aspect of the underlying problem can be described as a problem of assignment of a limited set of resources (batteries, reconditioning slots) to a limited set of consumers (transportation means) based on environmentally
5 dependent driving behaviour (e.g. availability of resources and conditions thereof) which can also vary over time.

Those environmentally dependent conditions can to a certain extent be stated as predefined and calculable, while others are recursively dependent on each other, some of them are
10 only partly predictable by an incorporation of some additional information but there are also some constraints that have to be stated as random in their occurrences so that they can, if at all possible, only be numerically accessible by statistical means.

15 A closed numerical solution of the assignment problem is therefore only possible for a limited number of problems with simple scenarios and hence some optimisation approach, most likely including some recursive re-calculation, has to be applied to "solve" the overall problem, whereby "solve"
20 does not necessarily stand for finding the one and only best solution, but rather will be a trade-off between calculation effort, available information and actually desired overall accuracy of the result, also known as suboptimal or near-optimal result. The mathematical problem
25 therefore can be described as a kind of constraint satisfaction problem.

The influencing parameters of the mentioned conditions and their consequences will herein be described in detail by way of examples, whereby a plurality of combinations of
30 those conditions and also further parameters, in particular dependent on their impact in a concrete given case, can be included in the actual optimisation process. For example,

an assignment-solution for one entity of transportation means to an entity of energy cell at an entity of reconditioning station will influence the availability of energy cells and reconditioning stations for the rest of the set
5 of transportation means which has to be taken into account in further calculations.

For the optimisation, certain conditions and aspects of the influencing parameters can be comprised by a usage of abstracted mathematical models of the underlying physical
10 or logical background, which can be comprised in lookup tables, statistical, historical or forecasted data. Those models can be overall, global models of the behaviour of the whole set of resources as well as models for subsystems such as e.g. a single battery or engine of a transportation
15 means. For the modelling, a plurality of methods are known to a skilled person, as e.g. physical models, differential equations, Fuzzy-Logic models, logical models, statistics models, forecasting models, etc.

In an actual implementation, a balance has to be found
20 between the number of parameters involved, the modelled dependencies between those parameters, the increase of complexity of calculation, and the increase of accuracy gained, whereby the inclusion of more information does in general not necessarily have to result in a correlative
25 increase of the overall performance of the method.

The process of optimisation does not have to be done globally - in the view of the whole world - although such might also be possible under serious calculation effort. Actually an approach which considers the resources being
30 approximately within a range being about the size of the range of mobility of the transportation means, or maybe twice, which should in general be sufficient to achieve

decent results. Therefore, the word "global" as used in this text should be interpreted as such and in contrast thereto the term "local" will be used to characterize the view of a small group or even single transportation means,
5 battery or reconditioning station, preferably of those entities which are likely to interact with each other.

The so defined global or local approach will result in the fact that some resources can dynamically drop in or out of the considered global or local zone by reaching the border
10 of such a zone, whereby some kind of handshaking between the zones will have to be considered. This leads to a dynamic variation of not only the values, but also the numbers of constraints according to the vehicles on the way.

15 The dropping in or out can also occur when a resource is taken in or out of service, e.g. by parking, repairs, duty, demanded stopovers, overnight stays, holidays, etc. so the number of resources to consider in the optimisation can be reduced to the actual active ones. Nevertheless, data about
20 means currently out of service can also be valuable for predicting forecasts, which can be included in the planning of the assignment.

Mathematically, an assignment problem has to be solved, in which a limited quantity has to be dynamically mapped to
25 another quantity by taking into account variable environmentally dependent behaviour. As the environment is partly recursively dependent on the assignment and it can further vary dynamically in number and value, an optimisation process is needed, which is trying to find an optimized
30 assignment by, probably recursively, optimizing the found solution by following a strategy that directs the results towards an, at least locally, optimal solution.

The parameters to be optimized, which are used to characterize the optimized solution, are in general a plurality of such parameters which will be combined in a desired way e.g. by an appropriate cost function.

- 5 The possibility of dynamic changes of auxiliary conditions also has to be taken into account when designing an appropriate algorithm which will most likely be implemented as a computer program product for the execution of the herein described methods, in particular those of the
- 10 independent and dependent claims, by a digital processor, and which will be stored in some memory means.

The optimisation can be done by an application of a search algorithm, particularly based on the principle of incomplete search, which comprises heuristics that try to

15 exploit partial knowledge about structure of the mathematical space, such as linear relaxation, constraint generation, and constraint propagation and the described models. This category includes a great variety of general metaheuristic methods, such as simulated annealing, tabu

20 search, A-teams, and genetic programming, which can be used for combining arbitrary heuristics in specific ways. A complete and exhaustive enumeration is theoretically possible but in practice a rise of complexity of the problem will increase the calculation effort in such a way

25 that the solution will not allow to find a solution within reasonable time, in particular not to provide solutions in real time or online.

There are also promising search methods designed for (currently non-existent) quantum computers, like Grover's

30 algorithm, that are theoretically faster than linear or brute-force search even without the help of data structures or heuristics.

As the optimisation includes geographically distributed locations which are connected by discrete pathways for the transportation means, also the art of graph theory can be incorporated in the optimisation, wherein the positions can
5 be represented as vertices and the pathways as edges. The basic approach used will be similar to the problem of state of the art navigation systems but the weighting of the edges and vertices of the graph and even the availability of the vertices is dependent on other auxiliary conditions
10 than those simple ones from prior art wherein only the shortest time of travel from A to B has to be found. This makes a comparison of the simple, two-dimensional route planning as known from prior art to the herein presented method for assigning is not feasible, although the present
15 method can also comprise some basics of such an approach, but in a much more sophisticated form.

The term combinatorial search is often used for algorithms that look for a specific sub-structure of a given discrete structure, such as a graph, a string, a finite group, and
20 so on. The term combinatorial optimization is typically used when the goal is to find a sub-structure with a maximum (or minimum) value of some parameter. Since the sub-structure is usually represented in the computer by a set of integer variables with constraints, these problems
25 can be viewed as special cases of constraint satisfaction or discrete optimization; but they are usually formulated and solved in a more abstract setting where the internal representation is not explicitly mentioned.

To be able to achieve a decent forecast of the remaining
30 range available with the remaining charge of the battery, some additional information is helpful.

First of all, information about the condition of the battery has to be known. The most important factor therein is the remaining amount of consumable electrical energy stored in the battery, e.g. measured in kWh. Other factors
5 such as full capacity, elapsed regeneration cycles, operating hours, maintenance schedule, temperature, age, manufacturer, type, model, maximum and optimal supply and charge currents, optimal charge profile, expected charging time to full capacity, a weighted age or an overall health
10 of the battery which is dependent on its usage history, can be comprised in such condition information of the storage as they directly or indirectly influence the amount of energy available. The content of electrical energy or charge in such a storage can be evaluated e.g. by the known
15 methods of measurement of the cell-voltage or cell-current, the impedance of the cell or other physical values. But also a measurement of the in and outflow of energy can be used to determine the present energy content.

By involving at least one of them, the accuracy of the
20 forecast can be improved. For example, the remaining available capacity or the allowable peak current can strongly depend on the temperature or usage history of the battery. In advanced embodiments for example even the heating of the battery can be predicted dependent on an
25 estimated forecast of current consumption, whereof not only a variation of available capacity but also a possibly resulting restriction of further current limits dependent on the expected rise in the temperature of the battery can be taken into account in the management of the battery.

30 Secondly, a consumption prediction of the vehicle is required to estimate the available range of the vehicle, achievable by the available amount of energy. In the

simplest form this can be expressed as an average energy consumption per distance, but more accurate results can be achieved by taking into account at least one of the following sets of information.

- 5 As e.g. solar cells are also allowing a regeneration during driving or stopovers, this can also be taken into account when determining the expected range by incorporation of actual data of energy supplied from such a source and/or by a forecast of such, which can e.g. consider weather
10 forecasts and the resulting expectable sunshine.

A three dimensional terrain model enables to not only take into account the distance to be travelled, but also an altitude profile of the track and the thereof influenced consumption or charge of battery during travel, which
15 allows a more accurate prediction of consumption on the selected path of travel.

Also, the type of road, potential stop and go or overland zones, speed profiles, weather conditions, traffic information as well as traffic guidance information, such as
20 already distributed over radio-signals or mobile internet, in particular containing information about obstructions, roadwork, traffic jams, accidents or the like, can be comprised in such an evaluation. Systems and protocols therefore are e.g. the ones developed by TPEG, known e.g.
25 as TMC or TIS which are broadcasted over the RDS channels of radio stations, but also lots of internet based services are known which are usable for the same purpose.

Further also expected holiday or season conditions on the road as well as rush hours or planned or required stopovers
30 can be valuable information which can be comprised in a forecast of consumption. Such a forecast of consumption

based on similar, event based occurrences is, for example, daily routine in electrical supply network administration, wherein the management of network consumption versus production of electricity has to be forecasted quite
5 accurately each day to buy or sell the correct amount of energy resources on the international electricity market as required the next day.

Also the characteristics of the vehicle itself have influence on the energy consumption. Such characteristics
10 can range from a simple numerical factor representing the characteristic kWh/km, over a speed and/or load dependent characteristic, to a plurality of information such as type of vehicle, weight and load conditions, aerodynamic resistance, top speed, most efficient speed, characteristic
15 energy consumption on different types of roads, which can for example also be determined according to analyses of recorded history data. The energy consumption can also be classified per road or path segment. Thereby a desirable optimum-speed on a road segment can be determined according
20 to the actual position and road segment the vehicle is travelling, for example to optimize the energy consumption of the vehicle, to enhance the road usage, for traffic guidance, according to road conditions, to enhance service life of the top-surface and/or according to the gradients
25 of the road segments.

If the batteries are exchangeable, also the types of batteries usable by the vehicle have to be known, as possibly batteries, differing in size, voltage, capacity, power-characteristics or the like can be available.
30 But also the consumption of further devices in the vehicle which are supplied by the battery, such as heating, cooling, entertainment equipment like radio or DVD-players,

headlights, windscreen wipers, breaks, the management system itself, communication equipment, etc. should be taken into account to complete the prediction of consumption. Some of them can as well be predicted according to
5 e.g. the local time of travel, weather conditions, ambient light or temperature conditions which can either be determined by sensors at the vehicle or taken from e.g. the weather forecast received by radio waves.

Beside the characteristics of the vehicle, also the ones of
10 the actual driver can have enormous impact on the consumption per mileage. Those can range from a simple classification like "race driver", "normal driver", "cruiser" or "sunday driver" to a more sophisticated approach by modelling the driver's characteristics based on known
15 historical data, in particular on the same vehicle or route or at least the same type of vehicle or route. To make use of such information, the driver has to be identified by some means such as e.g. a special code of his keys, his fingerprint, voice recognition, RFID, entering information
20 on an input device, or others, which information can for example also be used for adjusting the seat position and mirrors to suit the driver's needs.

Further, information about planned or expected stopovers and durations of stopovers as well as further planned
25 destinations and destinations to continue on afterwards are valuable information, since those can help to forecast the consumption of battery power with less uncertainty. For example such information about stopover durations and further targets allows to determine whether a recharge
30 during a stopover is sufficient for storing enough energy to reach the further planned target, or if for example an exchange of the battery, even before reach of the interme-

mediate stopover location would be the overall better option, whereby since a charging at the intermediate stopover is possible, also a replacement by a not fully charged battery would do, since the rest of the charge to full capacity can
5 be done during the stopover.

Restriction of the driving times for drives, in particular as applied by governmental restrictions for commercial vehicles, busses, long-distance traffic, can also be an issue which can be factored into the evaluation of a
10 desirable stopover station where the energy cells will be regenerated.

The driver does not necessarily have to be human, but can also be an electronic vehicle guidance system which, at least partially, steers the transportation means from one
15 location to another. Although such systems are at the moment in a quite early development stage, they will probably be available to the public in near future, at least for simple tasks such as overland highway travel. In such automated driving systems, even more enhancements
20 could be gained by the herein disclosed methods, as e.g. an automatic adaptation of driving characteristics for the achievement of a desired range of movement which allows reaching a certain station can be implemented.

In advanced embodiments also the time of day for charging
25 can be incorporated in the planning process, since the price of electricity is highly dependent on the availability which can highly fluctuate in the course of time. The incorporation of so called "Smart-Grid-Charging-Infrastructures" can bring further benefits in the forecast
30 of desirable recharging schedules by taking into account the availability and/or price of electricity.

The above described conditions, or at least a subset of those, will help to determine an accurate forecast of the remaining range of the vehicle.

Based on this consumption forecast and the condition
5 information of the battery, planning the required reconditioning stopovers where the batteries are exchanged or regenerated can be done on a quite accurately predicted basis.

In particular since some of the above mentioned characteristics are dependent on each other or on the chosen route,
10 an overall optimisation also including the choice of route can be done, e.g. in cooperation with a state of the art car navigation system. The criteria therefore can for example be the shortest time to travel, shortest distance
15 to travel, lowest energy consumption, nicest view, sight-seeing spots, avoiding of toll charges or parking fees, optimized connections to public transportation means, optimized round-trip time by inclusion of a plurality of destinations, possible activities during stopovers like
20 coffee breaks, meals, golf courses, swimming pools, hotels, or others. It is also possible to work out the most relevant alternatives and provide those as options for the driver to choose from. In particular the mentioned identification of the driver or analysing the choices from a
25 history of the same or similar trips enables the system to tune the presented alternatives according to the preferences of the driver or even automatically choose the drivers preferred route if the driver and his preferences are known as for example the daily route to and from work.

30 As the resources for charge or exchange of the storages are a limited factor herein, further advantages can be gained by not only involving the single vehicle and battery into

the optimisation process, but by considering a plurality of such, in particular the ones within an intractable range. By doing so an overall - here also called "global", although geographically restricted to areas certainly
5 smaller than the whole world - further optimisation of the management of the resources and their usage can be achieved. Thereby it is possible to distribute the limited resources across the transportation means in an optimized way.

10 Either this can be done by a centralized, dedicated management means or a group of such means or by individually distributed means at each of the vehicles or the batteries. What is needed therefore is some kind of computation means and a communication link in-between the
15 vehicles, reconditioning stations and/or the management means that allows the exchange of actual information, either directly or indirectly e.g. by a connection to a communication network like the internet or its successors. Also cloud computing can be used as computation means, i.e.
20 computational resources can be provided on demand via a communication network.

This does not mean - although this is would be a preferable variant - that the vehicles have to be online all the time during travel. An information update e.g. at the recondi-
25 tioning stations can also be sufficient. Means for establishing the communication line are, due to the mobility of the vehicles, preferably wireless communication means, such as the known WPAN, WLAN, WMAN, WWAN, GSM, GPRS, UMTS, HSDPA, NGMN, Iridium OpenPort, WIMAX, Bluetooth, Zigbee or
30 other similar means. Also, a communication over the power-line which is used for charging is possible.

To execute the herein presented method, some information about the actual positions of the resources (batteries, vehicles and reconditioning locations) are also desirable. Those can e.g. be defined by global position data from a
5 GPS, GLONAS, GALILEO or other system, capable of providing position information, which can be received by means associated either directly to the battery or to the transportation means.

Based on the position data, the conditions of the batteries
10 and the forecasts of consumption, in particular in combination with positions and characteristics of the reconditioning locations, allow an optimisation of the distribution of the resources that can be managed by an application of an optimisation algorithm on the overall problem.

15 By characteristics of the reconditioning locations, information on things like charging capacity, capability, number of charging slots, stock and condition of batteries in stock, availability of the battery-stock and the charging-slots, scheduled reservations or fixed bookings of
20 the batteries on stock or changing-slots and others, can be obtained. Also the price for regeneration can be of importance and included in the decision e.g. whether to choose a close but pricey or a remoter but also cheaper location.

25 A problem thereby is to find a decent assignment of the available resources, while still gratifying auxiliary conditions, at least to a certain range.

The optimisation can be done by some search algorithms such as known from the arts of combinatorial, graph-theory,
30 genetic algorithms, Tabu-Search, Simulated Annealing, or others. Criteria for optimisation can be e.g. the time of

travel for each vehicle, the overall energy consumption, the distribution of batteries as desired according to a forecast of further needs, a load balancing over the plurality of reconditioning locations, a load balancing on
5 the roads, an optimisation of vehicle delays due to charging times, avoidance of traffic jams at rush-hours, or any combination of such.

The relevant optimisation criteria can be weighted and combined by application of a cost function which helps to
10 optimize against multiple demands. For example the optimisation could be directed to consider minimizing the individual travelling times of the entities of transportation means to 50% but also to reducing the overall energy consumption of the whole set of transportation means to 25%
15 by still fulfilling the stopover demands of the drivers to a certain range which seems acceptable at 25%.

In particular when closing in to a desired reconditioning location, a narrowing of the solution space of the optimisation will occur, whereby for example in a first step a
20 preliminary reservation of an available stock or regeneration slot can be executed, and/or in a second step a fixed booking of the desired resources can be executed to ensure the availability at the time the desired location is reached, and also inform management means(s) of the reduced
25 resources at the desired location, which has to be concerned in the further optimisations. Thereby an avoidance of resources conflicts or "jumping around" of the selected stopover location can be avoided and also the optimisation process does not need to re-evaluate those fixed solutions
30 any more.

The means for managing the battery in the vehicle can also fulfil other additional purposes such as e.g. auto speed

limit, distance control, management of the motors and/or comfort functions, etc.

The method according to the invention for guiding a mobile transportation means of a set of transportation means, to a
5 selected reconditioning station of a set of reconditioning stations which transportation means have each associated a powering battery of a set of batteries, in a geographically distributed arrangement of the transportation means and the reconditioning stations, comprises at least the following
10 steps:

The step of determining a position of the battery and/or the associated transportation means as a position datum by the usage of a position determination means, in particular wherein the position of the battery is determined either by
15 the battery itself or by the position of the associated transportation means or by the position of the reconditioning station where the battery is currently on stock.

The steps of determining a condition of the battery, and forecasting a consumption prediction of the transportation
20 means, for evaluating an achievable range of mobility of the transportation means according to its consumption prediction and the condition of its powering battery and the step of guiding the transportation means to the selected reconditioning station, which is located within
25 the range of mobility of the transportation means along a path to a desired target and assigning the selected reconditioning station to the transportation means for charge or substitute of the powering battery.

Therein, the assignment of the selected reconditioning
30 station is based on an environmentally dependent driving behaviour.

The environmentally dependent driving behaviour can be represented by a model and/or historical data, in particular with forecasting of the consumption characteristic according to an altitude profile of the path from a three-dimensional terrain information and/or characteristics of a driver of the transportation means.

The environmentally dependent driving behaviour can comprise further information from a plurality of entities of the sets of reconditioning stations, transportation means and/or batteries as part of the environment, in particular also information of their respective conditions.

The characteristics of a driver of the transportation means comprise the driving style of the driver of the vehicle, in particular determined from actual data or a history of the driving characteristics of the same driver.

The model of the environmentally dependent driving behaviour can optionally further comprise the actual and/or forecasted information of the stations, transportation means and/or batteries as well as the other environmental influences as mentioned in this document.

The invention also relates to a guidance unit and a computer program product for the execution of the method according to the invention.

The method according to the invention and the devices and setup according to the invention are described or explained in more detail below, purely by way of example, with reference to working examples shown schematically in the drawings. Specifically,

Fig. 1 shows an example of a possible geographical setup for explanation of the method according to the invention;

5 Fig. 2 shows an abstracted view of a setup wherein an evaluation of an achievable range under forecast of a consumption prediction comprising auxiliary conditions of terrain and environmental characteristics is done according to the method of the invention;

10

Fig. 3 shows a further example of another setup where the method according to the invention is executed;

15 Fig. 4 shows an abstracted example to explain some aspects of the assignment of the sets by the method according to the invention;

20 Fig. 5 shows all possible assignments in a simple setup of small sets of transportation means and reconditioning stations and stopover locations;

25 Fig. 6 shows a path of an entity of transportation means to a destination with a regeneration stopover and a coffee break along the path which is assigned by the method according to the invention;

Fig. 7 shows an illustration of the basic steps of an exemplary assignment according to the invention;

30 The diagrams of the figures should not be considered as being drawn to scale.

Figure 1 illustrates a 3D view of an exemplary geographical setup of an area 1 wherein a set of transportation means

2a, 2b, 2c and a set of reconditioning stations 3a, 3b and 3c is shown. In this case, the transportation means 2 are illustrated by cars only although the method is not limited to this type of vehicle. The reconditioning stations 3a to 5 3c are illustrated by circles comprising a stock of two batteries 4, but in practice, the stocks will most certainly be different at different stations. At such a station 3, it is possible to substitute or replace a battery 4 which powerings the transportation means. The 10 battery 4 can then be charged at the station 3 to be subsequently supplied to another transportation means 2. Some of those reconditioning stations 3 can also allow the charging of the battery 4 without substitution, by supplying charging energy to the transportation means 2 (or, more 15 exact, to its assigned battery 4) for recharging, which can be done for example by a connecting cable or wireless by induction. Dependent on the type of energy cell 4, which does not need to be a battery or accumulator in a popular sense, but can also be some new concept of energy storage, 20 the term "reconditioning" can also mean any other process, such as for example an exchange of electrolytes or electrodes, either solid or liquid ones.

The target 5 towards which the entity of transportation means 2b is heading is, in this special case, also a 25 refreshing station, in particular a "charge-only" station where no stock of batteries for exchange is present. The destination 5 could for example be a parking slot at a shopping centre 5a which is equipped with an electrical socket where vehicle 2b can be plugged in for recharge, 30 while the vehicle is parked and the driver is doing business.

Close to the reconditioning station 3b there is a restaurant 6 located, which can be visited by the driver for a lunch or coffee stopover during which the battery of his vehicle can be reconditioned, which means it can be
5 exchanged or charged. Such a stopover can be one planned by the driver, allowing him to relax, consume food or drinks, as well as one demanded e.g. by governmental restrictions such as limited driving hours or times. Especially, if charging the vehicle's battery 4 takes quite a long time,
10 also other leisure activities such as sightseeing, museums, swimming pools, amusement parks, golf courses, etc. as well as business opportunities like temporary offices, can be provided at the stopover location 6. Such additional opportunities can be included in the planning of the trip
15 and the assignment of a certain entity of reconditioning station 3b out of the available set, dependent on needs and likes of the driver.

As illustrated for the transportation means 2b, but obviously not limited to this single entity of transportation means, a position determination means, as illustrated
20 by the satellite navigation system 7, which can for example be a GPS, GLONAS, or GALILEO system, is comprised in either the vehicle 2 or its powering battery. Also, other possibilities such as GSM-Stations or movement tracking systems
25 can be used to gather an actual position datum of the vehicle or battery. As the positions of reconditioning stations 3 are known (although there might be mobile reconditioning stations too) this allows an assigning of a certain entity of reconditioning station 3b or 3c to an
30 entity of transportation means 2b, preferably close to a path to a desired target position 5, as exemplarily shown by the two paths which are indicated by the dashed lines.

Such a guidance means for guiding a transportation means 2b to a reconditioning station 3b can for example be similar to the state of the art navigation systems, where a driver can enter a desired target location to which he then will
5 be guided along the shortest, quickest or cheapest path.

As the power contained in the battery of the vehicle is limited, some stopovers for reconditioning the battery might have to be included in the planning, if the energy of the battery is not sufficient to directly reach the desired
10 destination 5. Especially for short stopovers at the destination 5, or when a reconditioning at the stopover location to a sufficient level is not possible, the inclusion of information about a continuation of travel - if known - can be planned in as well to avoid running out
15 of energy later on, in an area where no reconditioning stations are within range or an indirection would have to be taken to reach a station. By the inclusion of planned going on, an exchange of the battery can be planned in along the path, even in advance of reaching the first
20 target 5, although such would not be necessary for reaching the target 5. By this pre-exchange, a later target can then be reached after the stopover at the target 5 without having to take an indirection to a reconditioning station. The second target can be, as a simple example, the way home
25 from the target 5, taking the same path as used to go there.

The transportation means 2c is also equipped with a solar panel 10, which allows a recharge of the energy cell by sunlight during travel or stopovers, dependent on the
30 weather conditions. This can also be taken into account in the forecast of the consumption prediction, in particular

in combination with a forecast of potential sunshine at its location.

Please also take notice of the trees 8 and 9 in the area 1 which will be less polluted by exhausts of the transportation means 2a to 2c since those are powered either fully or
5 at least partially by electricity and managed by the method according to the invention.

Figure 2 shows an abstracted close-up view of one entity of transportation means 2 on the way to the target 5.

10 To select an assignment of a reconditioning station 3a, 3b, or 3c to the transportation means 2, an achievable range of the transportation means 2 has to be evaluated, which certainly has to involve a determination of the remaining power of the powering battery 4, as described above. The
15 powering battery 4 is thereby not limited to a single unit but can also comprise multiple units which can be used parallel or sequentially. It is also an option to vary the number of units according to an actually desired range which means for example that for short travels less
20 batteries will be on board of the vehicle than for long overland travels which for example can bring advantages due to weight reduction.

To evaluate the theoretically achievable range 11, further a prediction of the consumption of energy of the transportation means 2 needs to be forecasted or estimated as well.
25

According to the invention, such a forecast can comprise information about the environmental driving behaviour such as terrain, in particular the altitude profile 13a, 13b and 13c, of the path 12a, 12b or 12c which will be travelled
30 and/or other additional environmentally dependent driving behaviours.

The terrain information allows a more accurate forecast of the consumption, as for example type or condition of the road on the selected path and in particular, the altitude profile of the path, has a direct influence on the power consumption. For example, a path over a steep pass on a mountain will require more energy than taking a path along a valley with less height differences or a flat highway through a tunnel. Therefore, the achievable range will vary dependent on the selected path as shown by the ranges 11a, 11b and 11c in context of the respective paths 12a, 12b and 12c.

The path 12b can not be taken, since the range 11b is not sufficient to reach the destination 5 with the amount of energy from the energy cell 4 associated to the transportation means 2. Therefore, a reconditioning of the power energy cell 4 by charge or exchange would be needed but apparently, no station 3 for doing so is available along the path 12b, so that this path can not be chosen.

In this example, the inclusion of the terrain information 13a and 13c results in the case of path 12a in a range 11a which makes it impossible to reach the reconditioning station 3a.

A system according to prior art would fail in such a situation, since according to the theoretical, path-independent range 11 this would not have been foreseeable.

The environmental dependent driving behaviour can comprise the characteristics of the driver of the vehicle which can be human, but also non-human in a computer controlled vehicle or in case of an autonomous vehicle comprising an auto-pilot. Another example of a driver characteristic can be class of driver, his preferences and all the other

things influencing the assignment as mentioned herein. For example the driving characteristics can be implemented as a mathematical model of a driver which is parameterized according to historical data recorded for the same driver, or also automatic detection according to the present behaviour of the driver or by input from the driver which helps to indicate the fact how "urgent" a travel is and if a higher energy consumption has to be predicted due to the sportive driving style which will be used.

Such information to be comprised in the forecast can be modelled in different ways, for example based on the underlying physics of driving, but also on recorded historical data, a model whereof is generated and/or parameterized.

Figure 3 shows a single entity of transportation means and a set of reconditioning stations 3a, 3b, 3c and stopover locations 6a, 6b, and 6c and connecting path 12a and 12b to a desired final station or location 5, which can be seen as one of the simplest embodiments according to the present invention. Apparently, practical implementations can be much more complex with much bigger sets. The assignment can be done completely offline, with the necessary data coming from some digital storage media, such as a DVD comprising geographical data like terrain information, connecting street networks and positions of reconditioning stations. The data can be comprised according to the invention to find possible solutions for the assignment of entities of reconditioning stations to the transportation means and guiding the transportation means on a path to the reconditioning stations 3, the stopover locations 6 toward the final destination 5, wherein the actual assignment will also influence the path.

In this example, the currently assigned battery will allow, according to its condition at the actual time and position, and according to the usage forecast, which comprises a terrain-dependent consumption prediction of the paths 12a and 12b, to achieve a range as marked by the line 11b. Since this range 11b allows only on one of the two possible paths to reach a reconditioning station 3, this path 12b is in this case the only one which can be taken. At the station 3b, located within the range 11b on the path 12b there will be - according to online information about the condition of the station 3b - only one battery available at the expected time of arrival, which will be reconditioned up to 70%.

With this 70% charged battery, the achievable range 11a will not be sufficient to reach the desired destination 5 from the station 3b, for which at least 80% of full capacity of the available type of battery would be needed. In this case, a solution would be to wait at the station 3b until the battery will be sufficiently charged, which can be expected, according to a forecast of the charging process, in about 42 minutes after the expected arrival at the station 3b. The driver has to wait at the station 3b until the battery has reached its 80% capacity or alternatively, the method according to the invention can suggest for example a coffee-stopover at the location 6b along the path 12b, to reduce or avoid waiting times at the station 3b. To ensure the availability of the desired battery at the station 3b at the time of arrival, the battery can be reserved online or booked according to the selected assignment at the station 3b where the transportation means will be guided.

Figure 4 illustrates an exemplary assignment according to the invention in view of multiple transportation means 2, stations 3 and batteries 4 out of the respective sets, which are geographically distributed over an area. As noted
5 above, it is one possible way for solving the assignment to consider the whole sets, but this is in general not mandatory, since it can be sufficient to consider only those subsets of entities, which can actually interact with each other due to their availabilities, positions, ranges
10 and directions.

In this example, the considered set of transportation means consists of two cars 2a, 2c, whose drivers have each entered desired target location 5a, 5c into their guidance systems. There is also a third vehicle 2b in the set of
15 transportation means that has to be considered, which is a mail van 2b on its planned daily route to the remote post offices 5d and 5b.

One of the plurality of possible solutions for assignment of the transportation means 2 to the set of available
20 reconditioning stations 3a to 3d and under consideration of the available road-connections between them is shown by the lines from the transportation means 2 to their targets 5.

As it will be shown below, the presented solution has some drawbacks which can be overcome by the method according to
25 the present invention.

Obviously, a shortage of batteries 4 exists at the station 3b as there is only one entity of battery 4d in stock, but there are two transportation means 2a and 2b which are assigned to the station 3b. In an unmanaged system, this
30 would result in delay of one of the vehicles 2, since only one can exchange its battery 4 at the station 3b and the

other one will have to wait until charging has finished, at least to such a capacity that allows a further travel to the destination or another station, where a sufficiently charged battery is available.

- 5 In the scenario comprising the method according to the invention, this can be avoided by an optimisation of the assignment and guidance. As an accurate prediction of energy consumption, dependent on the path of travel is achieved by taking into account environmentally dependent
- 10 driving behaviour, in particular the terrain information 13a and 13b, which are forecasted by a model, a new, alternative solution can be found, which is marked by the dotted line 14. Due to the lower energy consumption on the new path 14 with the terrain 13a than on the path with
- 15 terrain 13b, the station 3a will be in range of vehicle 2a. As the driver of 2a on his way to 5a has planned a meal stopover at the restaurant 6b anyway, his path can be optimized by taking the meal about half an hour earlier at the restaurant 6a, which is combined with the recondition-
- 20 ing station 3a. At the station 3a there will be, according to a current forecast, no battery 4 on stock at the estimated arrival time of the car 2a, but since the planned meal stop at 6a will last for about an hour, this time can be used to charge the battery 4a onboard of the vehicle 2a
- 25 to a condition which allows to achieve the range needed to reach the final destination 5a. The overall travelling time of vehicle 2a will be about the same as in the first approach, but the guidance and assignment is optimized according to the invention.
- 30 This optimisation does also affect the vehicle 2b, as this can now be assigned to the battery 4d at the station 3b without conflict, allowing it a quick reconditioning

stopover by exchange of the battery at the station 3b, which is desirable since the post van 2b has a fixed schedule for its trip, which comprises the stations 5d and 5b, wherein delays can have severe impact on the whole postal service in this area. Therefore, a certain priority can be assigned to this vehicle's demand over e.g. leisure travels, or shopping trips.

According to the invention in a more sophisticated embodiment, the assignment can also comprise information about the mentioned schedule of the trip of 2b whereby a forecast of demand of batteries at station 3b can be done each working day, when the post van 2b will be on its way, to ensure the quality of the postal service in this area. In one case, this can e.g. be done by a preliminary reservation of the reconditioning station 3b or in particular of an entity of the stock of batteries 4 at the station 3b.

Since a change of path for the transportation means 2b is not desirable, its path can also be fixed and a fixed booking of the reconditioning station 3b or in particular of a battery 4d which has sufficient remaining charge at the expected time of exchange, can be done for each working day.

Mathematically, the method according to the invention does assign the set of transportation means 2 {2a, 2b, 2c} to the set of reconditioning stations 3 {3a, 3b, 3c, 3d} for charging or exchanging the powering battery {4a, 4b, 4c} of the corresponding transportation means out of the set of batteries 4 {4a, 4b, 4c, 4d, 4e, 4f, 4g, 4h, 4i}.

In this assignment, supplementary conditions are comprised such as for example the possible paths between the mentioned sets, a model of terrain information 13a and 13b of

the paths, a model of driver's characteristics, the conditions of the entities like charge level of the entities of battery 4, consumption index or model of the transportation means 2, reconditioning capabilities of the stations and/or the other influencing factors, especially, but not restricted to those factors and aspects explicitly mentioned in this application.

Based on those supplementary conditions, an optimisation of the assignment can be done with the goal of finding the best global solution. Such an optimisation can for example be targeted to an avoidance of resource conflicts, in particular a lack of charge or exchange facilities at the reconditioning stations 3, but also multiple aspects can be targeted in optimisation for example by weighting different aspects according to a cost function as already explained.

Examples for supplementary conditions which can be included in the assignment process according to a modelling of influencing parameters and their effects have already been shown. For example, the terrain or environmental information can be used to weight the edges of the graph between the vertices.

Figure 5 exemplarily shows an almost complete solution space of assignment and guidance options for a small set of stations B and transportation means 2 which shows rapid increase of complexity in view of larger sets.

Although the method according to the invention brings advantages in view of single, offline transportation means, an embodiment which comprises information of a plurality of entities or a subset of the sets can further improve the performance of the method according to the invention. In particular, when an information exchange between the

entities is established, only at certain times like during stopovers or online during most of the time of travel by some wireless communication means as discussed above the overall performance can be increased.

- 5 In a particular embodiment, the edges of the graph in figure 5, which are shown by solid lines, can be weighted dependent on a number of the side conditions, which can also be interdependent on each other, as already explained above.
- 10 The method according to the invention will determine the assignment of the resources by applying of a search algorithm as known in the art, to the graph for determining an optimized assignment whereby the transportation means can be guided to the reconditioning stations.
- 15 Figure 6 shows an exemplary setup were a path 15 of the transportation means 2 to a destination 5 is shown, along which a reconditioning station 3 is assigned to the transportation means 2, where its assigned battery can be exchanged. Further there is a coffee-stopover 6 assigned
- 20 where the already exchanged battery of the transportation means 2 can further be connected to a recharging facility if necessary for reaching the destination 5 or follow up destinations. The information on which the assignment is based is in this embodiment transmitted over wireless
- 25 communication means 16, illustrated by antennas at the transportation means and stations. The actual optimisation is done at the centralized assignment means 17 for the considered area 1 which can establish a communication link to the transportation means, stations and also to the
- 30 internet for the reception of weather forecasts, traffic information, expectable demands due to special events, planned schedules and the other information already

mentioned. This actual and forecasted information is used as auxiliary conditions or constraints in the assignment process, which is done by a cluster of servers at the assignment means 17. The grid shown in the area 1 can be
5 used for determining the distances according to the Metric- or Manhattan-Method. The results of the assignment will be transmitted to the transportation means and station which will comprise the assignment in the local planning at the station 3 or guidance of the transportation means 2, for
10 example in planning the path and stopovers and guiding or assisting the driver of the transportation means to follow the path along the assignments.

Figure 7 exemplarily shows a simple illustration of an embodiment of the assignment, not from a geographical, but
15 from a logical view, to explain some of the basic steps comprised therein.

An entity of the set of transportation means 2 which has an associated or currently assigned battery 4 is assigned to an entity of reconditioning station 3 out of a set of such
20 stations. The stations can also have a stock of currently assigned batteries 4 which are either waiting for charging, are currently being charged or have already been charged and are stocked to be supplied to demanding transportation means. All the batteries 4 at the reconditioning stations 3
25 and the transportation means 2 make up the set of batteries.

The assignment 25 according to the invention will at least comprise information about the condition 22 of the battery 4 and the consumption prediction 21 of the transportation
30 means 2 along a desired path 20, whereof a range of motion 23 can be evaluated, which is currently achievable. Out of the information, regarding the range 23 and the path 20, as

one special example, a pre selection of a subset of eligible stations 24 which are convenient for the transportation means can be involved, out of which subset selected assignment 25 can be made. This selected assignment
5 comprises an optimisation of the assignment 25 on the basis of the environmentally dependent driving behaviour. A change of assignment 25 can also result in a change of the path 20, whereby a recursive re-calculation might occur during optimisation. As already explained, a plurality of
10 other environmental restrictions and/or conditions 26 can also be comprised in the selection of the assignment 25 according to the invention.

Patent claims

1. Method for guiding a mobile transportation means (2a) of a set of transportation means (2), to a selected reconditioning station (3a) of a set of reconditioning stations (3) which transportation means (2) have each associated a powering battery (4a) of a set of batteries (4), in a geographically distributed arrangement of the transportation means (2) and the reconditioning stations (3), with the steps of:
- determining a position of the battery (4a),
 - determining a condition of the battery (4a),
 - forecasting a consumption characteristic of the transportation means (2a),
 - evaluating an achievable range of mobility for the transportation means (2a) according to its consumption characteristic and the condition of its powering battery (4a),
 - assigning the selected reconditioning station (3a), out of the set of reconditioning stations (3), to the transportation means (2a) for charge or substitute of the powering battery (4a), which is located within the range of mobility of the transportation means (2a) along a path (12a) to a desired target (5a),
 - guiding the transportation means (2a) to the selected reconditioning station (3a),
- characterised in that**
- an optimisation of the assignment and/or the path is executed by a search algorithm for assigning the set of transportation means (2) to the set of reconditioning stations (3) and batteries (4), based on actual and/or forecasted information about multiple entities of the

sets of transportation means (2), stations (3) and batteries (4) as well as their conditions, the optimisation being done on a cost function combining at least:

- 5 • a spatial distribution of the set of batteries (4) over the reconditioning stations (3), and a forecast of desired stocks,
- a travelling time of transportation means (2),
- an overall energy consumption of one or multiple en-
- 10 tities of the set of transportation means (2),
- a priority of one or multiple entities of the set of transportation means (2).

2. Method according to Claim 1,
- 15 **characterised in that**
- the search algorithm is based on the principles of:
- heuristics,
 - incomplete search,
 - genetic algorithms,
 - 20 • tabu search,
 - simulated annealing,
 - Greedy-Algorithm,
 - Prim-Algorithm, and/or
 - Kruskal-Algorithm.

- 25 3. Method according to any of the preceding claims,
- characterised in that**
- the optimisation is executed in a centralized way, by
- a stationary dedicated means (17) or
- 30 a group of such dedicated means,
- or decentralized
- in each battery or transportation means or

by cloud computing.

4. Method according to any of the preceding claims,
characterised by
- 5 the optimisation comprising a narrowing of the solution space while progressing towards the selected reconditioning station (3) or a stopover location (6) for each transportation means (2, 2a, 2b, 2c), resulting in an optimized path (12a, 12b, 15) of travel.
- 10
5. Method according to any one of the preceding claims,
characterised in that
- the path (12a) or a section of the path and/or assignment will be re-determined for the transportation means (2a) while travelling,
- 15 in particular by involving a preliminary reservation of the assigned reconditioning station (3a) or an entity of battery (4a) stocked there, and/or
- the path, section of the path and/or assignment will be fixed for the transportation means (2a) in advance of arrival at the reconditioning station (3a) by a fixed booking of the assigned reconditioning station (3a) or an entity of the set of batteries (4) stocked there.
- 20
- 25 6. Method according to any of the preceding claims,
characterised in that
- the selected reconditioning station (3a) is determined by further involving actual and/or forecasted information about:
- 30
- a condition of the reconditioning stations (3) of the respective set,
 - a condition and position of the at least one other battery out of the according set (4),

- the path (12a) of the transportation means (2a), and/or
- a path (12b) and allocation of at least one other transportation means (2b) out of the according set.

5

7. Method according to claim 6,

characterised in that

the condition of the reconditioning station (3) comprises at least actual and/or forecasted information about:

10

- a reconditioning capacity of the station,
- a usage of the reconditioning capacity,
- a number of available slots for reconditioning,
- a maximum reconditioning speed,
- 15 • a restriction of usage for public, private or certain other groups,
- a battery stock at the station,
- a booking or reservation information of the battery stock or the reconditioning capacity,
- 20 • a price for reconditioning of the battery, and/or
- an information about leisure or business activities located around the station.

8. Method according to any of the preceding claims,

25

characterised in that

the actual information is exchanged by a communication network (16), either updated generally online while travelling or at least updated occasionally, in particular by a wireless communication means.

30

9. Method according to any of the preceding claims,

characterised in that

the assignment of the selected reconditioning station (3a) is based on an environmentally dependent driving behaviour.

5 10. Method according to claim 9,

characterised in that

the environmentally dependent driving behaviour is represented by a model and/or historical data, in particular with a forecasting of the consumption
10 characteristic according to an altitude profile (13) of the path (12) or a section of the path from a three-dimensional terrain information and/or a characteristics of a driver of the transportation means (2a).

15

11. Method according to any of the preceding claims,

characterised in that

the path (12a) is determined according to:

- the position of the transportation means (2a),
- 20 • the position of the desired target (5a) of the transportation means (2a), in particular according to a driver's input,
- the positions of the reconditioning stations (3),
- information on a planned continuation after the desired target (5a) has been reached,
25 • information on planned or demanded stopovers (6) of the transportation means (2a) and expected times for stopovers, and/or
- information from traffic information or traffic guidance systems.
30

12. Method according to any of the preceding claims,

characterised in that

the condition of the battery (4a, 4b, 4c, 4d, 4e, 4f, 4g, 4h, 4i) comprises at least a subset of:

- actual capacity,
- full capacity,
- 5 • temperature,
- actual state of usage,
- estimated remaining power,
- estimated time to recharge to full capacity,
- age,
- 10 • date of production,
- elapsed operating hours,
- elapsed regeneration cycles,
- health or weighted age, according to a usage-history,
- required maintainance times,
- 15 • life expectancy,
- load history,
- desired recharging characteristics,
- max recharging power,
- desired supplying characteristics,
- 20 • max peak power,
- max continuous power and/or
- manufacturer, type, model, serial number.

13. Method according to any of the preceding claims,
25 **characterised in that**

the model used for the forecast of the consumption characteristic comprises at least a subset of:

- the path (12a) or a section of the path of the transportation means (2a), in particular comprising a stop
30 and go zone, a road type and a road condition;

- a consumption characteristic of the transportation means (2a), in particular comprising a characteristic energy consumption of the transportation means (2a), a class of transportation means, a weight and/or a load;
 - a drivers characteristic of an actual driver of the transportation means (2a), either human or non-human;
 - an information history of other transportation means (2) and/or drivers previously travelling the path;
 - a forecast of holiday, seasonal or rush-hour conditions to be expected on the path and/or
 - an information from traffic information or traffic guidance systems.
14. Guidance-unit designed for performing the method according to any of claims 1 to 13, comprising at least:
- a localisation unit (7) for determination of a position datum,
 - a battery observation unit, for determination a condition of a battery,
 - a range evaluation unit for determination of an achievable range according to the condition of the battery and to a forecast of a consumption prediction of a transportation means (2a) associated to the battery,
 - a guiding unit, in particular comprising an interface to a human user, for assigning an entity out of a set of reconditioning stations (3) to the transportation means (2a) and providing information for guiding the transportation means (2a) to the entity of recondi-

tioning station along a path to a target (5) for the transportation means.

15. Computer program product comprising program code stored
5 on a machine-readable medium, for carrying out the method according to any of Claims 1 to 13, in particular if the program is executed in a computer or on a cluster of computation units.

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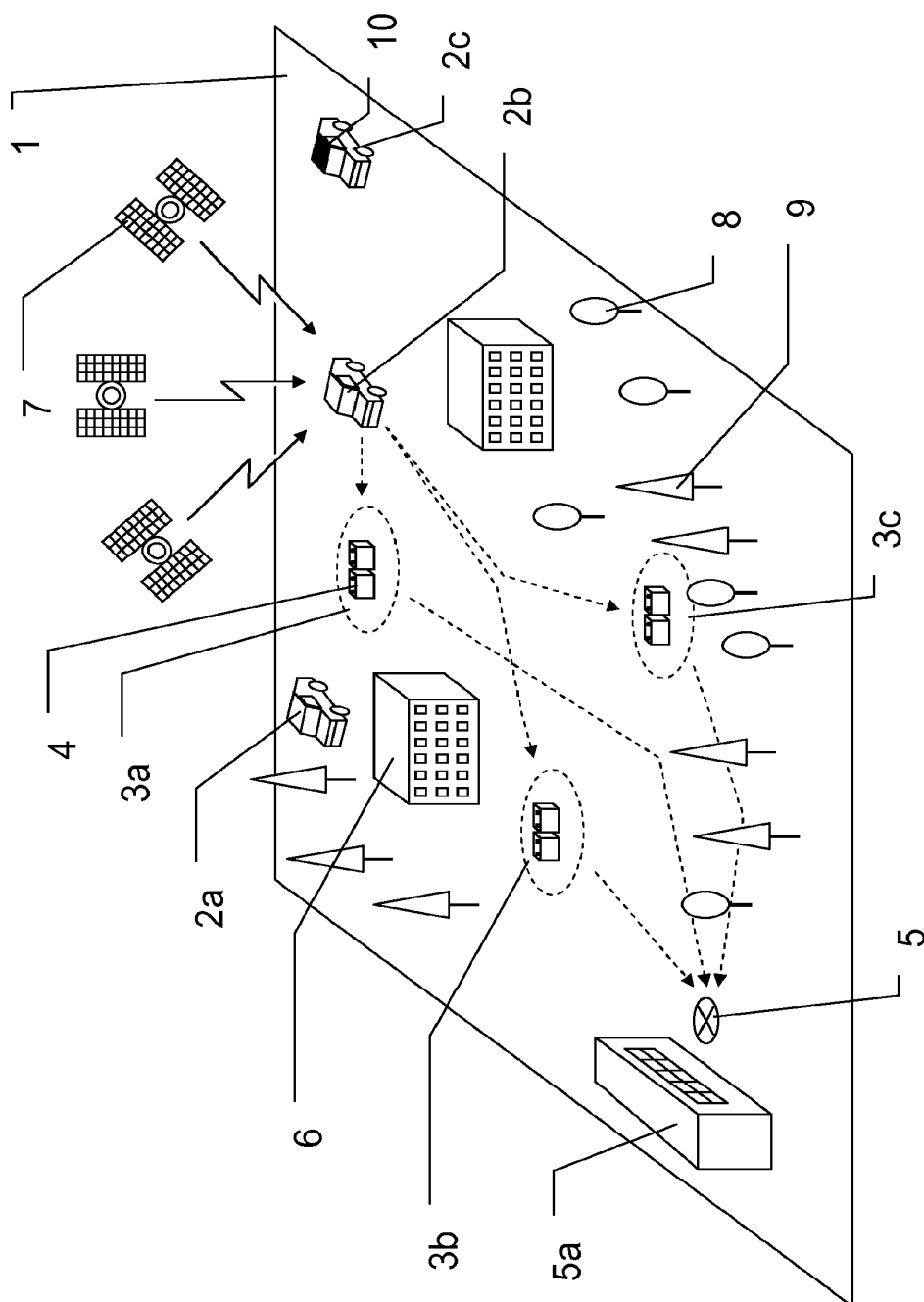
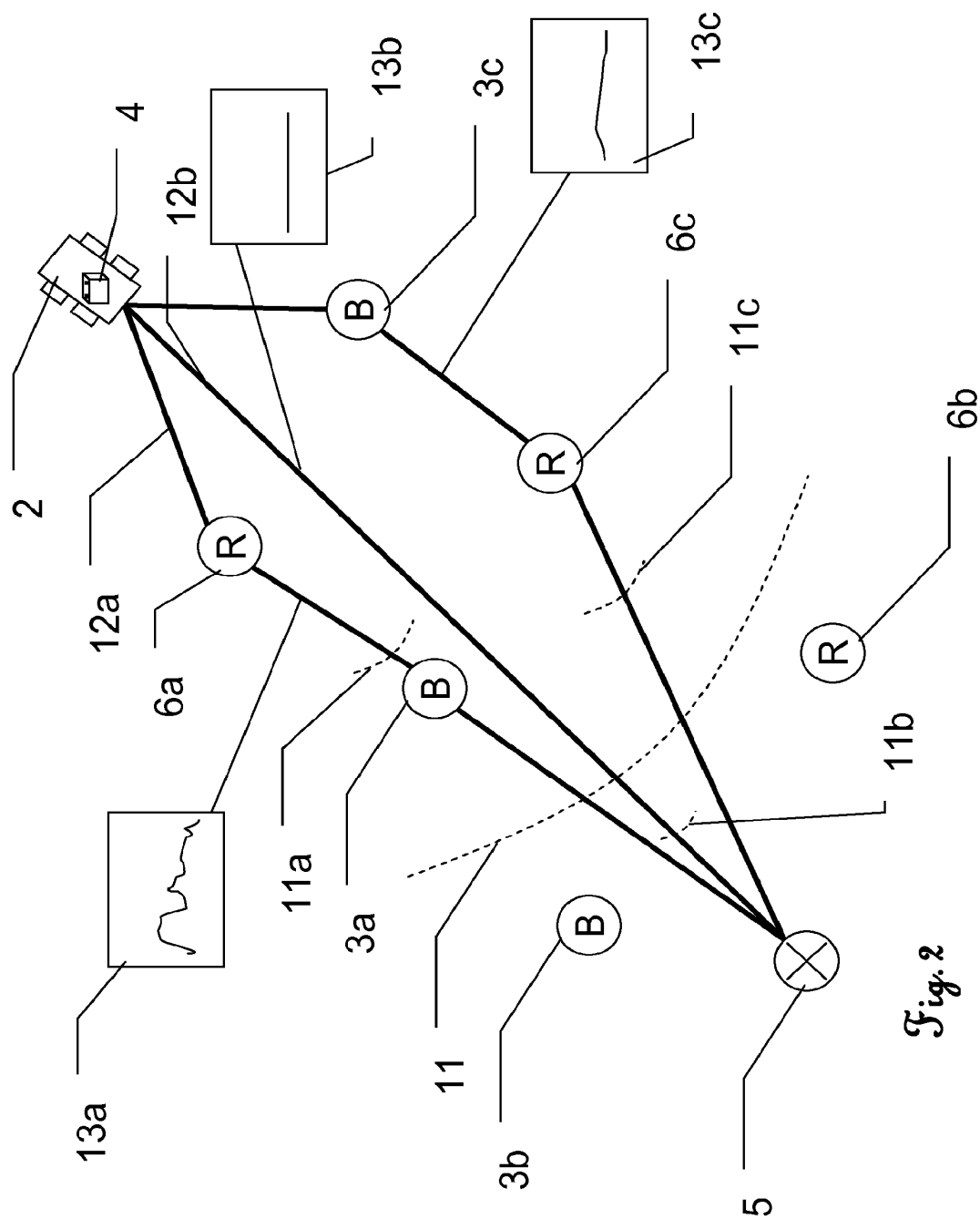


Fig. 1



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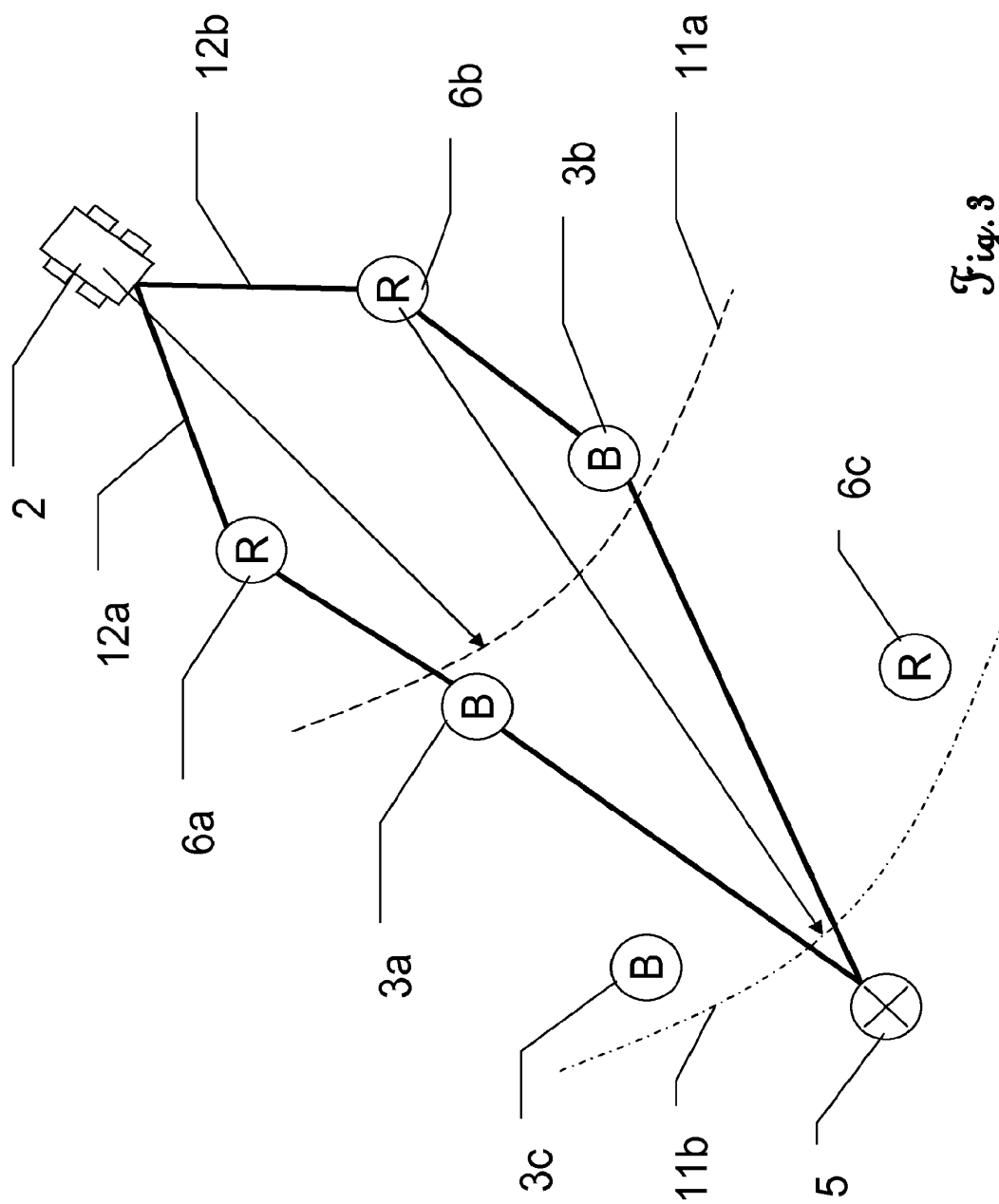


Fig. 3

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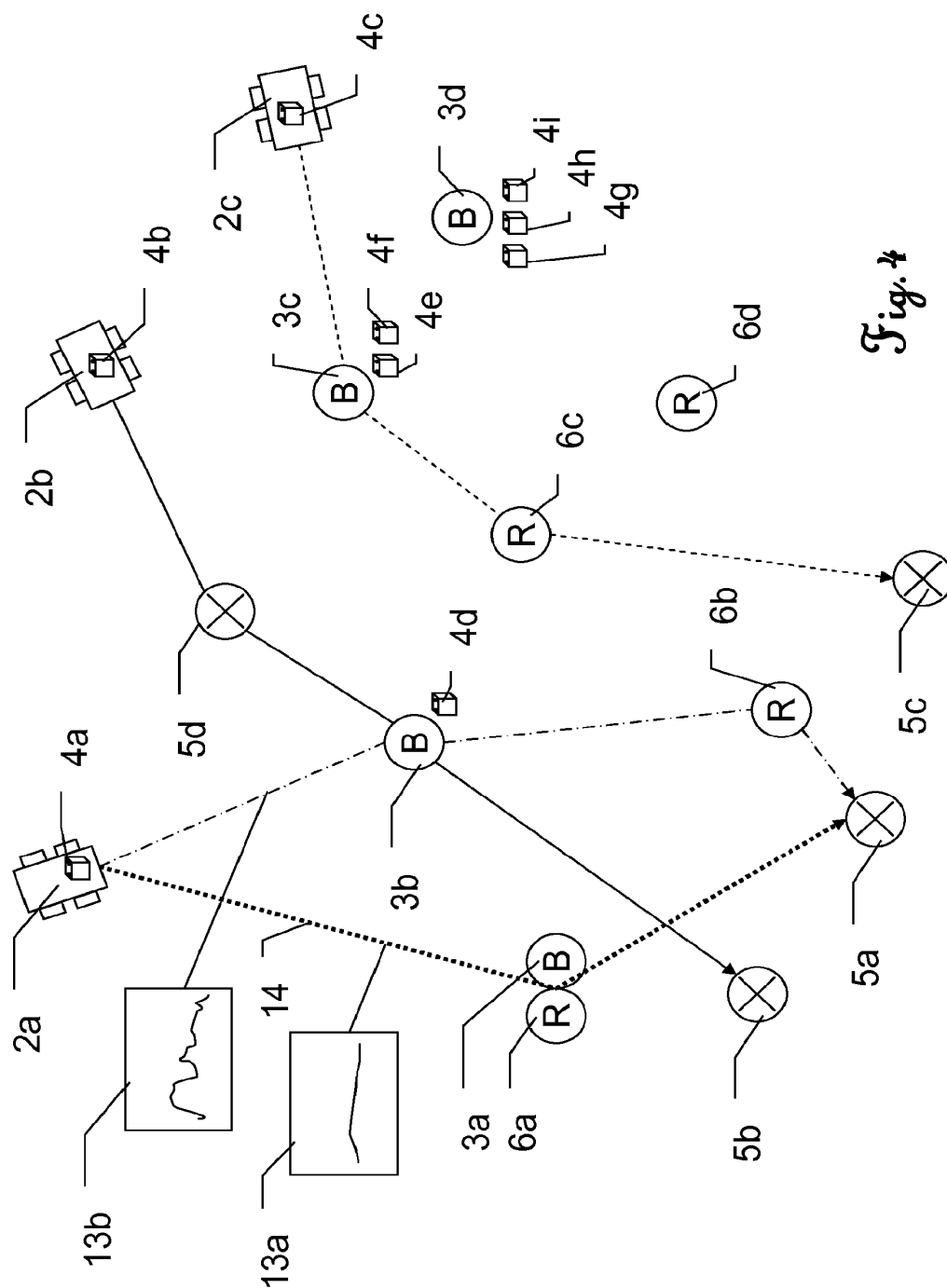


Fig. 4

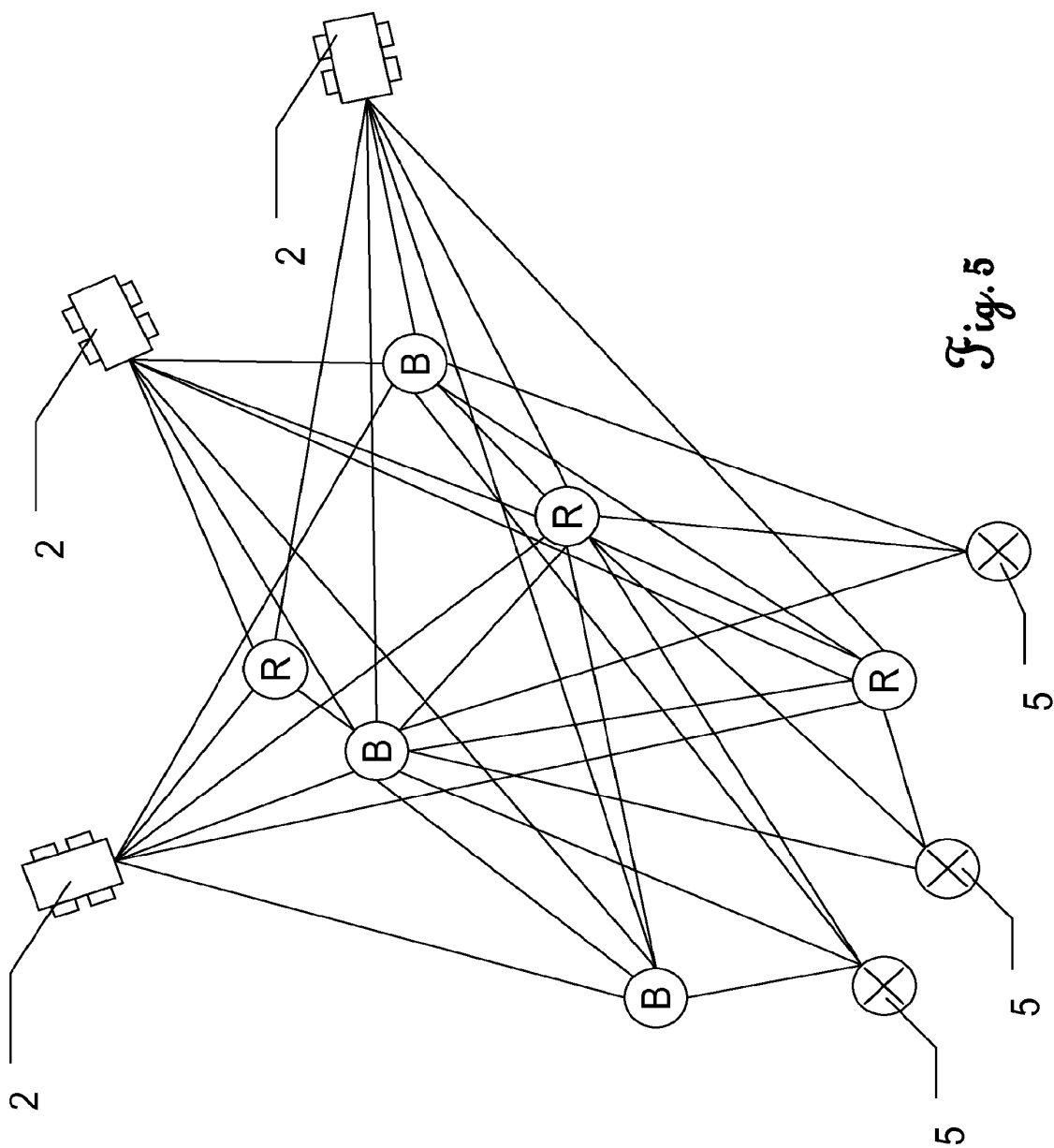
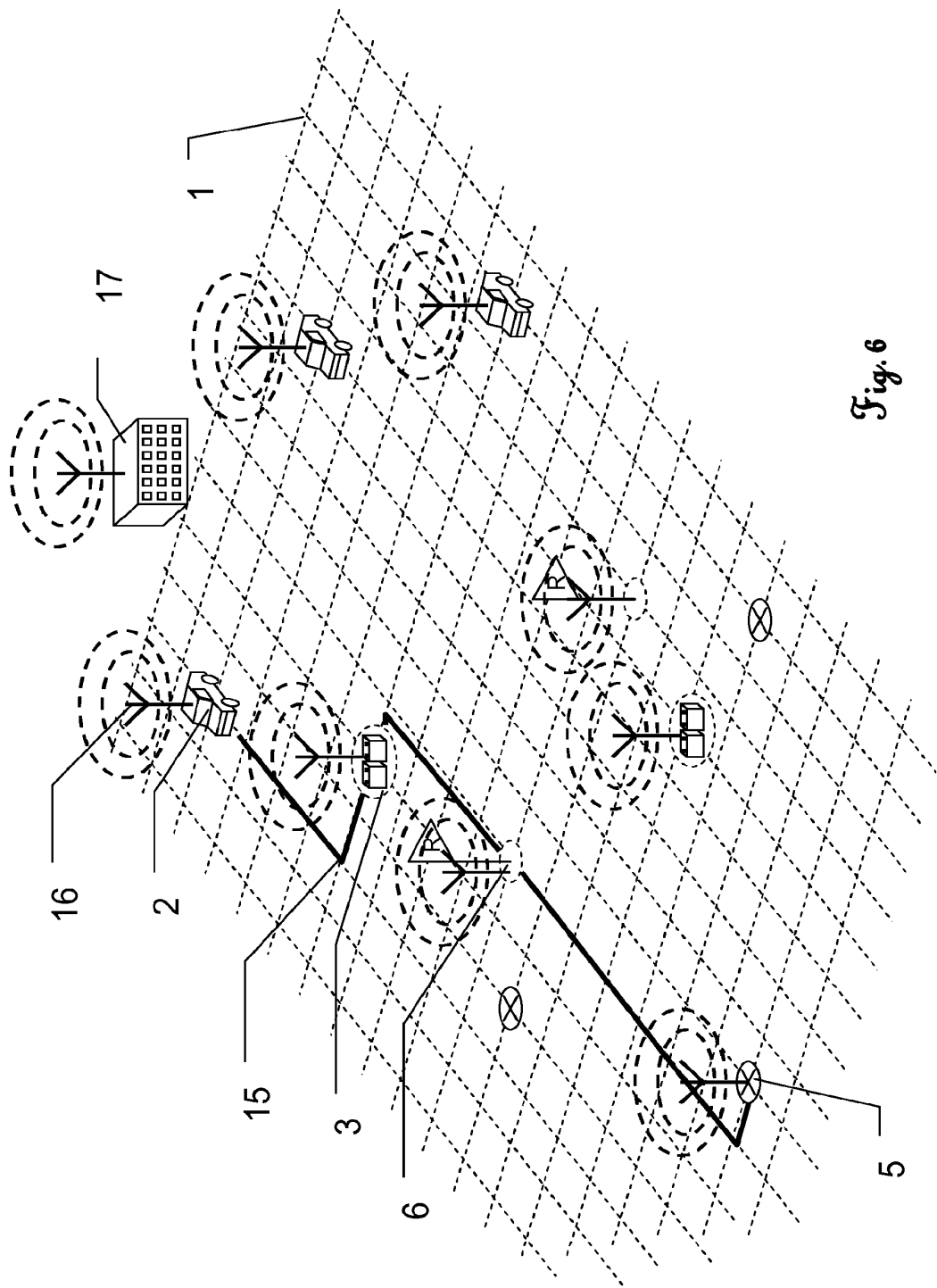


Fig. 5

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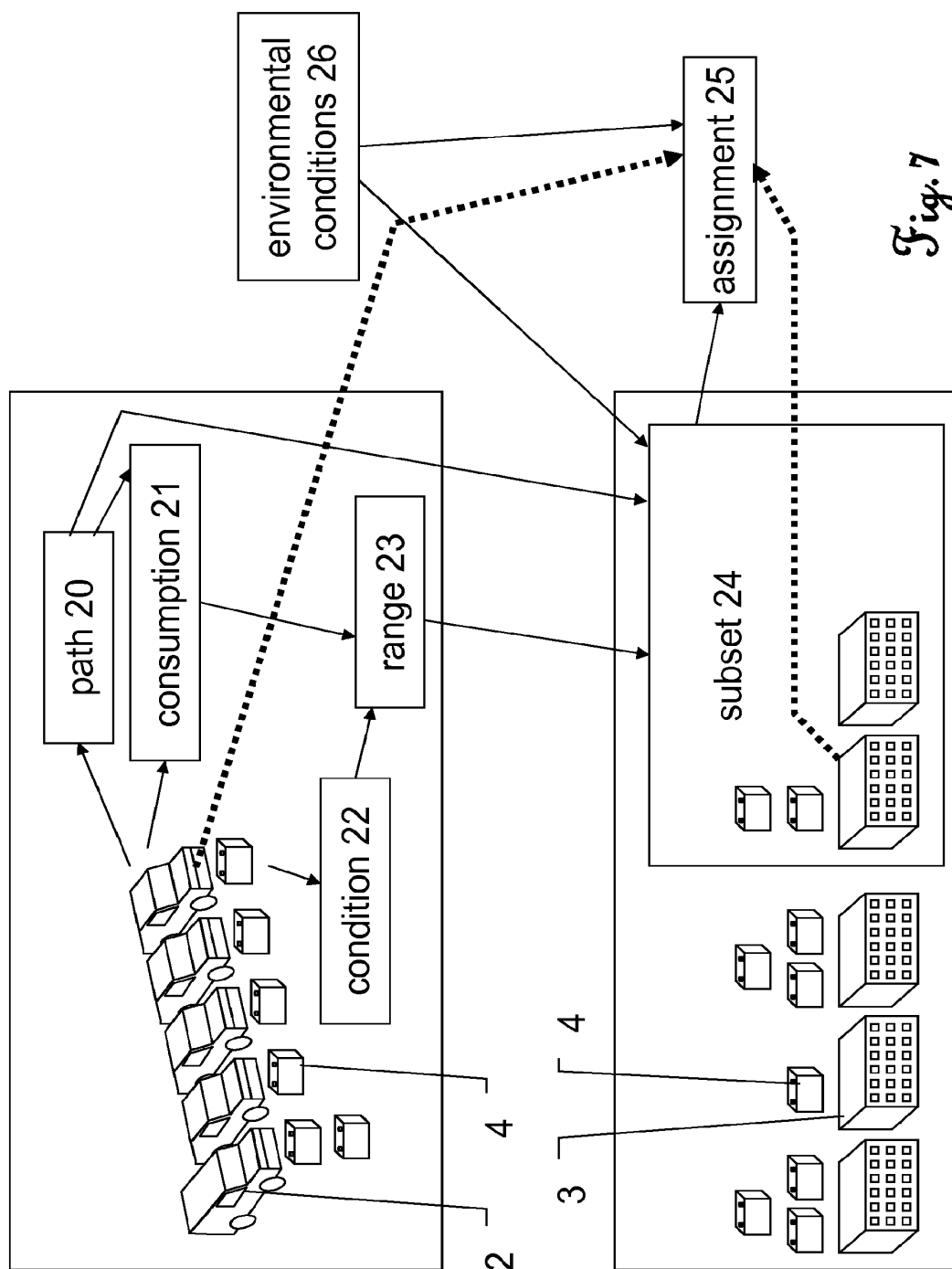


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/056688

A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

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)

G01C B60L G08G

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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 790 976 A (BOLL WOLF [DE] ET AL) 4 August 1998 (1998-08-04) column 1, line 6 - line 25 column 2, line 1 - line 63 column 3, line 55 - column 7, line 52 figures 1-4	1-15
X	US 5 487 002 A (DILLER ROBERT W [US] ET AL) 23 January 1996 (1996-01-23) column 1, line 45 - column 2, line 52 column 5, line 55 - column 6, line 67 column 14, line 45 - column 16, line 47 figures 1,8,9	1-15

☒ 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

4 August 2011

Date of mailing of the international search report

10/08/2011

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/056688

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 6 005 494 A (SCHRAMM SCOTT W [US]) 21 December 1999 (1999-12-21) column 1, line 20 - column 2, line 8 column 2, line 41 - line 47 column 3, line 39 - column 4, line 27 column 5, line 14 - column 7, line 54 figures 1-5</p> <p>-----</p>	1-15

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2011/056688

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5790976	A	04-08-1998	CH 690360 A5 DE 19519107 C1 FR 2734659 A1 GB 2301207 A	15-08-2000 04-04-1996 29-11-1996 27-11-1996
US 5487002	A	23-01-1996	AU 6016794 A EP 0686257 A1 JP 8507671 T WO 9416304 A1	15-08-1994 13-12-1995 13-08-1996 21-07-1994
US 6005494	A	21-12-1999	NONE	

Form PCT/ISA/210 (patent family annex) (April 2005)



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(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: TWO-WAY VENDING

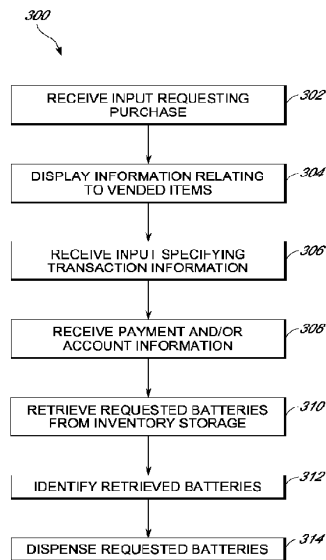


FIG. 3

(57) Abstract: Two-way vending can be performed by a two-way vending machine for vending rechargeable batteries. A two-way vending machine can include different modules to perform different functionalities. A two-way vending machine can include a communications module, a payment module, a dispensing module, and a receiving module. A communications module can communicate information to and receive inputs from a user. A payment module can transact payment with the user. A dispensing module can dispense one or more rechargeable batteries or other requested products to a user. A receiving module can receive one or more rechargeable batteries from a user.

Published:

— *with international search report (Art. 21(3))*

TWO-WAY VENDING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application 61/659,674 filed June 14, 2012, and U.S. Provisional Application 61/560,672, filed November 16, 2011, which are herein incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This relates to the field of vending, and particularly to the field of two-way vending of reusable or recyclable products, such as, for example, rechargeable batteries.

Description of the Related Art

[0003] Batteries power a variety of devices. As more devices become battery powered, consumer demand for batteries increases. This results in the manufacturing and disposal of ever greater numbers of batteries, which can include precious metals or other toxic materials such as, mercury, cadmium, or lead. Some people have begun using rechargeable batteries to save money and to minimize battery waste. However, rechargeable batteries require careful recharging, optimally achieved with expensive chargers, and are not as convenient as disposable batteries.

SUMMARY OF THE INVENTION

[0004] Some embodiments relate to a two-way battery vending machine. A two-way battery vending machine can include, for example, a communications module that communicates information to a user and receives inputs from a user including input indicative of the user identity, a dispenser that dispenses a selected battery, a receiver that receives a battery, an identifier configured to identify a battery by reference to an identification characteristic, a processor that controls the vending machine, and memory including stored instructions for operation of the vending machine.

[0005] In some embodiments the two-way battery vending machine further includes a receptacle to store a received battery, a storage area for the battery before it is dispensed, or a network communications module that communicates vending machine information across a network. In some embodiments, associating the battery with an account as performed by the

two-way vending machine can further include associating the identification characteristic with a user account.

[0006] In some embodiments of the two-way battery vending machine the identifier can be a scale and the unique identification characteristic can be a weight, the identifier can be a scanner and the identification characteristic can be a computer readable code, or the identifier can be a camera and the identification characteristic can be a visible feature. In some embodiments of the two-way battery vending machine the identification characteristic can be a pattern, the identification characteristic can be one or more colors, the identification characteristic can be an ultraviolet marking, the identification characteristic can be a fluorescent marking, the identification characteristic can be an infra-red marking, or the identification characteristic can be a radio emitter. In some embodiments of the two-way battery vending machine, the network communication module can communicate with a server across a network.

[0007] Some embodiments relate to a method of using a two-way battery vending machine. The two-way battery vending machine can include the features discussed above. The method can include, for example, dispensing a requested battery, which dispensing can include, receiving a request for dispensing of a battery via the communications module, processing the request with the processor, identifying the requested battery by the identification characteristic, associating the requested battery with an account, and dispensing the requested battery. The method of using a vending machine can further include receiving a battery, which can include, for example, identifying the received battery, associating the received battery with an account, and crediting the account when the received battery has specified characteristics.

[0008] In some embodiments of the method of using the vending machine, the requested battery can be dispensed in a battery container that can, in some embodiments, include an identification feature. In some embodiments of the method of using the vending machine, identifying the requested battery can include scanning a computer readable code, or receiving a data containing radio signal. In some embodiments of the method of using the vending machine, associating the requested battery with an account can include associating the identification characteristic with an electronic payment account that can be, for example, a credit account, a bank account, or a user account identifier. In some embodiments of the method of using the vending machine, the user account identifier can be, for example, an email account, an account number, or a user name.

[0009] The foregoing is a summary and thus contains, by necessity, simplifications, generalization, and omissions of detail; consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects,

features, and advantages of the devices and/or processes and/or other subject matter described herein will become apparent in the teachings set forth herein. The summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The foregoing and other features of the present disclosure will become more fully apparent from the following description taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are not to be considered limiting of its scope, the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

[0011] FIGURE 1 depicts a front view of one embodiment of a battery case.

[0012] FIGURE 2 depicts a front view of one embodiment of a two-way vending machine.

[0013] FIGURE 3 is a flow chart illustrating one embodiment of a method of operating a two-way vending machine to distribute one or several rechargeable batteries.

[0014] FIGURE 4 is a flow chart illustrating one embodiment of a method of operating a two-way vending machine to receive one or several deposited rechargeable batteries.

[0015] FIGURE 5 is a flow chart illustrating a method of operating a two-way rechargeable battery vending machine to determine if one or several received items are returnable, rechargeable batteries.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description and drawings are not meant to be limiting. Other embodiments may be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented here. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, and designed in a wide variety of different configurations, all of which are explicitly contemplated and make part of this disclosure.

[0017] As used herein, the term battery may refer to any device or electrical unit capable of storing electrical energy. For example, the term battery may refer to standard consumer batteries denoted as AAA, AA, C, D, 9V, CR-123, etc. The term battery may refer to a battery power unit configured to provide backup power to a mobile device such as a tablet computer, GPS unit, smart phone, mp3 player, or other mobile electronic device. Battery may refer to energy storage devices having a variety of chemical compositions.

[0018] Some embodiments disclosed herein relate to machines configured for two-way vending of rechargeable batteries. In some embodiments, a two-way rechargeable battery vending machine can comprise a variety of features in a variety of combinations. In some embodiments, these features can be configured to perform designated functions. Some embodiments include a vending machine capable of performing more or fewer functions than those described herein. In some embodiments, features of a two-way rechargeable battery vending machine can include, for example, an interactive communications module, a dispenser, an identification module, a processor, memory, a network communications module, and/or any other desired features. In some embodiments of a two-way rechargeable battery vending machine, the two-way rechargeable battery vending machine can communicate with a central control and monitoring station. In some embodiments, a two-way rechargeable battery vending machine, the two-way rechargeable battery vending machine can communicate with a central control and monitoring station over a network, such as, for example, the internet. In some embodiments, the two-way rechargeable battery vending machine can communicate information such as, for example, inventory status, functionality status of the two-way rechargeable battery vending machine, service requests, user account updates, and/or any other desired information to the central control and monitoring station.

[0019] Various types and configurations of batteries, battery packs, charging units, and other power providing devices are disclosed. As used herein, the term battery may refer to any of the types of power providing devices disclosed, including standard batteries, battery packs, charging units, etc.

[0020] Some embodiments disclosed herein relate to methods of two-way vending of rechargeable batteries. Some embodiments can include a variety of steps performed in a variety of orders. Some embodiments can include more or fewer steps than those specifically outlined herein. In some embodiments, the steps outlined herein can be supplemented by additional steps. In some embodiments, methods of two-way vending of rechargeable batteries can include, for example, receiving a user request, dispensing requested rechargeable batteries, receiving

batteries, identifying received batteries, associating the received batteries with an account, storing the received batteries, and/or any other desired steps.

[0021] A two-way rechargeable battery vending machine can comprise a variety of shapes, sizes and configurations. In some embodiments, a two-way rechargeable battery vending machine can be sized for floor mounting, for wall mounting, for table/countertop mounting, or for any other desired mounting configuration. In some embodiments, a vending machine can be shaped so as to facilitate machine identification, and/or configured to advertise the services provided by the vending machine. In some embodiments, a two-way rechargeable battery vending machine can be shaped to resemble a battery. In some embodiments, the two-way rechargeable battery vending machine can be shaped and colored to resemble the batteries vended by the machine.

[0022] A two-way rechargeable battery vending machine can be configured to vend a variety of products. In some embodiments, a two-way rechargeable battery vending machine can be configured to vend rechargeable batteries. In some embodiments, a two-way rechargeable battery vending machine can be configured to vend certain sizes of rechargeable batteries, such as, for example, AAA, AA, C, D, 9-volt, or any other battery size. In some embodiments, a two-way rechargeable battery vending machine can be configured for vending of non-battery products, such as, for example, a battery size adapter. In some embodiments, a vending machine can be configured to vend, for example, an AA to D-size battery adapter case, an AA to C-size battery adapter case, an AAA to D-size battery adapter case, an AAA to C-size battery adapter case, or any other desired battery adapter case, or other accessories.

[0023] In some embodiments, a two-way rechargeable battery vending machine is configured to vend a battery power unit. A battery power unit is a rechargeable unit having one or more electrochemical cells contained within an enclosure and having a charge port and a discharge port. The battery power unit may have one of a variety of form factors. For example, the battery power unit may be cylindrical, circular, square, rectangular prism, or any other desirable form factor.

[0024] The battery power unit may comprise a plurality of electrochemical cells, or battery cells, or may have a single battery cell. Where the battery power unit comprises a plurality of battery cells, the battery cells may be one of many battery chemistries suitable for rechargeable batteries. For example, the battery cells may be Li-ion, NiMH, NiCd, fuel-cell based, or lead acid. The battery power unit may comprise one or more standard battery cells, c.g., AAA, AA, C, D, or 9V, arranged within an enclosure and wired together. The battery cells may be wired in series or parallel, connected to a single discharge port.

[0025] As used herein, the term terminal or battery terminal may refer also to the discharge port or the charge port of the battery power unit. The discharge port may be one of many varieties, such as those commonly used on electrical devices having an internal or integral battery or power source. Specifically, the discharge port may be configured to have a port compliant with the universal serial bus (USB) standard. In some embodiments, the discharge port may be a 3.5mm jack, a standard 120V plug, microUSB, or other suitable discharge port. The charge port may be one of many varieties, including those described herein with reference to the discharge port. The charge port is wired to the battery cell or cells within the battery power unit such that a power source supplied to the charge port will charge all the battery cells within the battery power unit. In some embodiments, the charge and discharge ports may be co-located on a single end of the battery power unit for convenience of access and use. In some embodiments, the functions of the charge and discharge ports can be combined into a single port. In some embodiments, the charge and discharge ports can be separate.

[0026] The battery power unit may also comprise internal electronics configured to transform, step-up, step-down, modulate, rectify, regulate, or otherwise adapt the output of the battery cell or cells to be compatible with a specific device to be charged. The internal circuitry may be connected to one or both of the charge and discharge ports. The internal circuitry may be connected to the discharge port and provide communication functionality such that, upon connecting a cord or plug to the discharge port, the internal circuitry identifies the device or type of device, and adjusts the output power or signal accordingly. The internal electrical circuitry is also configured to adapt a power source or signal applied to the charge port such that the applied power source or signal is transformed or changed to be compatible with and capable of charging or recharging the battery cell or cells within the battery power unit enclosure. Either the charging port or discharging port can be used by an external charging system to ascertain the type or model or category of the battery power unit for the purpose of product identification and/or application of appropriate charging regime, program, algorithm

[0027] In one exemplary embodiment, the battery power unit may enclose one or a plurality of Li-ion 18650-type batteries. The batteries are connected to a discharge port which comprises a USB port. The battery power unit has internal circuitry which transforms the voltage to a voltage used in a handheld mobile device, such as a cellular telephone or a tablet computer. In this embodiment, the battery power unit acts as a backup power supply for the handheld mobile device, providing a source from which to charge the internal battery of the mobile handheld device.

[0028] In some embodiments, a two-way rechargeable battery vending machine may vend a rechargeable battery pack. In some embodiments the rechargeable battery pack may be a mobile device charging unit. The mobile device charging unit may be of many types and support charging of many devices. For example, the mobile device charging unit may be rechargeable using a DC, AC, or other power source, such as solar cells. The mobile device charging unit may provide one or more charging ports, including a USB charging port, a micro USB charging port, mobile phone charging ports, or any other charging port. In some embodiments the battery pack is a battery power unit that can be connected to various devices and provides charging capability for various mobile devices such as mobile phones, tablet computers, laptop computers, mp3 players, GPS units, portable gaming devices, and others.

[0029] In some embodiments of a two-way rechargeable battery vending machine, a battery can be individually vended. In some embodiments of a two-way rechargeable battery vending machine, a battery can be vended with other batteries. Thus, in some embodiments, a user may be able to specify an exact number of batteries for purchase, and in other embodiments, a user may specify the number of packages of batteries for purchase.

[0030] In some embodiments, one or several batteries can be vended as individual units, or can be vended packaged into groups of multiple batteries. In one embodiment, and as depicted in Figure 1, the batteries can be vended in a battery package 100. In some embodiments, a battery package can be reusable or disposable. In some embodiments, the battery package 100 can hold one or several batteries 110 of a variety sizes, shapes, and/or types. In some embodiments, a battery package 100 can be configured to hold, for example, one battery, two batteries, three batteries, four batteries, five batteries, eight batteries, ten batteries, twelve batteries, or any other desired number of batteries. In some embodiments, the battery package 100 can be configured to hold one or more battery power units.

[0031] In some embodiments, and as depicted in Figure 1, a battery package 100 can comprise a reusable battery case 102. In some embodiments, a case 102 can comprise, for example, any desired type of container or packaging such as, for example, an envelope, a bag, a box, shrink wrap, a blister pack, or any other type of container or packaging. A battery case can include a latch 104 and a hinge 106. In some embodiments, a battery case can include internal features configured, for example, to secure one or several batteries within the battery case.

[0032] A battery case 102 can further comprise an identification feature 108. In some embodiments, an identification feature 108 can be a unique identification feature or a non-unique identification feature. In some embodiments, using a system where a plurality of battery cases 102 are used by multiple users, identification feature 108 may be configured to identify a

specific battery case 102. In some embodiments, identification feature 108 may be common to all battery cases 102, and serve to identify a battery case 102 as a reusable battery case 102. In some embodiments, an identification feature 108 can be affixed, adhered, or attached to the battery case 102. In some embodiments, the identification feature 108 can be integrated into the battery case 102. An identification feature 108 can include, for example, a computer readable code, an electronic tag, a color or text pattern, or any other identifying feature.

[0033] A two-way rechargeable battery vending machine can comprise a variety of functionalities to facilitate vending. Figure 2 depicts one embodiment of a two-way rechargeable battery vending machine 200 which resembles a battery. As further depicted in Figure 2, a two-way rechargeable battery vending machine can comprise a communications module 202, a payment module 204, a dispensing module 206, and a receiving module 208.

[0034] In some embodiments, a communications module 202 can be configured to communicate with a user of the two-way rechargeable battery vending machine 200. Specifically, in some embodiments of the two-way rechargeable battery vending machine 200, the communications module 202 can be configured to communicate information to the user and to receive inputs from the user. In some embodiments, a communications module can include, for example, a display screen, a speaker, or any other feature or feature combination capable of communicating information to a user of the two-way rechargeable battery vending machine 200. In some embodiments, a communications module 202 can comprise one or several input features such as, for example, a key pad, a touch screen, a track pad, a microphone, voice recognition hardware and software, or any other feature or features capable of receiving a user input.

[0035] In one embodiment of a two-way rechargeable battery vending machine 200, a communications module 202 can comprise a touch screen configured to communicate information to a two-way rechargeable battery vending machine 200 user and to receive inputs from the user.

[0036] In some embodiments, the communications module 202 of a two-way rechargeable battery vending machine 200 can communicate information to a user including, for example, the availability and costs of one or several batteries, one or more battery power units, the availability or cost of other vended products, such as, for example, a battery container, a battery adapter, or any other product, user account information, such as, for example, number of batteries purchased during a specified time frame, the number of batteries purchased and not returned, the number batteries returned during a specified time frame, and/or membership information. In some embodiments, some or all of the communicated information can relate to the user desired transaction with the vending machine. Thus, in some embodiments, the

communications module 202 can request a user to indicate a desired transaction such as, for example, purchase of one or more charged batteries, purchase of a vended item, or return of one or more batteries.

[0037] In some embodiments of a two-way rechargeable battery vending machine 200, the selection of a desired transaction type can be communicated to a controller. The controller can comprise, for example, a processor and memory with stored instructions. In some embodiments, the controller can have a communications link with some of the features of the two-way rechargeable battery vending machine 200 to receive inputs from these features. In some embodiments, the controller can further provide electronic signals to the features of the two-way rechargeable battery vending machine 200 that control or direct the operation of these features. In some embodiments, the controller can receive and process the user input, and in response to the input, direct the communication of information relating to the requested transaction to the user. This information can include, for example, pricing information, product availability, related products, or any other desired information. This information can allow the user to provide further inputs to the two-way rechargeable battery vending machine 200 to select the user desired transaction. Advantageously, the use of a communications module allows the two-way rechargeable battery vending machine 200 to communicate information relating to products to the user, and the user to input information relating to the desired transaction into the two-way rechargeable battery vending machine 200.

[0038] A two-way rechargeable battery vending machine 200 can include a payment module 204. A payment module 204 can include any feature or features configured to receive payment from a user. In some embodiments, a payment module 204 can be configured to receive cash payment or to receive electronic payment. In some embodiments, a payment module 204 can be a scanner configured for use with, for example, a credit card, or a debit card, a smart phone, a near field communication device, or a cash input device. In some embodiments, a user may have a unique identifier, such as, for example, a card, which encodes identification information specific to a user. The unique identifier, such as the card, is associated with an account of the user. In some embodiments, as the unique identifier card is used in the two-way rechargeable battery vending machine 200, a user's account or identification information is accessed, and a vending transaction occurs based on a balance of money or credit in user's account. The users account information, which is associated with and accessible by the unique identifier, such as the card, is updated as batteries are vended.

[0039] In some embodiments, payment module 204 may comprise a near field communication (NFC) device. A customer having a NFC enabled payment device may bring the

device within vicinity of the NFC device, and transact a payment. In some embodiments, the payment module may comprise a QR code, high capacity color barcode (HCCB), or other two-dimensional code. A customer may scan the QR code, HCCB, or other two-dimensional code with a smart phone or other device capable of reading two-way barcodes. The QR code, HCCB, or two-dimensional code may point the customer to a website, application, or other destination where the customer may subscribe to the battery vending service, provide payment, or transact other business related to the two-way rechargeable battery vending machine. A person of skill in the art will recognize that the present disclosure is not limited to any specific feature for receiving payment, but that it broadly encompasses all features capable of receiving payment.

[0040] In some embodiments, a two-way rechargeable battery vending machine 200 can comprise a dispensing module 206. A dispensing module 206 can be configured to remove one or more batteries from inventory storage, identify the one or more batteries, if necessary, and dispense the one or more batteries to the user.

[0041] A dispensing module can include a variety of features and functionalities. In some embodiments, a dispensing module can include, for example, inventory storage configured to store one or more batteries, dispensing features configured to deliver one or more batteries from the inventory storage to a user, and any other desired features.

[0042] Some embodiments of a dispensing module 206 can include an identifier. An identifier can be configured, for example, to identify a product before dispensing. In some embodiments, an identifier can include, for example, a scanner, a camera, a receiver, or any other component capable sensing an identifying characteristic of one or more batteries. In some embodiments, a scanner can be, for example, configured to scan a computer readable code such as, for example, a bar code, a QR code, and/or other one or two dimensional barcodes. The bar code may be one of conventionally known one or two dimensional codes. The barcode may use Pharma code protocol as promulgated in Pharma Code Specifications from RC Electronica, located at www.rcelectronica.com. In some embodiments, a camera can be configured, for example, create an image of an identifiable aspect of a vended item for use in image analysis. In some embodiments, a receiver can be configured, for example, to receive an emitted signal identifying the vended item, such as, for example, a radio signal from an RFID tag.

[0043] In some embodiments, the identifier of dispensing module 206 may be configured to identify a product before dispensing by detecting and identifying a battery based on electrical characteristics. For example, the identifier of dispensing module 206 may comprise a battery meter configured to sense battery voltage and resistance based on measurements between a terminal of the battery and the battery can.

[0044] In non-rechargeable, disposable, alkaline batteries, the positive terminal of the battery is usually in direct electrical contact with the battery can, and the can is electrically isolated from the negative terminal, or, in other words, is separated from the negative terminal by the cell or cells within the battery. Thus, a resistance measurement between the can and the positive terminal of a healthy battery will generally be zero or nearly zero. Similarly, resistance taken between the can and the negative terminal of a healthy battery will generally yield a high resistance, for example, greater than about 90 mΩ.

[0045] In rechargeable, reusable batteries, the negative terminal of the battery is generally in direct electrical contact with the can and the positive terminal is electrically isolated from the can, or in other words, is separated from the can by the cell or cells within the battery. In a cylindrical battery, the can is the cylindrical portion, but may also wrap at least partially around the end of the battery. Thus, a resistance measurement taken between the can and the positive terminal of a healthy rechargeable battery will be low, for example, less than about 90 mΩ. Similarly, a resistance measurement taken between the can and the negative terminal will yield high resistance, for example, greater than about 90 mΩ. As such, a battery can be identified as either a disposable battery or a rechargeable battery based on the terminal-can voltage measurement. In some embodiments, the battery meter may sense voltage between a battery terminal and the battery can or resistance between a battery terminal and the battery can, or both and identify the battery based on the battery's electrical characteristics. If the battery is identified as a rechargeable battery, or a battery proprietary to the two-way vending machine system, the battery may pass the identification process. If the battery fails the identification process, the battery may not be vended, and another battery which passes the identification test may be vended instead.

[0046] In some embodiments, the battery meter may measure the voltage or resistance from a terminal to the battery can, or from one terminal to the other. The battery meter may determine, based on these measurements, a healthy battery is being vended. If a terminal-to-terminal or terminal-to-can voltage is within a prescribed range, then a battery may be identified as healthy, and may be vended to a consumer or customer. If a terminal-to-terminal or terminal-to-can resistance is within a prescribed range, then a battery may be identified as healthy, and may subsequently be vended to a consumer or customer. In some embodiments, a battery may be vended only when the voltage characteristics, resistance characteristics, or both are within a prescribed range.

[0047] In some embodiments, the charge state of the battery can be indicated through the application of one or more tabs to the battery. The tab may comprise an adhesive configured

to adhere to a terminal of a battery, and may be sized or shaped to correspond to the size and shape of a battery terminal. The tab may comprise a conducting or non-conducting, and may comprise one or more indication which communicates information about the state of charge of the battery. For example, the tab may indicate when a battery is “full,” “fresh,” or “fully charged.”

[0048] In some embodiments, one or more batteries may be vended disposed within an enclosure. The enclosure may be a wrapper, a case, or a packet. The enclosure may comprise an indication of the state of charge of the battery, such as “full,” “fresh,” or other indication the battery is fully charged. In some embodiments, the presence of the wrapper may be the indication that the vended batteries are in a fully charged state. The enclosure may provide protection to the batteries against incidental discharge, damage, vandalism. The enclosure may indicate that the batteries have not been altered, modified, or tampered with.

[0049] In some embodiments, data indicative of the identity of the vended item can be collected by the controller of the two-way rechargeable battery vending machine 200, and can, in some embodiments, be associated with a user, an account, and/or a user account.

[0050] As depicted in Figure 2, a two-way rechargeable battery vending machine 200 can comprise a receiving module 208. In some embodiments, a receiving module can be configured to receive one or several batteries, to identify one or more received batteries, to communicate the identification for the one or more batteries to a controller, and/or to place the one or more batteries in a storage receptacle for received batteries.

[0051] A receiving module 208 can include a variety of features and functionalities. In some embodiments, for example, a receiving module 208 can comprise a receiving receptacle configured to receive batteries, a receiving identifier configured to identify one or more received batteries, a storage receptacle for storing received batteries, and features configured to transport the one or more received batteries from the receiving receptacle to the storage receptacle. In some embodiments, a receiving module can include each or some of these features. In some embodiments, a receiving module 20 can include additional features. In some embodiments, one or several of these features can be integrated into a single location.

[0052] In some embodiments, a receiving identifier can include features configured to identify the received batteries. In some embodiments, this identification can comprise uniquely identifying each received battery. In some embodiments, this identification can comprise identification of a class or category of each returned battery. In some embodiments, this identification can comprise identification of some dimension associated with a battery.

[0053] In one embodiment, for example, each battery can comprise a unique identification feature. This feature can include, for example, a computer readable unique identification feature, a receivable unique identification feature, a recognizable unique identification feature, or any other type of unique identification feature. In some embodiments, each battery can comprise a non-unique identification feature, indicating, for example, a class or category of each battery. In some embodiments, each battery can include an identifiable feature or be associated with an identifiable dimension, such as, for example, a weight. In some embodiments in which batteries are distributed in a case, and as discussed above, each case can include a unique or a non-unique identification feature.

[0054] In some embodiments, a battery or a battery case can include, for example, computer readable code such as, for example, a bar code or a QR code. In some embodiments, a battery or a battery case can include a non-unique identification feature such as, for example, a logo, color scheme, or any other identifiable features. In some embodiments, the identification feature can be configured to emit an identifying signal. In some embodiments, a computer readable code or other identification feature can be printed on, adhered to, affixed to, or embedded in a battery or a battery case. In some embodiments in which the identification feature is printed, the identification feature can be printed with fluorescent ink, ultraviolet ink, infrared ink, normal ink, or any other type of ink.

[0055] In some embodiments, a battery can be received by the receiving module 208 after the battery is placed within a disposable container. In some embodiments, this disposable container can include, for example, an envelope. The disposable container can include a unique identification feature, such as, for example, a computer readable code, which can be associated with a user account via the receiving identifier of the receiving module 208. In some embodiments, the unique identification feature can be used to track the disposable container and the contents of the disposable container. This tracking is particularly beneficial in that it can enable the operator of the vending machine to verify the returnability and condition of the contents of the disposable container and allow association of the returned contents with a specific user.

[0056] In some embodiments, a receiving identifier may use a variety of techniques to identify the received battery. In some embodiments, a deposited item is weighed to determine if the weight of the deposited item matches the expected weight of the item. In some embodiments, the receiving identifier may scan a received battery to determine if the battery is of a specific type such as, for example, a rechargeable battery, a vended battery, a specific size of battery, a battery power unit, or any other desired type. In some embodiments in which a battery

is returned in a battery case, a unique identification feature on the battery case is scanned, and the case is associated with a user account. In some embodiments, a receiving identifier may preliminarily identify the received battery. In some embodiments, a preliminary identification of a received battery can be finalized by reference to an additional identification feature identifying the battery.

[0057] In some embodiments, the receiving identifier may be configured to read a rotation-variant, rotation-invariant, or rotation agnostic identification mark. The term rotation-variant used in reference to identification marks or features on a battery means a feature or mark or symbol that may appear different depending on the orientation of the battery about an axis. For example, a logo, a word, or other similar identification mark may appear different when viewed from different perspectives, and therefore is rotation-variant. The term rotation-invariant used in reference to identification marks or features on a battery means a feature, mark, or symbol that appears the same regardless of the orientation of a battery about an axis or regardless of the point of view of a sensing or identification unit. For example, a stripe, line, barcode, or symbol which encompasses the entire circumference or outer perimeter of a cylindrical battery and is uniform over the circumference or outer perimeter is rotation-invariant. For example, a barcode may comprise a bar or set of bars which each completely encircle or circumscribe the battery, and appear the same regardless of the orientation of the battery when rotated about an axis. However, a barcode may also be rotation-variant, depending on the orientation of its bars, or if it does not encompass the entire circumference or outer perimeter of the battery. The term rotation-agnostic used in reference to identification marks or features on a battery means a feature or mark that may appear different depending on the orientation of the battery about an axis, but can nonetheless be used to identify the battery, regardless of the battery orientation. For example, a mark, symbol, or barcode on an end of a cylindrical battery may appear different as a battery rotates about an axis, but can still be used to positively identify a battery regardless of orientation. A rotation agnostic mark may be, for example, a radial bar code, a QR code, a high capacity color barcode, an Aztec code, or other one or two-dimensional barcode.

[0058] In some embodiments, the owner/operator of a proprietary battery vending machine or battery exchange machine may wish to receive or vend only proprietary batteries or rechargeable batteries the owner/operator has previously provided. In order to ensure that only previously provided batteries are accepted or exchanged in the battery machine, the machine may have some system for identifying batteries inserted into receiving module 206 as rechargeable or proprietary.

[0059] In some embodiments, the receiving identifier may use some electrical characteristics of a battery to identify whether a battery is rechargeable or acceptable for return. The two-way battery vending machine may identify batteries as being rechargeable or as being proprietary batteries of the owner and operator of the two-way battery vending machine. In some embodiments, the two-way battery vending machine may comprise an internal battery charging system. If an incompatible battery, for example, a regular alkaline battery, is received into a two-way battery vending machine, the incompatible battery may interfere with proper operation of the machine, if the machine comprises an internal charging system an incompatible battery may adversely affect the charging system of the machine, or may otherwise cause difficulty.

[0060] Receiving module 208 may comprise a battery testing meter capable of determining whether a battery is rechargeable using the electrical characteristics of a battery. For example, as described elsewhere herein, batteries may be identified or typed based on voltage and resistance characteristics.

[0061] In some embodiments, a receiving module 208 can comprise a storage receptacle configured to store a received battery, and features configured to place a received battery in the storage receptacle. In some embodiments, the storage receptacle can include features configured to monitor the status of the storage receptacle and to provide status information to the controller. The two-way battery vending machine, upon receiving a rechargeable or proprietary battery, may provide the battery to an internal charging system. In some embodiments, the internal charging system may have limited capacity. If the internal charging system cannot accommodate a received battery, the two-way vending machine may store the battery in a storage receptacle to await further charging.

[0062] In some embodiments, a two-way rechargeable battery vending machine 200 can comprise a network communications module. The network communications module can be configured to communicate with another entity on a network. In some embodiments, the network communications module can be configured to communicate with a server across a network, such as, for example, across the internet, and can include features configured for wired or wireless communication.

[0063] The network communications module can be configured, in some embodiments, to transmit information to the server relating to the identification of a user, to the purchase by the user, to user payment details, and any other desired information. In some embodiments in which the user identifies himself to the two-way rechargeable battery vending machine 200, the network communications module can transmit this identification information

to the server. The server can determine which, if any, account is associated with the user, and provide account information to the two-way rechargeable battery vending machine 200. In some embodiments in which the user makes a payment to the two-way rechargeable battery vending machine 200, the two-way rechargeable battery vending machine 200 can provide information relating to the payment to the server. This information can include, for example, the amount of payment, whether a credit should be associated with the user account, payment account information such as, for example, a credit card or bank card number or identifier, or any other payment information. The server can then associate this payment information with the user account.

[0064] In some embodiments, the two-way rechargeable battery vending machine 200 can provide information relating to the purchase of the user, such as, for example, the number and type of items purchased, the number and/or type of items returned, or any other desired information. This information can be associated with the user account, and in some embodiments in which an item is returned, may be associated with the user account in the form of a credit or a tentative credit to the account.

[0065] In some embodiments, the network communications module can communicate information to the server relating to the status of the two-way rechargeable battery vending machine 200. Thus, in some embodiments, the network communications module can send a signal to the server when the two-way rechargeable battery vending machine 200 requires servicing such as, for example, replenishing of the stock of charged batteries, battery power units, or other vended items, removal of deposited discharged batteries or other used items, or any other required service. A person of skill in the art will recognize that the network communications module can communicate a variety of other information with the server, and that the present disclosure is not limited to the above-described specific embodiments.

[0066] In some embodiments, where the internal charging system lacks sufficient capacity to charge received batteries, the network communications module may communicate the lack of charging capacity to the server. The network communications module may communicate charging capacity information with other two-way rechargeable battery vending machines or with a central battery charging hub.

Method of Operation of a Two-Way Rechargeable Battery Vending machine

[0067] The features of a two-way rechargeable battery vending machine can be controlled to achieve the desired vending and/or receipt of one or several batteries. Figures 3 to 5 depict different methods of operating different aspects of a two-way rechargeable battery

vending machine, focusing on the method of distributing an item and/or on the method of receiving an item and/or a rechargeable battery.

[0068] Figure 3 depicts one embodiment of a method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries. In some embodiments, the method 300 begins when an input requesting purchase of one or several rechargeable batteries is received at block 302. This request can be received, as discussed above via a communications module.

[0069] Having received an input requesting purchase of an item, the controller can request communication of information relating to the one or several rechargeable batteries via the communications module, as depicted in block 304. This information can include, among other things, price information of the one or several rechargeable batteries, availability of the one or several rechargeable batteries, instructions for proceeding with the transaction, instructions for termination of the transaction, or any other desired information.

[0070] In some embodiments of a method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries, a communications module can include receiving an input specifying transaction information as depicted in block 306. This information can include, for example, the type of rechargeable batteries requested for purchase, the number of rechargeable batteries requested for purchase, and/or any other information.

[0071] In some embodiments of a method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can include receiving payment and/or account information as depicted in block 308. In some embodiments, payment can be achieved by insertion of money into payment module, by communicating information from a credit card or other form of electronic payment to the payment module, such as, by, for example, swiping a credit card through a magnetic strip reader, moving a credit card with an RFID tag near a detector, scanning a two-dimensional or three-dimensional code, inputting a unique identifier, such as a card, wirelessly transmitting payment information from a mobile electronic device, such as a tablet computer or a smart phone, or by other method of transferring payment. In some embodiments, account information can be received via input of an account number, email address, or other account identifier into the communications module.

[0072] A method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can include retrieving the requested items from an inventory storage as depicted in block 310. A method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can

further include identifying the one or more rechargeable batteries retrieved from the inventory storage as depicted in block 312. In some embodiments, identifying the one or more rechargeable batteries retrieved from the inventory storage can include, for example, retrieving information from an identification feature located on one or more of the requested batteries, or on one or more battery cases containing the one or more requested batteries. As discussed above, the identification feature can include, for example, a computer readable code, a visible feature, transmitted data, or any other feature capable of uniquely or non-uniquely identifying the one or more batteries.

[0073] A method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can, in some embodiments, include dispensing of the requested one or more rechargeable batteries as depicted in block 314.

[0074] A person of skill in the art will recognize that a method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a method 300 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can include the above listed steps performed in any order, including in an order different than that shown above.

[0075] Figure 4 depicts one embodiment of a method 400 of operating a two-way rechargeable battery vending machine to receive one or several deposited rechargeable batteries. In some embodiments, the method 400 begins when an input is received requesting the return of one or more batteries as depicted in block 402. In some embodiments, this input can be received, as discussed above, via a communications module.

[0076] In some embodiments of a method 400 of operating a two-way rechargeable battery vending machine to receive one or several deposited rechargeable batteries, one or several batteries can be received as depicted in block 404. In some embodiments, the one or several deposited rechargeable batteries can be received in a receiving receptacle.

[0077] After receiving the one or several batteries in a receiving receptacle, method 400 can move to decision block 406 and determine if the deposited item is identified as returnable. Identification of the received batteries can be advantageous in preventing the crediting of an account for the return of batteries other than a desired type. In some embodiments, this can include the prevention of crediting an account for the return of disposable batteries, of a non-battery item, of rechargeable batteries of a non-desired brand, or any other undesired item. In some embodiments, identification can be performed by use of an

identification feature on the one or several batteries, or on one or several battery cases holding the one or several batteries.

[0078] In some embodiments of a method 400 of operating a two-way rechargeable battery vending machine to receive one or several deposited rechargeable batteries, if the received item is not identified as returnable, the received item can be returned as depicted in block 408, or disposed of.

[0079] If the received item is identified as a returnable battery, method 400 can move to block 410 and receive payment and/or account information associated with the user returning the one or several batteries.

[0080] Method 400 of operating a two-way rechargeable battery vending machine to receive one or several deposited rechargeable batteries can move to decision state 412 and determine if the deposited item is verified as returnable. In some embodiments, the use of an identification feature may not be sufficient to determine if a received item or battery is returnable. For example, in some embodiments, an identification feature located on a battery case may sufficiently identify the received items to allow the return transaction to advance, but may not be sufficient to allow completion of the return transaction as the identification feature identifies a battery case and not the battery contained in the battery case. In this embodiment, reading of the identification feature found on the battery case indicates that the deposited item is likely of the right type, but may not determine that the deposited item is returnable. Similarly, in some embodiments, one or several received batteries may be damaged or otherwise rendered inoperable. Thus, in some embodiments, a deposited item is verified as returnable by, for example, identifying each of the one or several received batteries as returnable, and/or verifying that each of the one or several received batteries meets return criteria. In some embodiments, this verification can include, for example, image analysis, functional analysis, or any other desired analysis. In some embodiments, image analysis can comprise analyzing an image of the one or several received batteries for identification and functionality criteria such as, for example, battery packaging, or visible signs of damage to the battery. In some embodiments, functional analysis can include, for example, testing the one or several batteries' performance characteristics, such as charging and discharging characteristics, which can include, for example, a measurement of battery voltage and/or internal impedance/resistance.

[0081] In some embodiments of a method 400 of operating a two-way rechargeable battery vending machine to receive one or several deposited rechargeable batteries, failure to verify the deposited one or several batteries as returnable can result in providing a preliminary indication of an account credit. In some embodiments, failure to verify the deposited one or

several items and/or one or several batteries as returnable can result in postponed crediting of an account as depicted in block 414 until the batteries are verified as returnable. In some embodiments, the deposited one or several batteries can be verified as returnable as depicted in block 416. This verification can, in some embodiments, be performed as discussed above. In some embodiments, this verification can be automatically performed. In some embodiments, this verification can be performed by a human.

[0082] Method 400 of operating a two-way rechargeable battery vending machine to receive one or several deposited rechargeable batteries can move to decision state 417 and determine if the deposited item is verified as returnable. If the verification process of block 416 was unsuccessful, and the deposited item is not verified as returnable, customer service can be notified as depicted in block 419. In some embodiments, customer service can use then request the returned items to perform a manual inspection, and/or can add information to the customer account relating to the inability of the system to verify the deposited item as returnable.

[0083] If the deposited item is verified as returnable, as depicted in decision state 417, or after determining that the deposited item is verified as returnable as depicted in decision state 412, the account can be credited as depicted in block 418. In some embodiments, crediting of an account can include dispensing cash payment to a user, transferring money to credit or debit card, which can be, for example, the card used for purchase, or swiped at the time of return, or any other form of providing a credit to a user and/or the associated account.

[0084] A person of skill in the art will recognize that a method 400 of operating a two-way rechargeable battery vending machine to receive one or several rechargeable batteries can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a method 400 of operating a two-way rechargeable battery vending machine to receive one or several rechargeable batteries can include the above listed steps performed in a different order than shown above.

[0085] Figure 5 depicts one embodiment of a method 500 of operating a two-way rechargeable battery vending machine to determine if one or several received items are returnable, rechargeable batteries. In some embodiments, the method 500 moves to decision state 502 to determine if one or several received items have an expected characteristic. In some embodiments, this characteristic can include a physical characteristic such as, for example, a weight, a size, and a color or color scheme. In some embodiments, this characteristic can be identified by one or more sensors. In some embodiments, in which the characteristic is the weight, the weight can be determined by a scale. In some embodiments, the measured weight

can be compared, for example, to an expected weight or an expected weight range for one or several batteries.

[0086] In some embodiments, if the item does not have a weight matching an expected weight, or falling within an expected weight range, a received item is rejected, as depicted in block 504.

[0087] If the item does have a weight matching an expected weight, or falling within an expected weight range, the process 500 moves to decision state 506 and determines if the received item has an associated identification feature. If the received item does not have an associated identification feature, the received item is rejected as depicted in block 504.

[0088] If the item is determined as having an associated identification feature, the method 500 moves to decision state 508 to determine if the identification feature identifies a returnable rechargeable battery. As discussed above, in some embodiments, one or several batteries may be received in one or several battery cases. In such embodiments, an identification feature may be located on the one or several battery cases, and may identify the case and not a returnable rechargeable battery. In other embodiments, an identification feature may be located on the one or several batteries, and may identify the one or several returnable rechargeable batteries.

[0089] If the item does not have an identification feature that identifies a returnable rechargeable battery, the method 500 optimally moves to decision state 510 to determine if the item includes an additional identification feature. If the item does not include an additional identification feature, then the item is designated as not verified returnable as depicted in block 512, and decision state 417 depicted in Figure 4 would lead to notifying customer service as depicted in block 419 of Figure 4. If the item does include an additional identification feature, then the process 500 returns to decision state 506 to analyze the additional identification feature.

[0090] If a determination is made in decision state 508 that the identification feature identifies a returnable rechargeable battery, process 500 moves to decision state 514 to determine if the battery is returnable. This determination can include, for example, functional testing of the battery, evaluation of the exterior condition of the battery, or any other desired testing. If the battery is not returnable, the received item is rejected as depicted at block 504. If the battery is returnable, then the received battery is designated as verified returnable as depicted in block 516, and decision state 417 depicted in Figure 4 would lead to crediting the account as depicted in block 418 of Figure 4.

[0091] A person of skill in the art will recognize that a method 500 of operating a two-way rechargeable battery vending machine to determine if one or several deposited

rechargeable batteries are returnable can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a method 500 of operating a two-way rechargeable battery vending machine to distribute one or several rechargeable batteries can include the above listed steps performed in a different order than that shown above.

[0092] The technology is operational with numerous other general purpose or special purpose computing system environments or configurations. Examples of well known computing systems, environments, and/or configurations that may be suitable for use with the invention include, but are not limited to, personal computers, server computers, hand-held or laptop devices, multiprocessor systems, processor-based systems, programmable consumer electronics, network PCs, minicomputers, mainframe computers, distributed computing environments that include any of the above systems or devices, and the like.

[0093] As used herein, instructions refer to computer-implemented steps for processing information in the system. Instructions can be implemented in software, firmware or hardware and include any type of programmed step undertaken by components of the system.

[0094] A processor may be any conventional general purpose single- or multi-chip processor such as a Pentium[®] processor, a Pentium[®] Pro processor, a 8051 processor, a MIPS[®] processor, a Power PC[®] processor, or an Alpha[®] processor. In addition, the processor may be a microcontroller or any conventional special purpose processor such as a digital signal processor or a graphics processor. The processor typically has conventional address lines, conventional data lines, and one or more conventional control lines.

[0095] The system is comprised of various modules as discussed in detail. As can be appreciated by one of ordinary skill in the art, each of the modules comprises various sub-routines, procedures, definitional statements and macros. Each of the modules are typically separately compiled and linked into a single executable program. Therefore, the description of each of the modules is used for convenience to describe the functionality of the preferred system. Thus, the processes that are undergone by each of the modules may be arbitrarily redistributed to one of the other modules, combined together in a single module, or made available in, for example, a shareable dynamic link library.

[0096] The system may be used in connection with various operating systems such as Linux[®], UNIX[®] or Microsoft Windows[®].

[0097] The system may be written in any conventional programming language such as C, C++, BASIC, Pascal, or Java, and may be run under a conventional operating system. C, C++, BASIC, Pascal, Java, and FORTRAN are industry standard programming languages for

which many commercial compilers can be used to create executable code. The system may also be written using interpreted languages such as Perl, Python or Ruby.

[0098] Those of skill will further appreciate that the various illustrative logical blocks, modules, circuits, and algorithm steps described in connection with the embodiments disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, circuits, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present disclosure.

[0099] The various illustrative logical blocks, modules, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a microcontroller, a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor may be a microprocessor, but in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[0100] In one or more example embodiments, the functions and methods described may be implemented in hardware, software, or firmware executed on a processor, or any combination thereof. If implemented in software, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Computer-readable media includes both computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A storage media may be any available media that can be accessed by a computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to carry or store desired program code in the form of instructions or data structures and that can be accessed by a computer. Also, any connection is properly termed

a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of medium. Disk and disc, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc where disks usually reproduce data magnetically, while discs reproduce data optically with lasers. Combinations of the above should also be included within the scope of computer-readable media.

[0101] The foregoing description details certain embodiments of the systems, devices, and methods disclosed herein. It will be appreciated, however, that no matter how detailed the foregoing appears in text, the systems, devices, and methods can be practiced in many ways. As is also stated above, it should be noted that the use of particular terminology when describing certain features or aspects of the invention should not be taken to imply that the terminology is being re-defined herein to be restricted to including any specific characteristics of the features or aspects of the technology with which that terminology is associated.

[0102] It will be appreciated by those skilled in the art that various modifications and changes may be made without departing from the scope of the described technology. Such modifications and changes are intended to fall within the scope of the embodiments. It will also be appreciated by those of skill in the art that parts included in one embodiment are interchangeable with other embodiments; one or more parts from a depicted embodiment can be included with other depicted embodiments in any combination. For example, any of the various components described herein and/or depicted in the Figures may be combined, interchanged or excluded from other embodiments.

[0103] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0104] It will be understood by those within the art that, in general, terms used herein are generally intended as “open” terms (e.g., the term “including” should be interpreted as “including but not limited to,” the term “having” should be interpreted as “having at least,” the term “includes” should be interpreted as “includes but is not limited to,” etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such

recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases “at least one” and “one or more” to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles “a” or “an” limits any particular claim containing such introduced claim recitation to embodiments containing only one such recitation, even when the same claim includes the introductory phrases “one or more” or “at least one” and indefinite articles such as “a” or “an” (e.g., “a” and/or “an” should typically be interpreted to mean “at least one” or “one or more”); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of “two recitations,” without other modifiers, typically means *at least* two recitations, or *two or more* recitations). Furthermore, in those instances where a convention analogous to “at least one of A, B, and C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, and C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to “at least one of A, B, or C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, or C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase “A or B” will be understood to include the possibilities of “A” or “B” or “A and B.”

[0105] While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting.

WHAT IS CLAIMED IS:

1. A two-way battery vending machine comprising:
 - a communications module configured to communicate information to a user and to receive inputs from a user including input indicia of the user identity;
 - a dispenser configured to dispense a selected battery;
 - a receiver configured to receive a battery;
 - an identifier configured to identify a battery by reference to an identification characteristic;
 - a processor configured to control the vending machine; and,
 - memory comprising stored instructions for operation of the vending machine.
2. The two-way battery vending machine of Claim 1, further comprising a receptacle to store a received battery.
3. The two-way battery vending machine of Claim 1, further comprising a storage area for the battery before it is dispensed.
4. The two-way battery vending machine of Claim 1, further comprising a network communications module configured to communicate vending machine information across a network.
5. The two-way battery vending machine of Claim 1, wherein the two-way battery vending machine is configured to associate the battery with a user account.
6. The two-way battery vending machine of Claim 5, wherein associating the battery with an account further comprises associating the identification characteristic with a user account.
7. The two-way battery vending machine of Claim 1, wherein the identifier comprises a scale and wherein the unique identification characteristic comprises a weight.
8. The two-way battery vending machine of Claim 1, wherein the identifier comprises a scanner and the identification characteristic comprises a computer readable code.
9. The two-way battery vending machine of Claim 1, wherein the identifier comprises a camera and the identification characteristic comprises a visible feature.
10. The two-way battery vending machine of Claim 1 wherein the identification characteristic comprises a pattern.
11. The two-way battery vending machine of Claim 1, wherein the identification characteristic comprises one or more colors.
12. The two-way battery vending machine of Claim 1, wherein the identification characteristic comprises an ultraviolet marking.

13. The two-way battery vending machine of Claim 1, wherein the identification characteristic comprises a fluorescent marking.

14. The two-way battery vending machine of Claim 1, wherein the identification characteristic comprises an infra-red marking.

15. The two-way battery vending machine of Claim 1, wherein the identification characteristic comprises a radio emitter.

16. The two-way battery vending machine of Claim 5 wherein the network communication module is configured to communicate with a server across a network.

17. A method of using the two-way battery vending machine of Claim 1, the method comprising:

dispensing a requested battery, wherein said dispensing comprises:

receiving a request for dispensing of a battery via the communications module;

processing the request with the processor;

identifying the requested battery by said identification characteristic;

associating the requested battery with an account; and,

dispensing the requested battery; and,

receiving a battery, wherein said receiving comprises:

identifying the received battery;

associating the received battery with an account; and

crediting the account when the received battery has specified characteristics.

18. The method of Claim 17, wherein the requested battery is dispensed in a battery container.

19. The method of Claim 18, wherein the requested battery container includes an identification feature.

20. The method of Claim 17, wherein identifying the requested battery comprises scanning a computer readable code.

21. The method of Claim 17, wherein identifying the requested battery comprises receiving a data containing radio signal.

22. The method of Claim 17, wherein associating the requested battery with an account comprises associating the identification characteristic with an electronic payment account.

23. The method of Claim 22, wherein the electronic payment account comprises a credit account.

24. The method of claim 22, wherein the electronic payment account comprises a bank account.

25. The method of Claim 17, wherein associating the requested battery with an account comprises associating the unique identification characteristic with a user account identifier.

26. The method of Claim 25, wherein the user account identifier comprises an email account.

27. The method of Claim 25, wherein the user account identifier comprises an account number.

28. The method of Claim 25, wherein the user account identifier comprises a user name.

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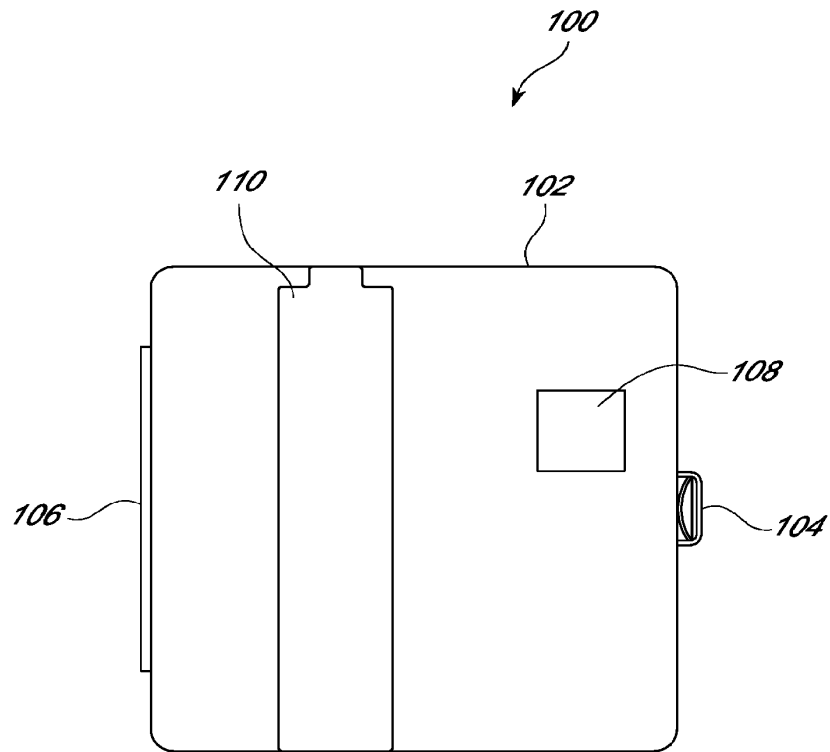


FIG. 1

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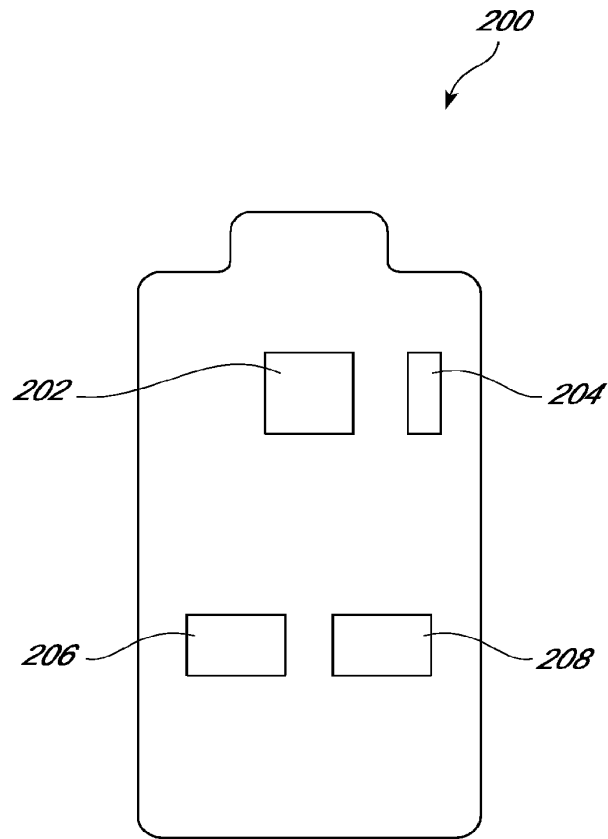
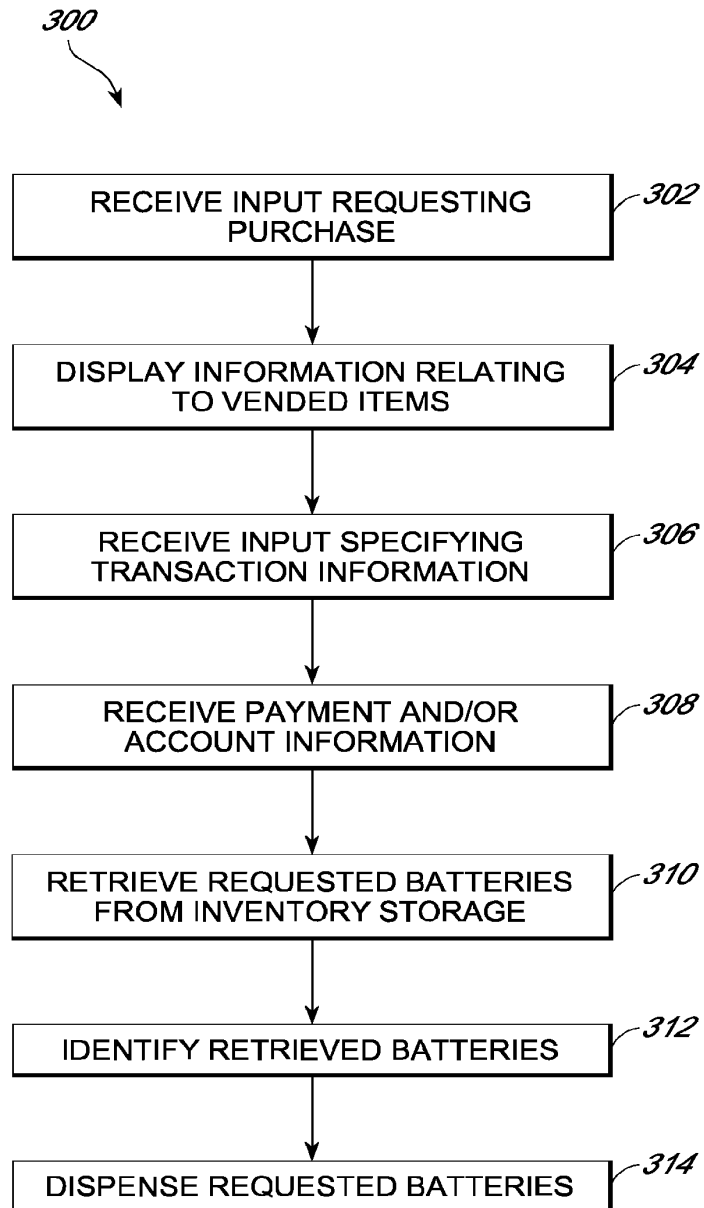
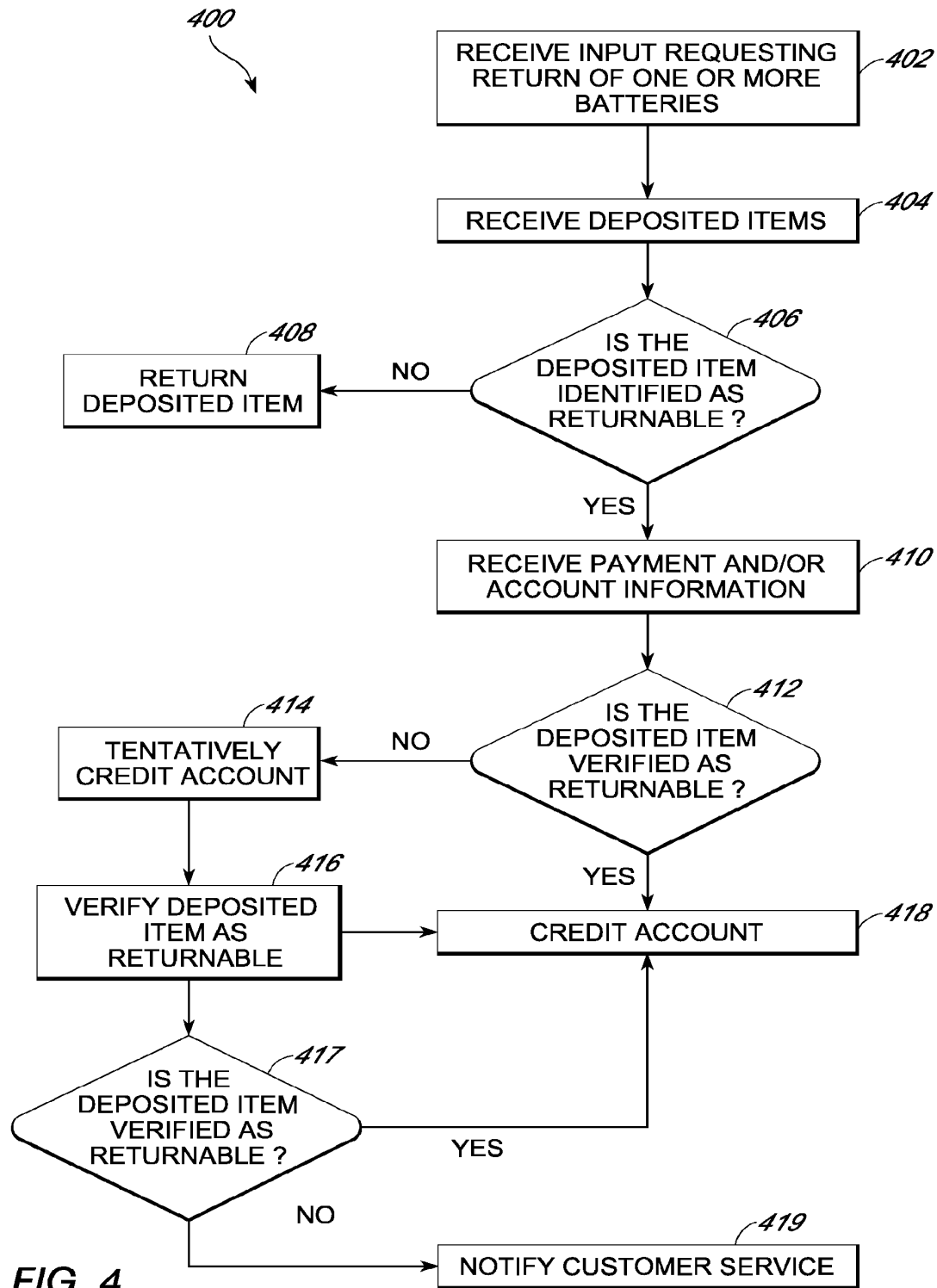


FIG. 2

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**FIG. 3**

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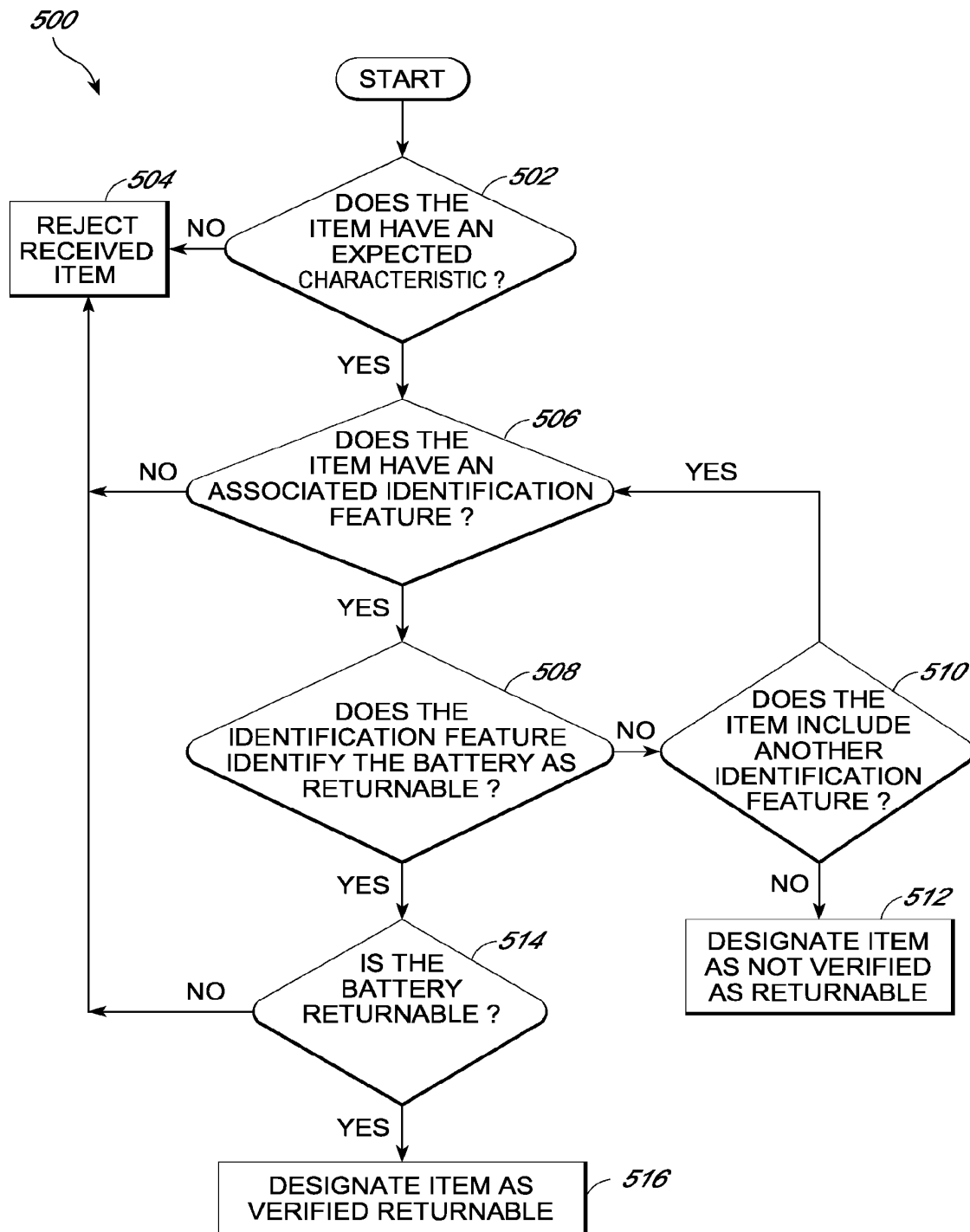


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/065326

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G06F 17/00 (2013.01)

USPC - 700/233

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) - B23Q 7/12; G06F 17/00; G07F 11/00 (2013.01)

USPC - 221/10, 22, 159, 163; 700/231-233, 240

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC: G07F 17/26, G07F 17/42

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

MicroPatent, Orbit.com, Google Patents, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,544,784 A (MALASPINA) 13 August 1996 (13.08.1996) entire document	1-28
Y	US 2010/0312380 A1 (LOWE et al) 09 December 2010 (09.12.2010) entire document	1-28
Y	US 2011/0225098 A1 (WOLFF et al) 15 September 2011 (15.09.2011) entire document	7, 9-11, 13
Y	EP 0 577 121 A1 (DALLA VALLE) 05 January 1994 (05.01.1994) entire document	18-19
A	US 2010/0169231 A1 (BOWLES et al) 01 July 2010 (01.07.2010) entire document	1-28
A	US 2001/0037207 A1 (DEJAEGER) 01 November 2001 (01.11.2001) entire document	1-28
A	US 2,119,063 A (WAGNER) 31 May 1938 (31.05.1938) entire document	1-28
A	US 6,822,422 B2 (SAGAWA) 23 November 2004 (23.11.2004) entire document	1-28

☐ 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

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"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

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Date of the actual completion of the international search

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Date of mailing of the international search report

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(54) Title: TWO-WAY EXCHANGE VENDING

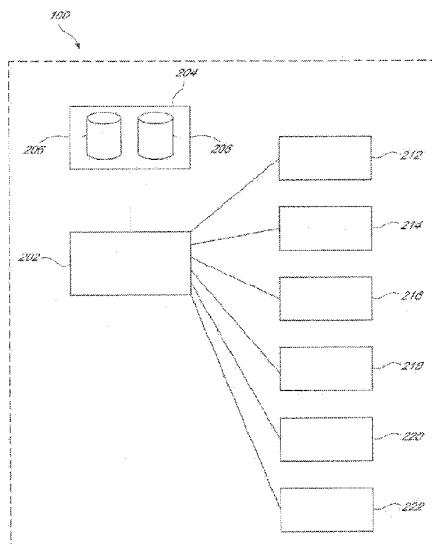


FIG. 2

(57) Abstract: Two-way exchange vending can be performed by a two-way exchange based vending machine. The two-way exchange based vending machine can vend rechargeable batteries. The two-way exchange based vending machine can include different modules to perform different functionalities. The two-way exchange based vending machine can include a communications module, a dispensing module, a rejection module, and a receiving module. The communications module can communicate information to and receive inputs from a user. The dispensing module can dispense one or more rechargeable batteries or other requested products to a user. The receiving module can receive one or more rechargeable batteries from a user.

WO 2013/142154 A1

TWO-WAY EXCHANGE VENDING

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to and the benefit of U.S. Provisional Application No. 61/613,415 filed March 20, 2012, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This relates to the field of vending, and particularly to the field of two-way exchange based vending of reusable or recyclable products, such as, for example, rechargeable batteries.

Description of the Related Art

[0002] Batteries power a variety of devices. As more devices become battery powered, consumer demand for batteries increases. This results in the manufacturing and disposal of ever greater numbers of batteries, which can include precious metals or toxic materials such as, mercury, cadmium, or lead. Some people have begun using rechargeable batteries to save money and to minimize battery waste. However, rechargeable batteries require careful recharging, optimally achieved with expensive chargers, and are generally considered not to be as convenient as disposable batteries.

SUMMARY OF THE INVENTION

[0003] Some embodiments relate to a vending machine. In some embodiments, the vending machine can include, for example, a processor that controls the vending machine, a receiving module that receives a battery and collects and transmits battery information to the processor, a dispensing module that dispenses a battery in response to the receipt of the battery and the determination that the battery is associated with a valid subscription. In some embodiments, the processor determines if the received battery is associated with a valid subscription.

[0004] In some aspects, the vending machine can further include, for example, a receptacle to store a received battery, a storage area for the battery before it is dispensed, and/or a charging module, a network communications module that communicates across a network. In some aspects, the charging module determines if the received battery meets charging criteria, and/or recharges the received battery if the received battery meets the charging criteria. In some aspects, the processor can, for example, determine if the received battery is acceptable, which

can include, for example, determining if the operating condition of the battery is acceptable and/or determining if the physical condition of the battery is acceptable.

[0005] In some aspects, the vending machine can further include, for example, a rejection module that returns a rejected battery to a user and/or a communication module that communicates information to a user. The communication module can, for example, receive user inputs and/or include a plurality of computer receivable codes that can, for example, provide information to direct an electronic device to a web-page, relate to a subscription related transaction, can be QR codes, and/or can be an emitted frequency.

[0006] Some embodiments relate to a method of using a vending machine. In some embodiments, the method includes, for example, receiving a battery, and dispensing a battery. In some embodiments, receiving the battery includes, for example, determining if the received battery is associated with a valid subscription, determining the type of received battery, and/or determining if the received battery is acceptable. In some embodiments, dispensing a battery includes, for example, dispensing the same type of battery as the received battery in response to the determination of the valid subscription associated with the battery and the acceptability of the battery.

[0007] In some aspects of the method, determining if the received battery is acceptable can include, for example, determining if the physical condition of the battery is acceptable, and/or determining if the operating condition of the battery is acceptable. In some aspects of the method, determining if the received battery is associated with a valid subscription can include, for example, determining if the received input is associated with a valid subscription, which received input can include, for example, at least one of a user name, a password, and an account number, and/or the received battery. In some aspects, determining if the received input is associated with a valid subscription can include, for example, determining if the received battery is a battery for use with the vending machine. In some aspects the method can further include, for example, determining the chargeability of the received battery, which can include, for example, determining the charge state of the received battery and/or determining if the received battery meets charging criteria.

[0008] In some aspects, the method can include, for example, rejecting the received battery if the received battery is not associated with a valid subscription, rejecting the received battery if the received battery is not acceptable, if the physical condition of the received battery is unacceptable, and/or if the operational condition of the received battery is unacceptable.

[0009] In some aspects, the vending system comprises a vending unit for vending products, the vending unit comprising a communication module and a unique identifier; a

central computer comprising a processor; a database storing product information; and a communication unit, the central computer being located remote to the vending unit; a vending interface, the vending interface being located remote from the vending unit and configured to communicate with the central computer; and wherein the vending interface is configured to communicate the unique identifier of the vending unit and vending information to the central computer, and the central computer is configured to communicate the product information to the interface and to communicate vending instructions to the vending unit with the unique identifier.

[0010] In some aspects, a method of vending an item comprises receiving, in a central processor, a unique identifier for a vending unit; retrieving product information from a database corresponding to the unique identifier for the vending unit; transmitting the product information to an interface, wherein the interface is remote from the vending unit; receiving, in the central processor, a product selection from the interface; receiving payment for the product selection from a payment system; communicating the product selection to the vending unit corresponding to the unique identifier; and vending the selected product at the vending unit.

[0011] In some aspects, the unique identifier may be used to identify the vending unit into which an exchange item, such as a battery, is to be deposited in exchange for a new item, such as a fresh or charged battery.

[0012] The foregoing is a summary and thus contains, by necessity, simplifications, generalization, and omissions of detail; consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects, features, and advantages of the devices and/or processes and/or other subject matter described herein will become apparent in the teachings set forth herein. The summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The foregoing and other features of the present disclosure will become more fully apparent from the following description taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are not to be considered limiting of its scope, the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

[0014] FIGURE 1 depicts a front view of one embodiment of a two-way exchange based vending machine.

[0015] FIGURE 2 is a schematic illustration of one embodiment of the functional blocks of a two-way exchange vending machine.

[0016] FIGURE 3 is a flow chart illustrating one embodiment of a method of operation of a two-way exchange based vending machine to distribute one or several rechargeable batteries.

[0017] FIGURE 4 is a flow chart illustrating one embodiment of a method of operating a two-way exchange based vending machine to verify a subscription.

[0018] FIGURE 5 is a flow chart illustrating one embodiment of a method of operating a two-way exchange based vending machine to determine whether to accept a deposited item.

[0019] FIGURE 6 is a flow chart illustrating one embodiment of a method of operating a two-way exchange based vending machine to distribute one or several rechargeable batteries.

[0020] FIGURE 7 depicts a “headless” vending system.

[0021] FIGURE 8 is a flow chart illustrating one embodiment of a method of a user interacting with a vending system using a mobile electronic device.

[0022] FIGURE 9 is a flow chart illustrating one embodiment of the operation of a vending system using a mobile electronic device.

[0023] FIGURE 10 is a flow chart illustrating one embodiment of a two-way exchange transaction with a vending system using a mobile electronic device.

DETAILED DESCRIPTION

[0024] In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. In the drawings, similar symbols typically identify similar components, unless context dictates otherwise. The illustrative embodiments described in the detailed description and drawings are not meant to be limiting. Other embodiments may be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented here. It will be readily understood that the aspects of the present disclosure, as generally described herein, and illustrated in the Figures, can be arranged, substituted, combined, and designed in a wide variety of different configurations, all of which are explicitly contemplated and make part of this disclosure.

[0025] Some embodiments disclosed herein relate to machines configured for two-way exchange based vending. In some embodiments, two-way exchange based vending can be subscription based, rental based, membership based (e.g. club membership), or based on any other system for tracking and/or regulating the exchange of a returned item for a new item. In some embodiments, the exchanged item can be any desired item, and can, in some embodiments, be a reusable item, such as, for example, a printer ink cartridge, a razor blade, a fuel cell such as, a portable fuel cell, a rechargeable battery, or any other item. Thus, in some embodiments, the machines can be configured to vend a variety of items, including, for example, of rechargeable batteries. In some embodiments, a two-way exchange based vending machine can comprise a variety of features in a variety of combinations. In some embodiments, these features can be configured to perform designated functions. Some embodiments include a vending machine capable of performing more or fewer functions than those described herein. In some embodiments, features of a two-way exchange based vending machine can include, for example, a communications module, a receiving module, a rejection module, a dispensing module, a charger, a processor, memory, a network communications module, and/or any other desired features. In some embodiments of a two-way exchange based vending machine, the two-way exchange based vending machine can communicate with a central control and monitoring station. In some embodiments of a two-way exchange based vending machine, the two-way exchange based vending machine can communicate with a central control and monitoring station over a network, such as, for example, the internet, a telecommunications network, or any other network. In some embodiments, the two-way exchange based vending machine can communicate information such as, for example, inventory status, functionality status of the two-way exchange based vending machine, service requests, subscription verification requests, and/or any other desired information to the central control and monitoring station.

[0026] Some embodiments disclosed herein relate to methods of two-way exchange based vending of, for example, rechargeable batteries. Some embodiments can include a variety of steps performed in a variety of orders. Some embodiments can include more or fewer steps than those specifically outlined herein. In some embodiments, the steps outlined herein can be supplemented by additional steps. In some embodiments, methods of two-way exchange based vending of, for example, rechargeable batteries can include, for example, receiving a deposited item, verifying a subscription status, verifying battery condition, verifying inventory availability, dispensing a rechargeable battery, storing the received battery, and/or any other desired steps.

[0027] A two-way exchange based vending machine can comprise a variety of shapes, sizes and configurations. In some embodiments, a two-way exchange based vending machine can be sized for floor mounting, for wall mounting, for table/countertop mounting, or for any other desired mounting configuration. In some embodiments, a two-way exchange based vending machine can comprise an integral component of another vending machine, such as, for example, a two-way battery vending machine.

[0028] A two-way exchange based vending machine can be configured to vend a variety of products. In some embodiments, a two-way exchange based vending machine can be configured to vend rechargeable batteries. In some embodiments, a two-way exchange based vending machine can be configured to vend certain sizes of rechargeable batteries, such as, for example, AAA, AA, C, D, 9-volt, or any other battery size. In some embodiments, a two-way exchange based vending machine can be configured for vending other battery products such as, for example, a battery pack. In some embodiments, the vending machine is configured to vend a rechargeable battery pack. The battery pack may comprise a case comprising one or more cells of Li-ion 18650-type batteries. In some embodiments, the one or more Li-ion 18650-type batteries are connected to a port which comprises a USB port. The one or more batteries may be sealed within an enclosure which comprises the USB port to which the battery cells are connected. The battery power unit has internal circuitry which transforms the voltage to a voltage used in a handheld mobile device, such as a cellular telephone or a tablet computer. In this embodiment, the battery pack acts as a backup power supply for the handheld mobile device, providing a source from which to charge the internal battery of the mobile handheld device, or any device having a USB or USB-compatible charging connection.

[0029] In some embodiments of the two-way exchange based vending machine, a battery can be individually vended. In some embodiments of the two-way exchange based vending machine, a battery can be vended with other batteries. Thus, in some embodiments, a user may be able to specify the exact number of batteries for vending, and in other embodiments, a user may specify the number of packages of batteries for vending. In some embodiments of the two-way exchange based vending machine, the number of batteries that are vended corresponds to the number of acceptable batteries that are received by the two-way exchange based vending machine. In one embodiment, for example, the number of batteries that are vended by the two-way exchange based vending machine is the same as the number of acceptable batteries that are received by the two-way exchange based vending machine.

[0030] In some embodiments, one or several batteries can be vended as individual units, or can be vended packaged into groups of multiple batteries. In one embodiment, the

batteries can be vended in a battery package that can be reusable or disposable. In some embodiments, the battery package can hold one or several batteries of a variety sizes, shapes, and/or types. In some embodiments, a battery package can be configured to hold, for example, one battery, two batteries, three batteries, four batteries, five batteries, eight batteries, ten batteries, twelve batteries, or any other desired number of batteries. In some embodiments, the battery package can contain one or several individual batteries, or one or several interconnected batteries. In some embodiments, the battery package can interconnect the batteries to provide a single power providing device, such as, for example, a battery pack.

[0031] The battery package can comprise a reusable battery case that can comprise any desired type of container or packaging such as, for example, an envelope, a bag, a box, shrink wrap, a blister pack, or any other type of container or packaging. The battery case can include features configured to allow opening and closing of the battery case such as, for example, a latch and a hinge, and the battery case can include internal features that secure one or several batteries within the battery case.

[0032] A two-way exchange based vending machine can comprise a variety of functionalities to facilitate vending. Figure 1 depicts one embodiment of the two-way exchange based vending machine 100. As depicted in Figure 1, the two-way exchange based vending machine 100 can comprise a body 110, a receiving module 112, a rejection module 114, a dispensing module 116, and a communications module 118.

[0033] In some embodiments, the body 110 can comprise the exterior of the two-way exchange based vending machine 100. The body 110 can be made of a variety of materials including, for example, natural, manmade, or any other desired materials. In some embodiments, for example, the body 110 can comprise a polymer or a metal. The body 110 can be designed and configured to house and protect the components and the inventory of the two-way exchange based vending machine 100. In some embodiments, the body 110 can include features to facilitate access to the components and the inventory of the two-way exchange based vending machine 100 such as, for example, a door, a lock, and/or any other desired features.

[0034] The two-way exchange based vending machine 100 can include the receiving module 112. In some embodiments, the receiving module 112 can be configured to receive one or several batteries, to identify the one or more received batteries, determine the acceptability of the one or more received batteries, to determine the operability of the one or more received batteries, to communicate the identification, acceptability, and chargeability information for the one or more received batteries to a controller, and/or to place the one or more received batteries in a storage receptacle for received batteries.

[0035] The receiving module 112 can include a variety of features and perform a variety of functionalities. In some embodiments, for example, the receiving module 112 can comprise a receiving receptacle configured to receive batteries, and a receiving identifier configured to identify one or more received batteries, a storage receptacle for storing received batteries, and features configured to transport the one or more received batteries from the receiving receptacle to the storage receptacle. In some embodiments, the receiving module can include each or some of these features. In some embodiments, the receiving module 112 can include additional features. In some embodiments, one or several of these features can be integrated into a single location.

[0036] In some embodiments, a receiving identifier can include features configured to identify the received batteries. This identification can, for example, comprise identification of a class or category of each returned battery. In some embodiments, this identification can comprise identification of some parameter associated with a battery. Advantageously, identification of a class or category of each returned battery can indicate a valid and/or active user subscription. In some embodiments, for example, a user receives one or several batteries in response to starting a subscription account, and retains the one or several batteries until the subscription account terminates. Each of these batteries can include features that identify the battery or allow identification of the battery as a subscription battery. As a user's possession of subscription batteries coincides with, in some embodiments, the active status of their subscription, the identification of a battery as a subscription battery simultaneously identifies a valid and/or active subscription.

[0037] In some embodiments, the receiving identifier can use a variety of techniques to determine the acceptability of the received battery. In some embodiments, the receiving identifier can include features configured to determine the physical condition of the received battery and/or configured to determine the operable condition of the received battery. In some embodiments, for example, the receiving identifier can include a scanner, a camera, or any other feature capable of capturing an image of the received battery. This image can, in some embodiments, be analyzed with different image analysis techniques to determine the condition of the exterior of the battery.

[0038] In some embodiments, the receiving identifier can include features configured to determine the operable condition of the received battery. These features can include, for example, one or more electrodes configured for electrical connection with the received battery. In some embodiments, the electrodes can be connected with features configured to determine the ability of the received battery to be recharged and meet performance requirements.

[0039] In some embodiments, the receiving module 112 can access the inventory module and can comprise features configured to transport a received battery to the inventory module.

[0040] As mentioned above, the two-way exchange based vending machine 100 can include the rejection module 114. In some embodiments, the rejection module 114 can be configured to return rejected batteries to the user. In some embodiments of the two-way exchange based vending machine 100, information obtained from the receiving module 112 can be used to determine whether to accept or reject received batteries. In some embodiments, for example, a received battery can be rejected if the physical condition of the received battery is inadequate. In some embodiments, for example, a received battery can be rejected if the operable condition of the battery is inadequate. In some embodiments, for example, a received battery can be rejected if the physical condition and the operable condition of the battery are inadequate. In some embodiment, the rejection module 114 can be configured to reject a battery, for example, if the battery is a non-supported type or brand of battery, if the battery does not include a proper identification feature or based on any other desired criteria.

[0041] The rejection module 114 can include a variety of features and components. In some embodiments, the rejection module 114 can include, for example, a rejection receptacle. In some embodiments, the rejection module 114 can include additional features. In some embodiments, one or several of these features can be integrated into a single location. In some embodiments, the rejection module can comprise an integral portion of the receiving module 112 and/or the dispensing module 116.

[0042] In some embodiments, the rejection receptacle can be configured to receive rejected batteries from the receiving module 112 and to present the rejected batteries to the user. In some embodiments, the rejection receptacle can comprise, for example, a user accessible tray.

[0043] The two-way exchange based vending machine 100 can include the dispensing module 116. The dispensing module 116 can be configured to remove one or more batteries from the inventory module and dispense the one or more batteries to the user. In some embodiments, the dispensing module 116 can dispense the number of batteries associated with a transaction. In some embodiments, the dispensing module 116 can be configured to dispense new batteries to a user starting or expanding a subscription. In some embodiments, the dispensing module 116 can be configured to dispense the same number of charged batteries to a user as the number of returned batteries that were received from a user. In some embodiments, the dispensing module 116 can be configured to dispense fewer charged batteries to a user than the number of returned batteries received from the user.

[0044] The dispensing module 116 can include a variety of features and functionalities. In some embodiments, the dispensing module 116 can include, for example dispensing features configured to deliver one or more batteries from the inventory module to a user, and any other desired features.

[0045] Some embodiments of the two-way exchange based vending machine 100 include the communications module 118. The communications module 118 can be configured to communicate with a user of the two-way exchange based vending machine 100. Specifically, in some embodiments of the two-way exchange based vending machine 100, the communications module 118 can be configured to communicate information to the user and/or to receive inputs from the user. In some embodiments, the communications module 118 can be static and/or dynamic. Thus, in some embodiments, the communications module 118 can comprise active features capable of providing information in response to an input, and in some embodiments, the communications module 118 may constantly display the same information. Thus, in some embodiments, the communications module 118 can comprise text, images, coding, or other static features located on a portion of the two-way exchange based vending machine 100, and in some embodiments, the communications module 118 can include, for example, a display screen, a speaker, or any other feature or feature combination capable of communicating information to a user of the two-way exchange based vending machine 100. In some embodiments, a communications module 118 can comprise one or several input features such as, for example, a key pad, a touch screen, a track pad, a microphone, voice recognition hardware and software, or any other feature or features capable of receiving a user input.

[0046] In some embodiments, the communications module 118 comprises features configured to facilitate online interaction with the two-way exchange based vending machine 100. Specifically, in some embodiments, the communications module 118 can comprise features to facilitate interaction with a web-site. In some embodiments, the web-site can have a communications link with the two-way exchange based vending machine 100 to transmit information relating to user interaction with the web-site to the two-way exchange based vending machine 100. Thus, in some embodiments, information relating to a transaction performed at the web-site can be communicated to the two-way exchange based vending machine 100.

[0047] In some embodiments, the features of the two-way exchange based vending machine 100, and the communications module 118 configured to facilitate accessing of a web-site can include, for example, a processor, memory, and other features configured for accessing the internet. In some embodiments, the communications module 118 can be configured to

provide information to a user to facilitate the user's accessing the web-site via a user device. In some embodiments, these features can comprise, for example, instructions for internet access, a web-address, or any feature configured to communicate the address of the web-site to or to guide a user to the website. In one embodiment, these features can include, for example, a computer receivable code. In some embodiments, the computer receivable code can comprise, for example, a barcode, including, a linear barcode, a 2-D barcode, a QR code, or any other type of barcode. In some embodiments, the computer receivable code can comprise, for example, an emitted signal, such as, a signal emitted by an RFID tag. In some embodiments, the communications module 118 can comprise a plurality of computer receivable codes, and in some embodiments, each code can facilitate user access to a unique web-page associated with each of the computer receivable codes. In some embodiments, the communications module 118 can display the computer receivable code in response to a user input. In some embodiments, the computer receivable code can be displayed on the two-way exchange based vending machine, such as, via a label or sticker applied to the two-way exchange based vending machine.

[0048] In some embodiments, a user can use an electronic device to receive the computer receivable code. The electronic device can comprise any desired electronic device, including, for example, a device capable of accessing the internet. In some embodiments the device capable of accessing the internet can comprise, for example, a mobile device such as a handheld device like a Smartphone, a cellular phone, a tablet, a laptop computer, a PDA device, or any other desired portable device.

[0049] In some embodiments, the electronic device can comprise features capable of receiving the computer receivable code. In some embodiments these features can comprise, a camera, a scanner, a sensor, a receiver, or any other desired features.

[0050] In one specific embodiment, for example, the communications module 118 can comprise a plurality of computer receivable codes, and specifically, a plurality of QR codes. In one embodiment, each of these computer receivable codes is associated with a transaction relating to a subscription, such as, for example, starting a subscription, expanding a subscription, such as, for example, increasing the number of batteries associated with the subscription, increasing the length of the subscription, or increasing the number of allowed recharges with the subscription, contracting a subscription, such as, for example, decreasing the number of batteries associated with the subscription, decreasing the length of the subscription, or decreasing the number of allowed recharges with the subscription, a change in payment source associated with the subscription, a change in the identity of the subscriber, or any other subscription related transaction. In one specific embodiment, the user can use a camera to receive the information

stored in the computer receivable code. This information can be configured to connect the user's electronic device with a web-page for the completion of a transaction associated with the computer receivable code. After completion of this transaction, the web-site can communicate information reflecting the transaction to the two-way exchange based vending machine 100, which can then proceed to receive batteries, dispense batteries, or perform any other desired function.

[0051] In one embodiment of the two-way exchange based vending machine 100, the communications module 118 can comprise a touch screen configured to communicate information to the two-way exchange based vending machine 100 user and to receive inputs from the user.

[0052] In some embodiments, the communications module 118 of the two-way exchange based vending machine 100 can communicate information to a user including, for example, the availability and costs of a new or expanded subscription, information relating to a user account and/or user subscription account, such as, for example, the status of the users subscription account, the acceptability of deposited batteries, and/or any other desired information.

[0053] In some embodiments, the communications module 118 transmits information to a user and receives inputs from a user relating to a transaction. In some embodiments of two-way exchange based vending machine 100, the communications module 118 can prompt a user for an input identifying the user account and/or user subscription account. In some embodiments, the communications module 118 can be further configured to receive user inputs identifying the user account and/or the user subscription account. These inputs can include, for example, a username and password, a unique user identification number, an input received by scanning a computer readable code, an input received by swiping an item containing identification features such as a magnetic strip or an RFID tag or any other features. In some embodiment, a user can be provided with an identification feature, such as, for example, a card or component including, a magnetic strip, a computer readable code such as, for example, a barcode, an integrated circuit, such as, for example, a smart card, a signal emitting features such as, for example, an RFID tag, or any other identifying component. In some embodiments, this identification feature can be configured to assist in the determination of the subscription status of a user, and can, for example, facilitate the input of information to the two-way exchange based vending machine 100.

[0054] The controller can comprise, for example, a processor and a memory comprising stored instructions. In some embodiments, the processor can have a

communications link with some of the features of the two-way exchange based vending machine 100 to receive inputs from these features. In some embodiments, the processor can further provide electronic signals to the features of two-way exchange based vending machine 100 that control or direct the operation of these features. In some embodiments, the processor can receive electronic signals from each of the components of the two-way exchange based vending machine 100. In some embodiments, the processor can receive and process the user input, and in response to the input, direct the communication of information relating to the requested transaction to the user. This information can include, for example, account status, received battery acceptability, available battery inventory, pricing and availability of a subscription and/or an expanded subscription, and/or any other desired information. This information can allow the user to provide further inputs to the two-way exchange based vending machine 100 to select the user desired transaction. Advantageously, the use of the communications module 118 allows the two-way exchange based vending machine 100 to communicate information relating to products to the user, and the user to input information relating to the desired transaction into the two-way exchange based vending machine 100.

[0055] The two-way exchange based vending machine 100 can include additional features not depicted in Figure 1. In some embodiments, the two-way exchange based vending machine 100 may be configured to accept electronic payment via a mobile telephone. In some embodiments, the payment may be received from a cellular service provider, such as when a user texts a specific code to a specific number, which instructs the cellular network to charge a user's account. In some embodiments, the payment may be made in a dedicated application, or app, on the user's mobile phone, or any other electronic payment method. These features can include, among others, a payment module. A payment module can include any feature or features configured to receive payment from a user. In some embodiments, a payment module can be configured to receive cash payment or to receive electronic payment. In some embodiments, a payment module can be a scanner configured for use with, for example, a credit card, or a debit card, or a cash input device. A person of skill in the art will recognize that the present disclosure is not limited to any specific feature for receiving payment, but that it broadly encompasses all features capable of receiving payment. In some embodiments, the payment module can be used, for example, to start a new subscription or to expand an existing subscription. In some embodiments, a subscription can be started or expanded with an on-line, in store, or two-way vending machine transaction. In some embodiments, the subscription can be associated by a single person, by a group of people, or by an entity.

[0056] In some embodiments, the two-way exchange based vending machine 100 can comprise a network communications module. The network communications module can be configured to communicate with another entity on a network. In some embodiments, the network communications module can be configured to communicate with a server across a network, such as, for example, across the internet, and can include features configured for wired or wireless communication. In some embodiments, the network communications module may be configured to communicate with other two-way exchange based vending machines 100, a server, or other network and network-connected entities using the internet, a local area network, wide area network, RF communication, IR communication, cellular telephone networks, 3G and/or 4G networks, Wi-Fi, Bluetooth, or any other desired wireless or wired connection method.

[0057] The network communications module can be configured, in some embodiments, to transmit information to the server relating to the user, to a user account, to the user subscription account, to a user transaction, to user payment details, and/or any other desired information. In some embodiments in which the user identifies himself to the two-way exchange based vending machine 100, the network communications module can transmit this identification information to the server. The server can determine the status of the user account and/or user subscription account, and provide this information to the two-way exchange based vending machine 100. In some embodiments in which the user makes a payment to the two-way exchange based vending machine 100, the two-way exchange based vending machine 100 can provide information relating to the payment to the server. This information can include, for example, the amount of payment, whether a credit should be associated with the user account, payment account information such as, for example, a credit card or bank card number or identifier, or any other payment information. The server can then associate this payment information with the user account.

[0058] In some embodiments, the two-way exchange based vending machine 100 can provide information relating to purchases by the user, such as, for example, details relating to the subscription purchased by the user or any other desired information. This information can be associated with the user account and/or user subscription account. In some embodiments, the information may relate to the number of batteries a user's subscription entitles the user to have checked out or in his/her possession. The information may include the status of batteries, battery packs, fuel cells, or other items a user's subscription entitles the user to receive from the exchange based service via two-way exchange based vending machines 100. In some embodiments, a user may provide instructions via a subscription or other method which requests

the user have access to a battery, battery pack, etc., available for pick-up at any two-way exchange based vending machine 100.

[0059] In some embodiments, the network communications module can communicate information to the server relating to the status of the two-way exchange based vending machine 100. Thus, in some embodiments, the network communications module can send a signal to the server when the two-way exchange based vending machine 100 requires servicing such as, for example, replenishing of the stock of charged batteries or other vended items, removal of deposited discharged batteries or other used items, removal of discharged batteries that the two-way exchange based vending machine 100 cannot charge, or any other required service. A person of skill in the art will recognize that the network communications module can communicate a variety of other information with the server, and that the present disclosure is not limited to the above-described specific embodiments.

[0060] Some embodiments of the two-way exchange based vending machine 100 can include, for example, a charging module. The charging module can comprise features configured to recharge discharged batteries that are received by the two-way exchange based vending machine 100. In some embodiments, the charging module can be configured to recharge any desired battery configuration, including, for example, one or several individual batteries, one or several battery packs, and/or one or several pluralities of linked batteries. In some embodiments, the charging module can be configured to test each of the received batteries to determine a charge state. If the battery is discharged, the charging module can be configured to determine if the battery meets the criteria for charging at the two-way exchange based vending machine 100. If the battery does not meet the criteria for charging at the two-way exchange based vending machine 100, then the battery is placed in a received battery inventory. If the battery meets the criteria for charging at the two-way exchange based vending machine 100, then the battery is charged by the two-way exchange based vending machine 100.

[0061] The charging module can include a variety of features including, for example, loading and unloading features, charging features, and a charge controller. In some embodiments the loading and unloading features are configured to load a discharged battery into the charger, and to unload a recharged battery from the charger. In some embodiments, the loading and unloading features can be configured to orient a battery so that the battery orientation matches a preferred charger orientation, and to then place the oriented battery in the charger.

[0062] The charging features can be configured for creating an electrical connection with the terminals of the battery to allow battery charging. In some embodiments, the charging features can comprise, for example, one or several electrodes.

[0063] The charge controller can be configured to recharge a battery. In some embodiments, the charge controller can recharge the battery according to a predetermined charging profile. In some embodiments, the charging profile can be the same for all batteries. In some embodiments, the charging profile can be varied based on one or several battery characteristics. Thus, in some embodiments, the charging profile can accelerate or decelerate battery charging based on one or several battery characteristics.

[0064] Some embodiments of the two-way exchange based vending machine 100 can include, for example, an inventory module. The inventory module can be configured to hold and store separate classes of batteries. In some embodiments, the inventory module can be divided into, for example, received batteries and batteries for dispensing. In some embodiments, the received batteries can be stored in a discharged inventory, and in some embodiments, the batteries for dispensing can be stored in a fresh battery inventory. In some further embodiments, the inventory module can store received batteries in either a battery recharging inventory or in a battery pickup inventory. In some embodiments, the batteries in the battery recharging inventory have been determined to be rechargeable at the two-way exchange based vending machine 100, and batteries in the battery pickup inventory have been determined to be non-rechargeable at the two-way exchange based vending machine 100.

[0065] The details of the interconnectivity of the different components of the two-way exchange based vending machine 100 are depicted in Figure 2. As seen in Figure 2, the components of the two-way exchange based vending machine 100 are interconnected. One embodiment of the two-way exchange based vending machine 100 can comprise a processor 202, memory 204 comprising, one or several databases 206, 208, the receiving module 212, the rejection module 214, the dispensing module 216, the communications module 218, the charging module 220, and the inventory module 222.

[0066] As discussed above, the processor 202 can be configured to receive inputs from the different modules and components of the two-way exchange based vending machine 100 and to process these inputs based on instructions stored within the memory.

[0067] As depicted in Figure 2, the memory 204 can be communicatively connected with the processor 202 to allow the processor to access the memory 204 so as to receive information from the memory 204 and to store information in the memory 204. In some embodiments, and as depicted in Figure 2, the memory 204 comprises a plurality of databases

206, 208. In some embodiments, the memory 204 can comprise a single database. In some embodiments the memory 204 can comprise a plurality of databases such as, two, three, four, five, ten, twenty, one hundred, or any other number of databases.

[0068] The databases 206, 208 can each comprise one or several organized collections of data. In some embodiments, the data stored in each of the databases 206, 208 can relate to the modules 212, 214, 216, 218, 220, 222. In some embodiments, for example, this information can relate to the inventory of the two-way exchange based vending machine 100, including, for example, the number of received batteries in the inventory, the number of batteries for distribution in the inventory, the number of batteries awaiting recharging at the two-way exchange based vending machine 100, the number of batteries that cannot be recharged by the two-way exchange based vending machine 100, or any other inventory information. In some embodiments, for example, this information can relate to user subscription accounts and/or user accounts.

[0069] As depicted in Figure 2, each of the receiving module 212, the rejection module 214, the dispensing module 216, the communications module 218, the charging module 220, and the inventory module 222 are communicatively connected with the processor 202. This connection can allow the processor to send control signals to each of the modules 212, 214, 216, 218, 220, 222 and receive signals from each of these modules 212, 214, 216, 218, 220, 222.

[0070] The communicating connection between each of the modules 212, 214, 216, 218, 220, 222, the processor and the memory 204 and the processor can be a wired or wireless connection.

Method of Operation of the Subscription based Rechargeable Battery Vending machine

[0071] The features of the two-way exchange based vending machine 100 can be controlled to achieve the desired vending and/or receipt of one or several batteries. Figures 3 through 6 depict different methods of operating different aspects of the two-way exchange based vending machine 100, focusing on the method of distributing an item and/or on the method of receiving an item and/or a rechargeable battery.

[0072] Figure 3 depicts one embodiment of a process 300 for operating the two-way exchange based vending machine 100 to distribute one or several rechargeable batteries. In some embodiments, the process 300 begins when a deposited item is received at block 302. This item can be received, as discussed above, via the receiving module. Having received item, the receiving module 112 can collect information relating to the identification and condition of the item and transmit this information to the processor 202.

[0073] The process 300 then optimally moves to decision state 304, and determines if the item is associated with a valid subscription. As discussed above, the determination of a valid and/or active subscription can be performed in a variety of ways. In one embodiment, each battery for use with the two-way exchange based vending machine 100 can include an identifying feature or characteristic that allows identification of batteries as being for use with the two-way exchange based vending machine 100. As also discussed above, in some embodiments, a user will only receive such a battery at the time of creating a subscription account, and will only maintain possession of the battery for the duration of their subscription account. Thus, in such an embodiment, identification of the battery as being of the type for use with the two-way exchange based vending machine 100 identifies a valid subscription. Optimally, the vended battery can include code, markings, or other information relating to the subscription status or subscription expiration or to the subscriber identity. As also discussed above, in some embodiments, a valid subscription can be identified through a user input, such as, for example, a user name and password, a unique account identifier, or any other distinguishing input.

[0074] If the item is not associated with a valid and/or active subscription, the process 300 moves to block 306 and the two-way exchange based vending machine 100 returns the deposited item to the user.

[0075] If the item is associated with a valid subscription the process 300 moves to decision state 308 and determines if the item is acceptable. In some embodiments, the determination of the acceptability of the item can include, for example, determining if the item is a battery, determining the type of battery, determining if the battery is for use with the two-way exchange based vending machine 100, determining if the battery is in acceptable physical condition, and/or determining if the battery is in acceptable operational condition. In some embodiments, the acceptability of the battery can be determined through the presence of one or several identification features, through physical attributes of the battery, or in any other desired fashion. In some embodiments, for example, the battery voltage, internal resistance/impedance, battery shape, the presence of a computer readable code on the battery, or any other battery attribute identifying a battery or battery condition and/or performance can be used. If the deposited item is not acceptable, then the process moves to block 306 and the two-way exchange based vending machine 100 returns the deposited item to the user.

[0076] If the deposited item is acceptable, the process 300 moves to decision state 310 and determines if a charged battery of the required type is available. In some embodiments, this includes determining whether the inventory of charged batteries of the required type is

depleted. This can include, for example, querying a database to determine inventory status of charged batteries of the required type, or requesting and receiving signals from the inventory module relating to the availability of required batteries. If the process 300 determines that no charged battery of the required type is available, then the process moves to block 306 and the two-way exchange based vending machine 100 returns the deposited item to the user.

[0077] If a charged battery of the required type is available, the process moves to block 312 and dispenses the charged battery. In some embodiments, this step can be performed by the dispensing module. After the charged battery is dispensed, the process terminates at block 314.

[0078] A person of skill in the art will recognize that a process 300 for operating the two-way exchange based vending machine 100 to distribute one or several rechargeable batteries can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a process 300 for operating the two-way exchange based vending machine 100 to distribute one or several rechargeable batteries can include the above listed steps performed in any order, including in an order different than that shown above.

[0079] Figure 4 depicts one embodiment of a process 400 for operating the two-way exchange based vending machine 100 to verify a subscription. As depicted in Figure 4, the process begins at block 402 and requests a user input. In some embodiments, the communications module can communicate the request to the user to provide the input. This request can be in the form of a visual or audible prompt to provide the input.

[0080] The process 400 then moves to block 404 and receives the user input. As discussed above, the input can comprise a variety of actions, including, for example, depositing an item in the receiving module of the two-way exchange based vending machine 100, inputting a username and password or any other unique identifier into the two-way exchange based vending machine 100, or any way through which an input can be provided.

[0081] The process 400 then moves to decision state 406 and determines if the received input is indicative of a valid and/or active subscription. In embodiments in which the input comprises the deposit of a battery that is identifiable as a battery for use with the two-way exchange based vending machine 100, identification of the battery also determines that a subscription is valid and/or active. In some embodiments in which an input such as a username and password, or other unique identifier is received, the determination of whether the received input is indicative of a valid and/or active subscription can involve querying the memory 204 to verify the subscription status, and/or communication with the server to determine the

subscription status associated with the username and password and/or the unique identifier. If the process 400 determines that the subscription is not valid and/or active, then the process 400 terminates at block 408.

[0082] If the process 400 determines that the received input is indicative of a valid and/or active subscription, then the process 400 moves to block 410 and proceeds to the next step depicted in Figure 4.

[0083] A person of skill in the art will recognize that a process 400 for operating the two-way exchange based vending machine 100 to verify a subscription can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a process 400 for operating the two-way exchange based vending machine 100 to verify a subscription can include the above listed steps performed in any order, including in an order different than that shown above.

[0084] Figure 5 depicts one embodiment of a process operating the two-way exchange based vending machine 100 to determine whether to accept the deposited item. In some embodiments, the process 500 begins at block 502 and the deposited item is received. As discussed above, in some embodiments, the deposited item is received in the receiving module.

[0085] The process 500 then moves to decision state 504 and determines if the deposited item is a battery. In some embodiment, the determination of whether the deposited item is a battery can be performed, for example, by the receiving module. In some embodiment, the receiving module can collect information relating to the deposited item and use the information to determine if the deposited item is a battery. This information can include, for example, the weight of the battery, the size of the battery, and/or any other desired characteristics of the deposited item. In some embodiments, this information can include the presence of a computer readable code associated with the battery, and the information stored in computer readable code. In some embodiments, the computer readable code can comprise, for example, a barcode. In some embodiments, this information can include, a frequency emitted by a feature associated with the battery, such as, for example, by an RFID tag. In some embodiments, the receiving module 112 can be configured to collect image data relating to the deposited item and use the image data to determine if the deposited item is a battery. If process 500 determines that the deposited item is not a battery, then the process moves to block 506 and the two-way exchange based vending machine 100 rejects the deposited item.

[0086] If the process 500 determines that the deposited item is a battery, then the process 500 moves to decision state 508 and determines if the battery is an exchangeable battery. In some embodiments, this determination can be made by determining whether the

battery is a battery of the type for use with the two-way exchange based vending machine 100. In some embodiments, the determination of decision state 508 can be simultaneously performed with the determination of decision state 504. As discussed above, this determination can be made based on the presence of an identification feature, such as, for example, a computer readable code, a frequency emission component such as an RFID tag, or any other identifying feature or trait. In some embodiments, the identifying feature or trait can include, for example, a battery parameter such as, for example, voltage, internal resistance/impedance, or any other desired battery parameter. If the process 500 determines that the battery is not an exchangeable battery, then the process moves to block 506 and the two-way exchange based vending machine 100 rejects the deposited battery.

[0087] If the process 500 determines that the battery is an exchangeable battery, then the process 500 moves to decision state 510 and determines if the physical condition of the battery is acceptable. In some embodiments information collected by the receiving module can be analyzed to determine if the physical condition of the battery is acceptable. Specifically, in some embodiments image data collected by the receiving module can be analyzed to determine the battery is in acceptable physical condition. In some embodiments, acceptable physical condition can include limited or no damage to a battery label and/or limited or no damage to any other portion of the battery. If the process determines that the battery is not in acceptable physical condition, then the process moves to block 506 and the two-way exchange based vending machine 100 rejects the deposited battery.

[0088] If the process 500 determines that the battery is in acceptable physical condition, then the process moves to decision state 512 and determines if the operable condition of the battery is acceptable. As discussed above, information relating to the operable condition of the battery can be collected by components of the receiving module. This information can include, for example, battery characteristics such as charging and discharging characteristics such as, for example, voltage, internal resistance/impedance, or any other desired charging and/or discharging characteristic. If the process 500 determines that the operable condition of the battery is not acceptable, then the process moves to block 506 and the two-way exchange based vending machine 100 rejects the deposited battery.

[0089] If the process 500 determines that the received input is indicative of a valid and/or active subscription, then the process 500 moves to block 514 and proceeds to the next step depicted in Figure 5.

[0090] A person of skill in the art will recognize that a process 500 for operating the two-way exchange based vending machine 100 to determine whether to accept the deposited

item can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a process 500 for operating the two-way exchange based vending machine 100 to determine whether to accept the deposited item can include the above listed steps performed in any order, including in an order different than that shown above.

[0091] Figure 6 depicts one embodiment of a process 600 for managing two-way exchange based vending machine inventories and for dispensing a rechargeable battery. Process 600 begins at block 602 when a request for dispensing of a battery is received. This request is communicated to the dispensing module from the processor.

[0092] The process 600 continues to decision state 604 and determines if the requested battery is available. In some embodiments, the determination of whether the requested battery is available can be made by querying the memory 204 for inventory information and then using the inventory information to determine if the requested battery is available. In some embodiments, the determination of whether the requested battery is available can be made by receiving signals from the inventory module relating to the inventory information of the requested battery, which received signals can be used to determine if the requested battery is available. If the process 600 determines that the requested battery is unavailable, then the transaction terminates at block 606.

[0093] If the process 600 determines that the requested battery is available, then the process 600 moves to block 608 and the requested battery is dispensed. As discussed above, in some embodiments the dispensing of the battery can be achieved by the dispensing module 116. In some embodiments, dispensing the requested battery may be delayed, or a battery may be requested to be dispensed at a two-way exchange based vending machine 100 other than the one in which a battery is deposited. In some embodiments, upon depositing an empty, discharged, or spent battery or battery pack, the user may request that the system “hold” a fresh, new, or charged battery or battery pack within the system. The user may indicate at which two-way exchange based vending machine 100 the user wishes to receive the “on-hold” battery or battery pack. In some embodiments, the user need not specify a particular two-way exchange based vending machine 100, but may generally request that one be available for pick-up within the system at any two-way exchange based vending machine 100.

[0094] In some embodiments, a spent, discharged, or used battery or battery pack may be deposited into the two-way exchange based vending machine 100, and the user may request credit to his/her account or subscription in lieu of dispensing a new, fresh, or charged battery or battery pack.

[0095] The process 600 then moves to decision state 610 and determines if the two-way exchange based vending machine 100 has a recharging capacity. In some embodiments, this determination is made by determining whether the two-way exchange based vending machine 100 has a charging module 220, and if the charging module 220 is capable of charging the battery. If the process 600 determines that two-way exchange based vending machine 100 does not have recharge capacity, then the process 600 moves to block 612 and the battery is deposited in the discharged inventory.

[0096] Returning again to decision state 610, if the process 600 determines that the two-way exchange based vending machine 100 has recharge capacity, then the process 600 moves to decision state 624 and determines if the battery is rechargeable. As discussed above, in some embodiments, the charging module 220 can be configured to test each of the received batteries to determine a charge state. If the battery is discharged, the charging module 220 can be configured to determine if the battery meets the criteria for charging at the two-way exchange based vending machine 100. These criteria can include, for example, the rate with which the battery can be recharged, the maximum level of charge the battery can accept, internal resistance in the battery to recharging, and/or any other desired criteria. If the process 600 determines that the battery is not rechargeable in decision state 624, then the process 600 moves to block 612 and deposits the battery in the discharged inventory.

[0097] If the process 600 determines that the battery is rechargeable, then the process moves to block 626 and the battery is recharged. The process 600 then moves to block 622 and proceeds to the next step depicted in Figure 6.

[0098] Returning again to block 612, after the battery is deposited in the discharged inventory, the process moves to decision state 614 and determines whether the discharged inventory should be retrieved. In some embodiments, this determination is made with information obtained by querying the inventory module for information relating to the status of the discharged inventory. In some embodiments, the determination is made with information obtained from querying the memory for information relating to the status of the discharged inventory. If the discharged inventory is above some threshold, then the processor 202 of the two-way exchange based vending machine 100 can determine that the discharged inventory should be retrieved from the two-way exchange based vending machine 100. If the discharged inventory is below some threshold, then the processor 202 of the two-way exchange based vending machine 100 can determine that the discharged inventory should not be retrieved from the two-way exchange based vending machine 100.

[0099] If the process 600 determines that the discharged inventory should be retrieved, then the process moves to block 616 and requests retrieval of the discharged inventory. In some embodiments, the request for retrieval of the discharged inventory can be made by network communications module. In this embodiments the network communications module can communicate, for example, with the server and request retrieval of the discharged inventory.

[0100] The process then proceeds to decision state 618 and determines if the fresh battery inventory should be resupplied. In some embodiments, this determination is made with information obtained by querying the inventory module for information relating to the status of the fresh battery inventory. In some embodiments, the determination is made with information obtained from querying the memory for information relating to the status of the fresh battery inventory. If the fresh battery inventory is above some threshold, then the processor of the two-way exchange based vending machine 100 can determine that the fresh battery inventory should not be resupplied. If the fresh battery inventory is below some threshold, then the processor of the two-way exchange based vending machine 100 can determine that the fresh battery inventory should be resupplied. If the process 600 determines that the fresh battery inventory should not be resupplied, then the process 600 then moves to block 622 and proceeds to the next step depicted in Figure 6.

[0101] If the process 600 determines that the fresh battery inventory should be resupplied, then the process moves to block 620 and the two-way exchange based vending machine 100 requests resupply. In some embodiments, the request for resupply of the fresh battery inventory can be made by network communications module. In this embodiments the network communications module can communicate, for example, with the server and request resupply of the fresh battery inventory. After the process 600 requests resupply of the fresh battery inventory, the process 600 moves to block 622 and proceeds to the next step depicted in Figure 6.

[0102] Returning again to decision state 614, if the process 600 determines that the discharged inventory should not be retrieved, the process moves to decision state 618 and determines if the fresh battery inventory should be resupplied. If the process 600 determines that the fresh battery inventory should not be resupplied, then the process 600 then moves to block 622 and proceeds to the next step depicted in Figure 6.

[0103] If the process 600 determines that the fresh battery inventory should be resupplied, then the process moves to block 620 and the two-way exchange based vending machine 100 requests resupply. After the process 600 requests resupply of the fresh battery

inventory, the process 600 moves to block 622 and proceeds to the next step depicted in Figure 6.

[0104] A person of skill in the art will recognize that a process 600 for managing two-way exchange based vending machine inventories and for dispensing a rechargeable battery can include some or all of the above discussed steps, as well as steps additional to the above requested steps. A person of skill in the art will further recognize that a process 600 for managing two-way exchange based vending machine inventories and for dispensing a rechargeable battery can include the above listed steps performed in any order, including in an order different than that shown above.

[0105] FIG. 7 illustrates a system for vending items using a “headless” or “dumb” vending machine. A vending system 700 comprises a vending unit 710, a mobile electronic device 720, and a central computer 730. Vending system 700 may vend batteries as described elsewhere herein. In some embodiments, vending system 700 may be configured to vend any desired product, for example, beverages, candy, food, books, music, electronics, or any other desired product. In some embodiments, the vending system 700 may be configured to provide a two-way exchange based vending procedure as described herein.

[0106] The vending unit 710 comprises a product display portion 711, a vending unit identifier 712, a dispensing port 713, a communication module 714, and a receiving port 715. It is notable that the vending unit 710 does not have a user interface, such as a payment port, a graphical interface comprising buttons for selecting a product to vend, or other similar features. Because the vending unit 710 lacks these features, it can be referred to as a “headless” or “dumb” vending machine.

[0107] The product display portion 711 may be a window into the vending unit 710 through which the products, including the product prices, may be seen. In some embodiments, the product display portion 711 may be a list of products, or chart or compilation of images of the products contained within the vending unit 710 and available for vending.

[0108] The vending unit identifier 712 may be a unique identifier assigned to a particular vending unit 710 which identifies the vending unit 710 among a plurality of other vending units. The vending unit identifier 712 may be an alphanumeric name or code, a QR code, an RFID tag, a barcode, or other similar unique identifier. The vending unit identifier 712 may be used to identify the particular vending unit 710 to a network or server which will be described below.

[0109] The dispensing port 713 is disposed in the vending unit 710 and provides a path through which a product is dispensed from the vending unit 710. The communication

module 714 is located within the vending unit 710, and is connected to the vending machinery within the vending unit 710. The vending machinery is the mechanism by which a product is selected for dispensing and then dispensed through dispensing port 713. The communications module 714 is configured to communicate with a server or network which will be described later herein. The communication module 714 may comprise a receiver and/or a transmitter configured to communicate wirelessly with a local area network using Wi-Fi or similar communications protocols, with a wide area network over the internet, using a cellular network, a 3G network, a 4G network, Bluetooth, Zigbee, IEEE 802.11x, or any other desired wireless communication method or protocol.

[0110] The receiving port 715 is disposed in the vending unit and provides a path through which a user may deposit an item, such as a spent or used battery as part of a two-way exchange described herein. An item received in the receiving port 715 may be taken into the vending unit 710 and sorted and/or stored within the unit 710. In some embodiments, the received unit may be exchanged for a similar item.

[0111] The vending system 100 may advantageously include a mobile electronic device 720 such as a cellular phone, smart phone, personal digital assistant, tablet computer, laptop or notebook computer, netbook, ultrabook, or any other mobile computing or communication device. The mobile electronic device 720 has an interface 721 configured to receive a user's input. The interface 721 may be a touch-screen type interface, a graphical user interface, an alphanumeric key pad, or other similar known mobile device interface. The mobile communication device 720. In some embodiments, the mobile electronic device 720 and its interface 721 may substitute as the user interface that is present on standard vending machines. Instead of selecting products and providing payment on the vending unit 710, these functions are performed using the mobile electronic device 720 via an internet site using a mobile web browser, or a dedicated app, or other similar method.

[0112] The mobile electronic device 720 is in wireless communication with a central computer 730. Central computer 730 may be a server, network node, or other similar device known in the art. Central computer 730 comprises a processor 731, which is in electrical communication with a database 732 and a communication unit 733. The communication unit 733 is configured to communicate with both the communications module 714 of the vending unit 710, and the mobile electronic device 720. The communication unit 733 is configured to both transmit and receive signals to and from the vending unit 710 and the mobile electronic device 720. The database 732 may store information regarding the price of items in the vending units 710, users of the vending system 700, subscribers, and other information as will be

described herein. The database 732 may also store information regarding a user's exchange subscription information, such as how many items has the user subscribed and/or paid for, or how many items does the user currently have checked out.

[0113] The processor 731 controls and coordinates the operations of the central computer 730 and the vending system 700. In some embodiments, the communication unit is configured to communicate with other devices or networks, such as the internet, credit card accounts, cellular telephone accounts, PayPal, e-wallets such as Google wallet, and any other desired system in order to facilitate payment and to process payments for products to be vended. The communication unit 733 may be configured to communicate via a wireless or wired connection or both. For example, the central computer may be configured to wirelessly communicate with vending unit 710, and may have a wired connection to financial networks, the internet, or other networks to facilitate processing electronic payments.

[0114] In some embodiments, the central computer 730 may be a web server or a host for an e-commerce site. A user may register for an account via a web server or similar network interface, and deposit money into an account or sign up for a subscription service for using the vending system 700. The user's account information may be stored in the database 732.

[0115] FIG. 8 depicts a flowchart of how the vending system 700 may be used. Process 800 illustrates a user's interaction with vending system 100. A user having a mobile electronic device 720 may approach the vending unit 710. In some embodiments, the user identifies the unique identifier associated with the vending unit 710. The process begins in block 802, wherein the vending unit identifier 712 is input into the mobile electronic device 720. As one example, the vending unit identifier 712 may be a QR code. The user scans the QR code using the mobile electronic device 720, and the mobile electronic device 720 navigates to an internet site or dedicated mobile application (app) for the vending system 700. In another example, the user opens an internet site or dedicated App for the vending system 700. Within the App or the site, the user may input the unique vending unit identifier into the app or site, such as an alphanumeric code or identification number for the vending machine. In some embodiments, the user may scan a barcode on the vending unit using a mobile electronic device 720.

[0116] Upon inputting the vending unit identifier, the process 800 moves to block 804, where the user receives a display of the products contained within the vending unit 710 for which the vending unit identifier 712 was input. The internet site or mobile app may display a

list, icon, description, or other indicia of the products or items available for purchase from the vending unit 710. As an example, the items may be batteries, soda, food, or other items.

[0117] In some embodiments, the items may be also displayed in the product display portion 711. In some embodiments, the product display portion 711 comprises images or logos, or descriptions of the products available, rather than being a window onto the actual products. Where a user can see the indicia of products available to vend, the need to physically display all the products available in vending unit 710 through glass or other transparent medium, the overall storage capacity and efficiency of the vending units 710 may be improved.

[0118] A user selects a product or item for vending in block 806. The selection can be made by tapping, touching, clicking, or otherwise selecting a link or icon associated with the desired product. For example, the mobile app may display the various beverages available for vending at a particular vending unit 710. The user may tap an icon on his or her mobile electronic device 720 corresponding to a cola beverage.

[0119] In some embodiments, the products are displayed in display portion 711, and a code is associated with each product. The code associated with the product can be used for selecting a product or item to vend. For example, in some embodiments, the vending unit identifier 712 may be instructions having a number to send an SMS or text message to for access to the vending system 100. For example, a user may text the code associated with a particular product to the number code of the vending unit 710, and the product will be vended via dispensing port 713. This system operation will be described below. The vending system 700 may be associated with an account or cellular carrier, such that the price of the vended product is deducted from the account balance, or is charged to the user's cellular telephone bill.

[0120] Following a user's selection, process 800 moves to block 808, wherein the user selects a method of payment. The internet site or dedicated app for the vending system 100 may provide payment options. For example, in some embodiments, the vending system 100 may be configured to charge a dedicated vending account, deduct from an account, charge to an input credit card, charge a credit card a user has previously placed on file, debit a user's bank account, or charge a purchase to a cellular telephone account. These methods are exemplary, and one of skill in the art would understand that other methods of electronic payment are possible without departing from the scope of this disclosure. The user selects the method of payment from the app or the internet site. Once payment is confirmed and received, process 800 moves to block 810, wherein the vending unit 710 dispenses the selected product via dispensing port 713, and the user receives the vended product. Upon receipt of the product, the internet site or app may ask the user whether the user desires to vend another product in decision state 812.

If the user desires another product, the process 800 returns to block 804, wherein the list or icons of products is again displayed. If the user does not desire a further product, the user may indicate that no further products are desired on the internet site or mobile app, and the process ends in block 814.

[0121] FIG. 9 is a flowchart illustrating the process of the vending system 700. Process 900 begins in block 902 where central computer 730 receives the vending unit identifier 712 from the mobile electronic device 720. The user may input the vending unit identifier 712 into the mobile electronic device 720 as described elsewhere herein. Once inputted into, for example, the internet site or dedicated app for the vending system 700, internet site or dedicated app transmits the vending unit identifier 712 to the central computer 730.

[0122] Upon receipt of the vending unit identifier 712, process 900 moves to block 904, wherein the processor 731 queries the database 732 for information regarding the identified vending unit 710. The information regarding the vending unit 710 may comprise the products available in the vending unit 710, prices, location of the vending unit 710, inventory levels, and any other desired information.

[0123] The process next moves to block 906, wherein the processor receives this information 710 from the database 730 and prepares it for transmission. The vending unit information is transmitted to the mobile electronic device 720 using the communication unit 733. The information is received on the mobile electronic device 720 via an internet site or a dedicated app. The app receives the vending unit information and provides a display of the available products with their corresponding prices on the mobile electronic device interface 721.

[0124] A user may select a product for vending via the interface 721, and the process 900 moves to block 910, wherein the central computer 730 receives the identity of the selected product via the communication unit 733. The processor 731 may then retrieve the price or cost associated with the selected product from, for example, the database 732, or from the signal generated by the mobile electronic device 720 with the product selection, received in the communication unit 733. In some embodiments, the user may also select a quantity of products to be dispensed using the internet site accessed with a mobile web browser or the dedicated app.

[0125] The process next moves to block 912, wherein the central computer 730 receives payment from the user. The payment may be made by different methods. For example, a user may have an account associated with the vending system 700 into which the user has deposited money. The account information and user identity may be stored in the database 732, and accessed when a user accesses the internet site or dedicated app, using, for example, a log-in or other known method of verifying credentials. The processor 731 may access the database to

verify the identity and/or account of the user. In some embodiments, the user may deposit money into the user's account using the dedicated app or the internet site on the mobile electronic device, such as by using a credit card, a PayPal account, or any other desired method. In some embodiments, a user may use a network terminal or other internet or network access point to deposit money into the user's account. The balance in the user's account may be stored in the database 732, and as the user selects a product, the processor debits the user's account, and tracks the remaining value. In some embodiments, the processor may be configured to provide account balance information to the user's mobile electronic device via the communication unit, by sending an SMS text message, providing an account information section in the dedicated app, or on the internet site.

[0126] In some embodiments, the user's account may be associated with another account, such as a credit card, a cellular phone account, PayPal account, an e-wallet, such as Google wallet, or any other desired account. The processor may be configured to access these accounts via the communication unit to request or receive payment. For example, a user may associate his account with a cellular telephone account. By ordering a product from the vending system 700 using the mobile phone, the central computer 730 may request and receive payment from the cellular telephone provider, and the payment will show up on the user's next cellular telephone bill. In some embodiments, a user may enter credit card information, including a credit card number into the internet site or dedicated app, and directly charge the credit card without having an account with the vending system 700.

[0127] In some embodiments, the user may order a product from a vending unit 710 by sending an SMS text message to a specific code identifying a specific vending unit 710 as described above. In this embodiment, the central computer may request and receive payment from the cellular provider, which payment is then passed along to the user through the cellular telephone bill.

[0128] Process 900 next moves to decision state 914 wherein it is determined whether a payment has been received. If no payment has been received, the process moves to block 916, wherein the user is prompted to select a different payment method, or to cancel the transaction. Payment may not be received, if, for example, the user's account does not have sufficient funds to cover the price of a product, or if a credit card is declined. If no payment is received, the central computer 730 sends a signal to the mobile electronic device 720 indicating that no payment has been received, and requesting the user select an alternate form of payment, or cancel the transaction.

[0129] If the central computer receives a signal confirming an electronic payment, or receives payment by any other method, the process moves to block 916, where the central computer 730 sends a signal to the vending unit 710 which was identified in block 902, instructing it to vend the selected product. The processor 730, upon receiving confirmation of payment, sends a signal via communication unit 733, which is received by the communications module 714 of the vending unit 710. The signal received from the central computer 730 by the communications module 714 of the vending unit 710 instructs the vending unit to dispense or vend the selected product.

[0130] Process 900 next moves to block 918, wherein the vending unit 710 vends the desired product via dispensing port 713. Upon dispensing the selected product, the process 900 moves to decision state 920, where the user is asked via the mobile electronic device 720, whether further vending purchases are desired. If no further purchases are required, the process 900 ends in block 922. If another purchase is desired, the process returns to block 908, and the product information is again displayed on the mobile electronic device 720.

[0131] In some embodiments, the vending unit identifier 712 may be a scanner, such as a barcode scanner. In such embodiments of the vending system 700, the internet site or dedicated app may generate a computer readable code, such as a barcode, in response to a request to purchase a specific item. The user may scan the computer readable code on the mobile electronic device. The vending unit 710 may additionally comprise a processor and memory configured to receive the scanned code, and convert the scanned code into an instruction. For example, a user request to buy a specific product from a vending unit 710. Once payment has been received as described elsewhere herein, the internet site or dedicated app generates a barcode which encodes the command to dispense the selected product. The user positions the barcode on the mobile electronic device 720 near the scanner, and the vending unit 710 receives the barcode, and uses the processor and memory to decode the barcode, and execute the encoded instruction—in this case, to dispense the selected product. In such embodiments, communications module 714 may be not be required in the vending unit 710.

[0132] FIG. 10 illustrates a system for a two-way exchange vending process using a “headless” or “dumb” vending machine. Process 1000 illustrates a user’s interaction with vending system 100 in an exchange process. A user having a mobile electronic device 720 may approach the vending unit 710. In some embodiments, the user identifies the unique identifier associated with the vending unit 710. The process begins in block 1002, wherein the vending unit identifier 712 is input into the mobile electronic device 720. As one example, the vending unit identifier 712 may be a QR code. The user scans the QR code using the mobile electronic

device 720, and the mobile electronic device 720 navigates to an internet site or dedicated mobile application (app) for the vending system 700. In another example, the user opens an internet site or dedicated App for the vending system 700. Within the App or the site, the user may input the unique vending unit identifier into the app or site, such as an alphanumeric code or identification number for the vending machine. In some embodiments, the user may scan a barcode on the vending unit using a mobile electronic device 720.

[0133] Upon inputting the vending unit identifier, the process 1000 moves to block 1004, where the user receives a display of the products contained within the vending unit 710 for which the vending unit identifier 712 was input. The internet site or mobile app may display a list of options, including conducting an exchange transaction or a purchase transaction.

[0134] In some embodiments, the items available for exchange be also displayed in the product display portion 711. In some embodiments, the product display portion 711 comprises images or logos, or descriptions of the products available, rather than being a window onto the actual products. Where a user can see the indicia of products available for exchange, the need to physically display all the products available in vending unit 710 through glass or other transparent medium, the overall storage capacity and efficiency of the vending units 710 may be improved.

[0135] A user selects an item exchange transaction in block 1006. The mobile electronic device 720 may access the user's exchange subscription on the database 732, and provide the user options for the exchange on the display 721. For example, the mobile app may display the exchange information for a user's battery exchange subscription. In some embodiments, a user may not have a subscription, but may have an exchange account for exchanging batteries or other items. The user may select an exchange transaction, and the mobile app may prompt the user to deposit the item for exchange. The user may tap an icon on his or her mobile electronic device 720 acknowledging that an item will be deposited into receiving port 715.

[0136] In some embodiments, the user may text the code associated with a particular exchange transaction located on the vending unit identifier 712. The central computer 730 may generate a response text message confirming the user's selection of an exchange transaction, which the user receives on the mobile electronic device 720.

[0137] The process 1000 moves to block 1008, wherein a user, the user may deposit an item, such as a used or spent battery, into the receiving port 715. Upon receiving the item, the vending unit may communicate the receipt of the exchange item to the central computer.

The central computer 730 may then generate a follow-up text message which confirms the deposit of the exchange item.

[0138] Following a user's deposit, process 1000 moves to block 1010, wherein the user receives an exchange item, such as a battery. Upon receiving the deposit item, and upon receiving an instruction from the central computer 730 to provide an exchange item, the vending unit 710 dispenses the exchange product via dispensing port 713, and the user receives the exchange item. Upon receipt of the product, the internet site or app may ask the user whether the user desires to vend another product in decision state 1012. If the user desires to exchange another item, the process 1000 returns to block 1004, wherein the list or icons of exchange options is again displayed. If the user does not desire a further transaction, the user may indicate that no further exchanges or products are desired on the internet site or mobile app, and the process ends in block 1014. In some embodiments, a user may select a product for vending and an item for exchange on the same vending unit 710 during a single session.

[0139] The steps of the above described methods are exemplary only. The steps of the processes may be performed in any order desired, and steps may be added or omitted from the above processes, as desired.

[0140] The technology is operational with numerous other general purpose or special purpose computing system environments or configurations. Examples of well known computing systems, environments, and/or configurations that can be suitable for use with the invention include, but are not limited to, personal computers, server computers, hand-held or laptop devices, multiprocessor systems, processor-based systems, programmable consumer electronics, network PCs, minicomputers, mainframe computers, distributed computing environments that include any of the above systems or devices, and the like.

[0141] As used herein, instructions refer to computer-implemented steps for processing information in the system. Instructions can be implemented in software, firmware or hardware and include any type of programmed step undertaken by components of the system.

[0142] A processor may be any conventional general purpose single- or multi-chip processor such as a Pentium® processor, a Pentium® Pro processor, a 8051 processor, a MIPS® processor, a Power PC® processor, or an Alpha® processor. In addition, the processor may be any conventional special purpose processor such as a digital signal processor or a graphics processor. The processor typically has conventional address lines, conventional data lines, and one or more conventional control lines.

[0143] The system is comprised of various modules as discussed in detail. As can be appreciated by one of ordinary skill in the art, each of the modules comprises various sub-

routines, procedures, definitional statements and macros. Each of the modules are typically separately compiled and linked into a single executable program. Therefore, the description of each of the modules is used for convenience to describe the functionality of the preferred system. Thus, the processes that are undergone by each of the modules may be arbitrarily redistributed to one of the other modules, combined together in a single module, or made available in, for example, a shareable dynamic link library.

[0144] The system may be used in connection with various operating systems such as Linux®, UNIX® or Microsoft Windows®.

[0145] The system may be written in any conventional programming language such as C, C++, BASIC, Pascal, or Java, and run under a conventional operating system. C, C++, BASIC, Pascal, Java, and FORTRAN are industry standard programming languages for which many commercial compilers can be used to create executable code. The system may also be written using interpreted languages such as Perl, Python or Ruby.

[0146] Those of skill will further appreciate that the various illustrative logical blocks, modules, circuits, and algorithm steps described in connection with the embodiments disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, circuits, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present disclosure.

[0147] The various illustrative logical blocks, modules, and circuits described in connection with the embodiments disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor may be a microprocessor, but in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

[0148] In one or more example embodiments, the functions and methods described may be implemented in hardware, software, or firmware executed on a processor, or any combination thereof. If implemented in software, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. Computer-readable media includes both computer storage media and communication media including any medium that facilitates transfer of a computer program from one place to another. A storage media may be any available media that can be accessed by a computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that can be used to carry or store desired program code in the form of instructions or data structures and that can be accessed by a computer. Also, any connection is properly termed a computer-readable medium. For example, if the software is transmitted from a website, server, or other remote source using a coaxial cable, fiber optic cable, twisted pair, digital subscriber line (DSL), or wireless technologies such as infrared, radio, and microwave, then the coaxial cable, fiber optic cable, twisted pair, DSL, or wireless technologies such as infrared, radio, and microwave are included in the definition of medium. Disk and disc, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk and Blu-ray disc where disks usually reproduce data magnetically, while discs reproduce data optically with lasers. Combinations of the above should also be included within the scope of computer-readable media.

[0149] The foregoing description details certain embodiments of the systems, devices, and methods disclosed herein. It will be appreciated, however, that no matter how detailed the foregoing appears in text, the systems, devices, and methods can be practiced in many ways. As is also stated above, it should be noted that the use of particular terminology when describing certain features or aspects of the invention should not be taken to imply that the terminology is being re-defined herein to be restricted to including any specific characteristics of the features or aspects of the technology with which that terminology is associated.

[0150] It will be appreciated by those skilled in the art that various modifications and changes may be made without departing from the scope of the described technology. Such modifications and changes are intended to fall within the scope of the embodiments. It will also be appreciated by those of skill in the art that parts included in one embodiment are interchangeable with other embodiments; one or more parts from a depicted embodiment can be included with other depicted embodiments in any combination. For example, any of the various

components described herein and/or depicted in the Figures may be combined, interchanged or excluded from other embodiments.

[0151] With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

[0152] It will be understood by those within the art that, in general, terms used herein are generally intended as “open” terms (e.g., the term “including” should be interpreted as “including but not limited to,” the term “having” should be interpreted as “having at least,” the term “includes” should be interpreted as “includes but is not limited to,” etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases “at least one” and “one or more” to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles “a” or “an” limits any particular claim containing such introduced claim recitation to embodiments containing only one such recitation, even when the same claim includes the introductory phrases “one or more” or “at least one” and indefinite articles such as “a” or “an” (e.g., “a” and/or “an” should typically be interpreted to mean “at least one” or “one or more”); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of “two recitations,” without other modifiers, typically means *at least* two recitations, or *two or more* recitations). Furthermore, in those instances where a convention analogous to “at least one of A, B, and C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, and C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to “at least one of A, B, or C, etc.” is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., “a system having at least one of A, B, or C” would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within

the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase “A or B” will be understood to include the possibilities of “A” or “B” or “A and B.”

[0153] While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting.

WHAT IS CLAIMED IS:

1. A vending machine comprising:
 - a processor configured to control the vending machine;
 - a receiving module configured to receive a battery and collect and transmit battery information to the processor, wherein the processor is configured to determine if the received battery is associated with a valid subscription; and
 - a dispensing module configured to dispense a battery in response to the receipt of the battery and the determination that the battery is associated with a valid subscription.
2. The vending machine of Claim 1, further comprising a receptacle to store a received battery.
3. The vending machine of Claim 1, further comprising a storage area for the battery before it is dispensed.
4. The vending machine of Claim 1, further comprising a charging module.
5. The vending machine of Claim 4, wherein the charging module is configured to determine if the received battery meets charging criteria.
6. The vending machine of Claim 5, wherein the charging module is configured to recharge the received battery if the received battery meets the charging criteria.
7. The vending machine of Claim 1, further comprising a network communications module configured to communicate across a network.
8. The vending machine of Claim 1, wherein the processor is configured to determine if the received battery is acceptable.
9. The vending machine of Claim 8, wherein determining if the received battery is acceptable comprises determining if the operating condition of the battery is acceptable.
10. The vending machine of Claim 8, wherein determining if the received battery is acceptable comprises determining if the physical condition of the battery is acceptable.
11. The vending machine of Claim 1, further comprising a rejection module configured to return a rejected battery to a user.
12. The vending machine of Claim 1, further comprising a communication module configured to communicate information to a user.
13. The vending machine of Claim 12, wherein the communication module is configured to receive user inputs.
14. The vending machine of Claim 12, wherein the communications module comprises a plurality of computer receivable codes.

15. The vending machine of Claim 14, wherein the computer receivable codes provide information to direct an electronic device to a web-page.

16. The vending machine of Claim 15, wherein each of the computer receivable codes relates to a subscription related transaction.

17. The vending machine of Claim 15, wherein the computer receivable codes comprise QR codes.

18. The vending machine of Claim 15, wherein the computer receivable codes comprise an emitted frequency.

19. A method of using a vending machine, the method comprising:

receiving a battery, wherein said receiving comprises:

determining if the received battery is associated with a valid subscription;

determining the type of received battery;

determining if the received battery is acceptable; and

dispensing a requested battery, wherein said dispensing comprises:

dispensing the same type of battery as the received battery in response to the determination of the valid subscription associated with the battery and the acceptability of the battery.

20. The method of Claim 19, wherein determining if the received battery is acceptable comprises determining if the physical condition of the battery is acceptable.

21. The method of Claim 19, wherein determining if the received battery is acceptable comprises determining if the operating condition of the battery is acceptable.

22. The method of Claim 19, wherein determining if the received battery is associated with a valid subscription comprises determining if the received input is associated with a valid subscription.

23. The method of Claim 22, wherein the received input comprises at least one of a user name, a password, and an account number.

24. The method of Claim 22, wherein the received input comprises the received battery.

25. The method of Claim 24, wherein determining if the received input is associated with a valid subscription comprises determining if the received battery is a battery for use with the vending machine.

26. The method of Claim 19, further comprising determining the chargeability of the received battery.

27. The method of Claim 26, wherein determining the chargeability of the received battery comprises determine the charge state of the received battery.

28. The method of Claim 26, wherein determining the chargeability of the received battery comprises determining if the received battery meets charging criteria.

29. The method of Claim 19, further comprising rejecting the received battery if the received battery is not associated with a valid subscription.

30. The method of Claim 19, further comprising rejecting the received battery if the received battery is not acceptable.

31. The method of Claim 30, further comprising rejecting the received battery if the physical condition of the received battery is unacceptable...

32. The method of Claim 30, further comprising rejecting the received battery if the operational condition of the received battery is unacceptable.

33. A vending system comprising:

- a vending unit for vending products, the vending unit comprising a communication module and a unique identifier;

- a central computer comprising:

- a processor;

- a database storing product information; and

- a communication unit, the central computer being located remote to the vending unit;

- a vending interface, the vending interface being located remote from the vending unit and configured to communicate with the central computer; and

wherein the vending interface is configured to communicate the unique identifier of the vending unit and vending information to the central computer, and the central computer is configured to communicate the product information to the interface and to communicate vending instructions to the vending unit with the unique identifier.

34. The vending system of claim 33, wherein the unique identifier is associated in the database with the product information, and the central computer is configured to receive the unique identifier from the interface, retrieve the corresponding product information, and communicate the product information to the interface.

35. The vending system of claim 34, wherein the product information comprises the list of products available for vending at the vending unit

36. The vending system of claim 33, wherein the vending interface comprises a mobile application configured for use on a mobile electronic device.

37. The vending system of claim 33, wherein the vending interface comprises an internet site configured for viewing in a mobile web browser.

38. The vending system of claim 33 wherein the vending unit is configured such it can only receive vending instructions from the central computer.

39. The vending system of claim 33 wherein the vending information comprises the selection of an item for vending and the quantity of the item.

40. The vending system of claim 33, wherein the vending information comprises the selection of an item for an exchange transaction.

41. The vending system of claim 38, wherein the vending instructions comprise instructions to the vending unit instructing the vending unit to vend the selected item.

42. The vending system of claim 33 wherein the central computer is configured to communicate with a payment system to receive payment information via the communication module.

43. The vending system of claim 42, wherein the payment system comprises account information contained within the database.

44. The vending system of claim 42, wherein the payment system is a credit card system.

45. The vending system of claim 42 wherein the payment system is a cellular telephone provider.

46. The vending system of claim 33, wherein the product information comprises the types and quantities of batteries and battery packs available in the vending unit.

47. The vending system of claim 33 further comprising a plurality of vending units, each vending unit having a unique identifier, wherein the central computer is configured to identify each of the plurality of vending units according to each unique identifier, and configured to communicate with each of the plurality of vending units.

48. The vending system of claim 33, wherein the vending unit further comprises a receiving port configured to receive an exchange item.

49. A method of vending an item comprising:

receiving, in a central processor, a unique identifier for a vending unit;

retrieving product information from a database corresponding to the unique identifier for the vending unit;

transmitting the product information to an interface, wherein the interface is remote from the vending unit;

receiving, in the central processor, a product selection from the interface;

receiving payment for the product selection from a payment system;

communicating the product selection to the vending unit corresponding to the unique identifier; and

vending the selected product at the vending unit.

50. The method of claim 49, wherein retrieving product information comprises querying a database located remote to the vending unit using the unique identifier.

51. The method of claim 50, wherein the product information comprises a list of products available for vending from the vending unit having the unique identifier.

52. The method of claim 49, further comprising receiving a request to deposit an exchange item from the interface and receiving the exchange item in the vending unit.

53. The method of claim 52 further comprising vending an item in responses to the deposit of the exchange item.

54. The method of claim 49, wherein the interface is on a mobile electronic device.

55. The method of claim 54, wherein the interface is a mobile application.

56. The method of claim 49, wherein the vending unit comprises a communication module for receiving the product selection.

57. The method of claim 49, wherein the payment system comprises account information accessible to the central processor.

58. The method of claim 57, wherein the account information comprises a user's identity and an account balance.

59. The method of claim 49, wherein the payment system is a credit card system.

60. The method of claim 49, wherein the payment system is a cellular telephone provider.

61. A method of exchanging an item comprising:

transmitting a unique identifier for a vending unit to a central processor;

receiving product information specific to the vending machine for which the unique identifier was transmitted;

transmitting a product selection selected from the product information; and

providing payment according to the product selection.

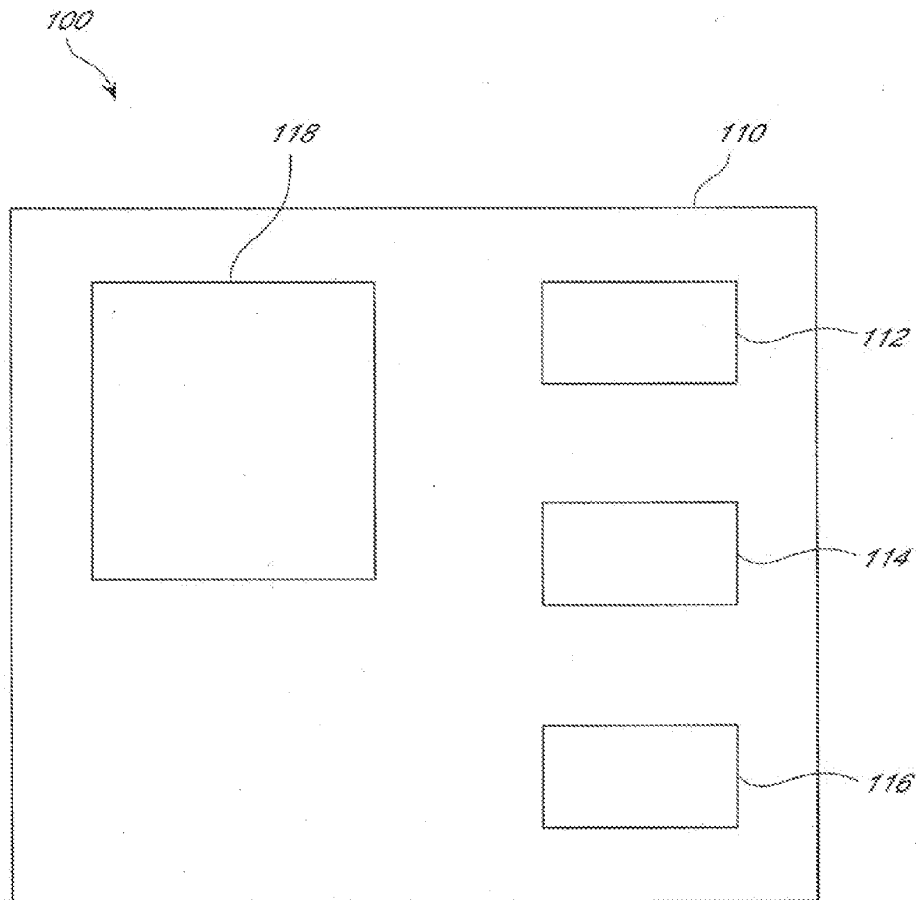


FIG. 1

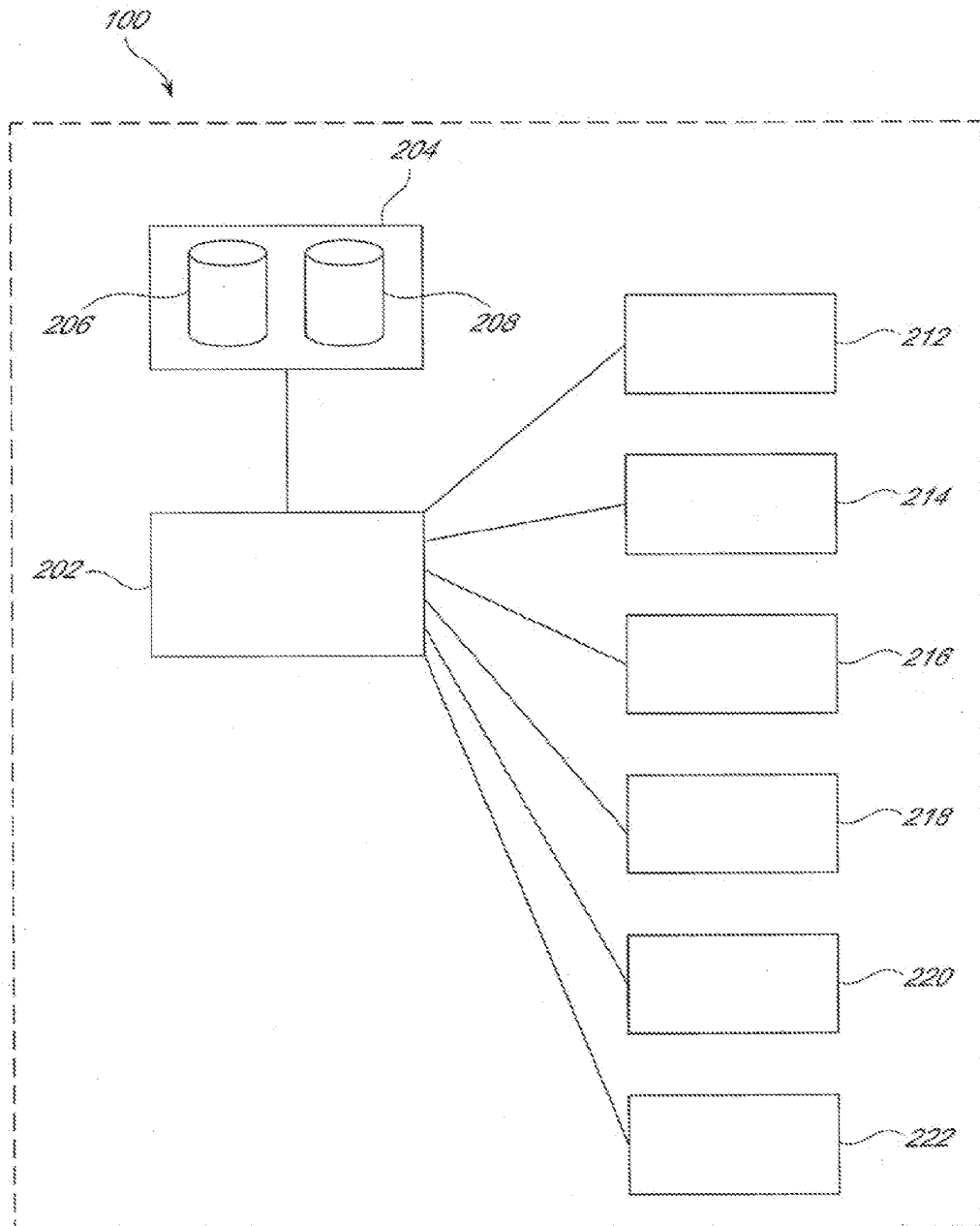


FIG. 2

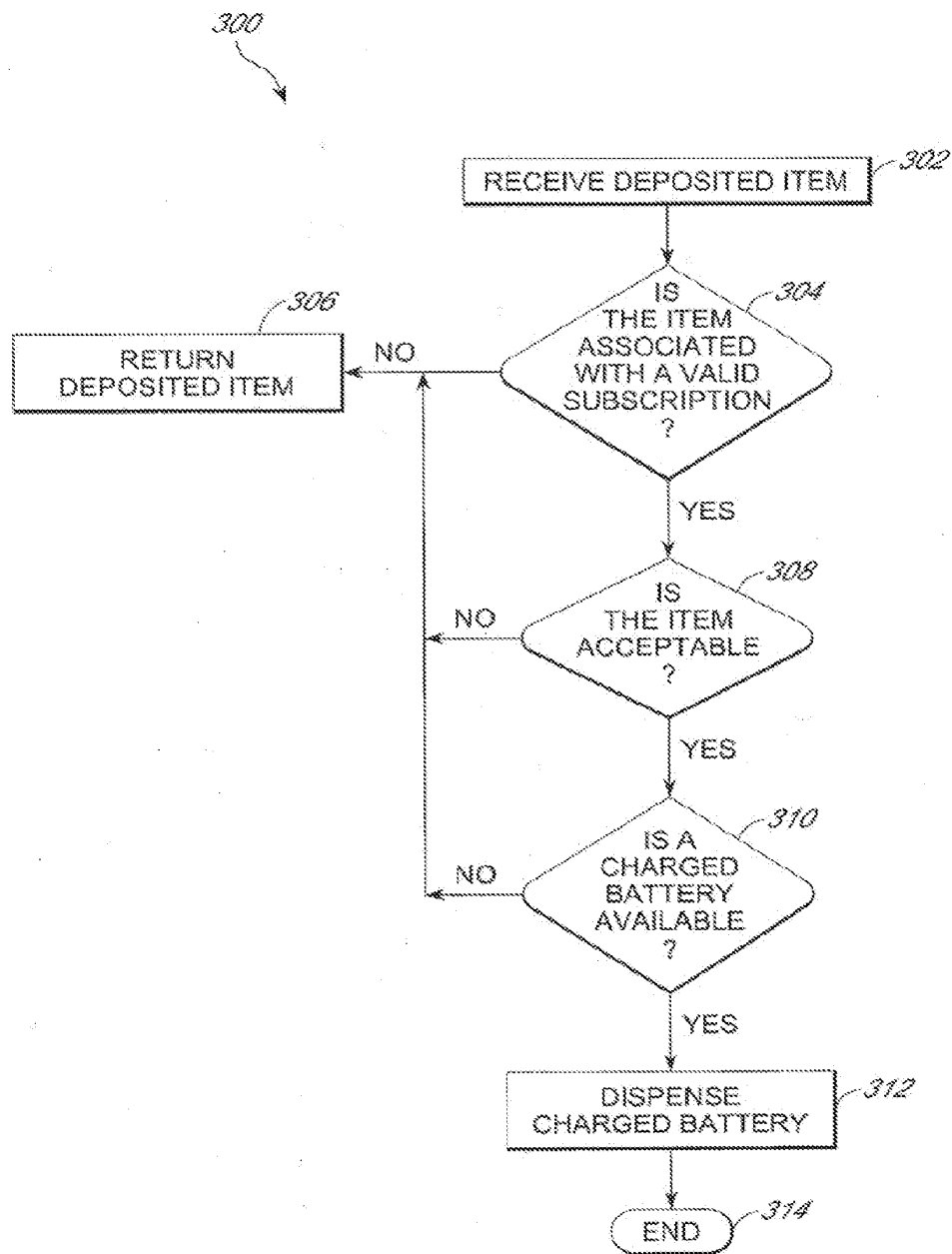


FIG. 3

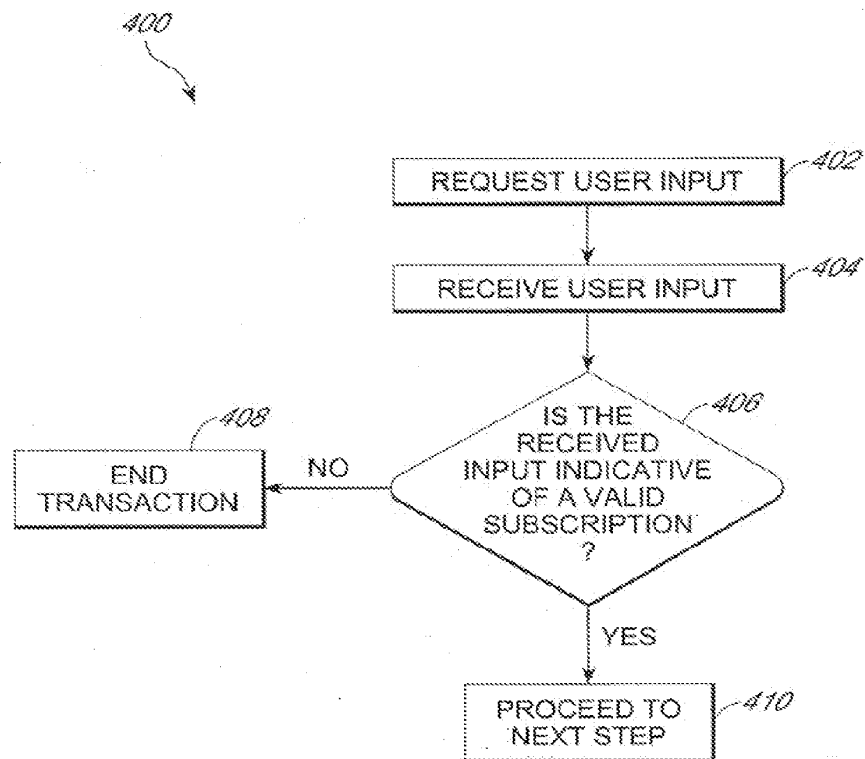


FIG. 4

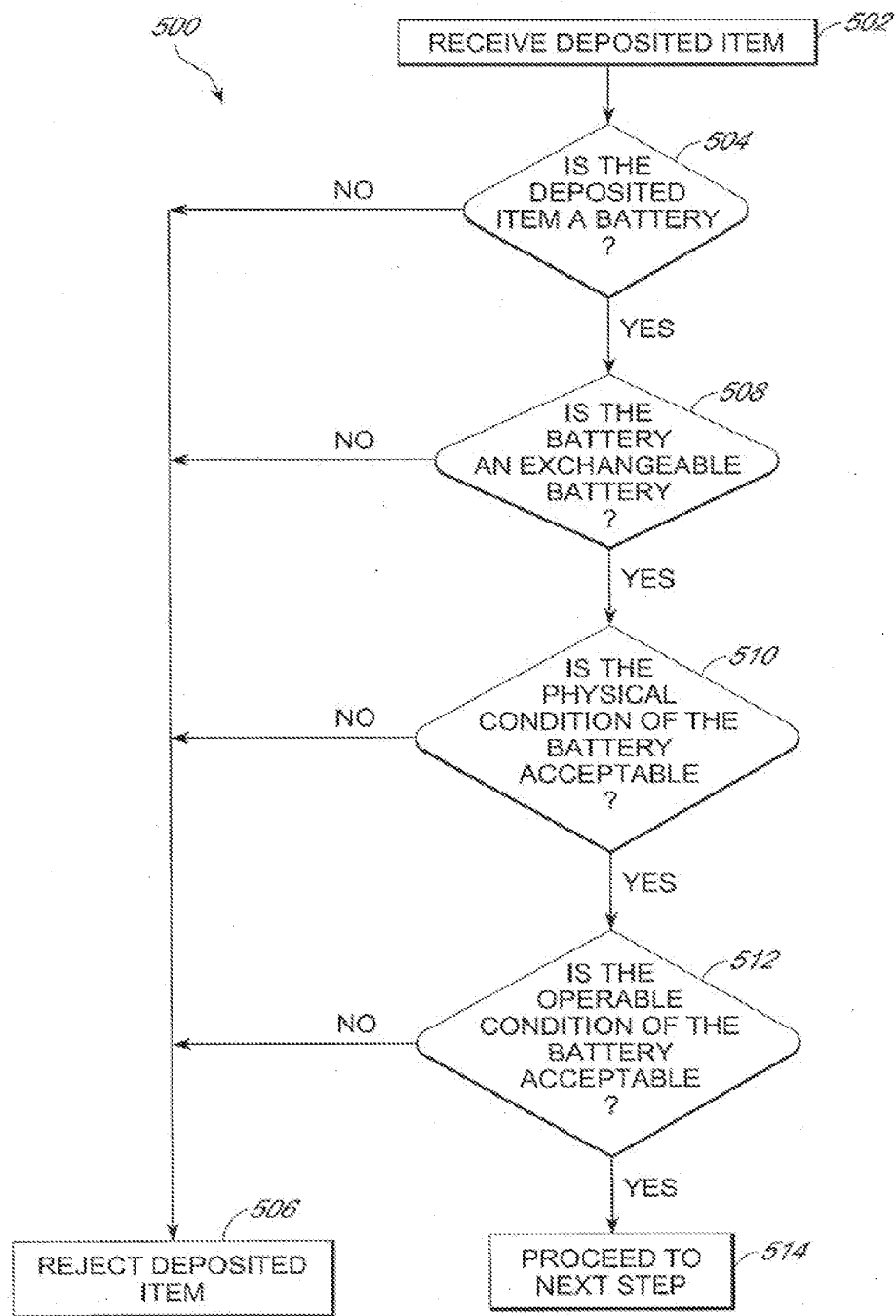


FIG. 5

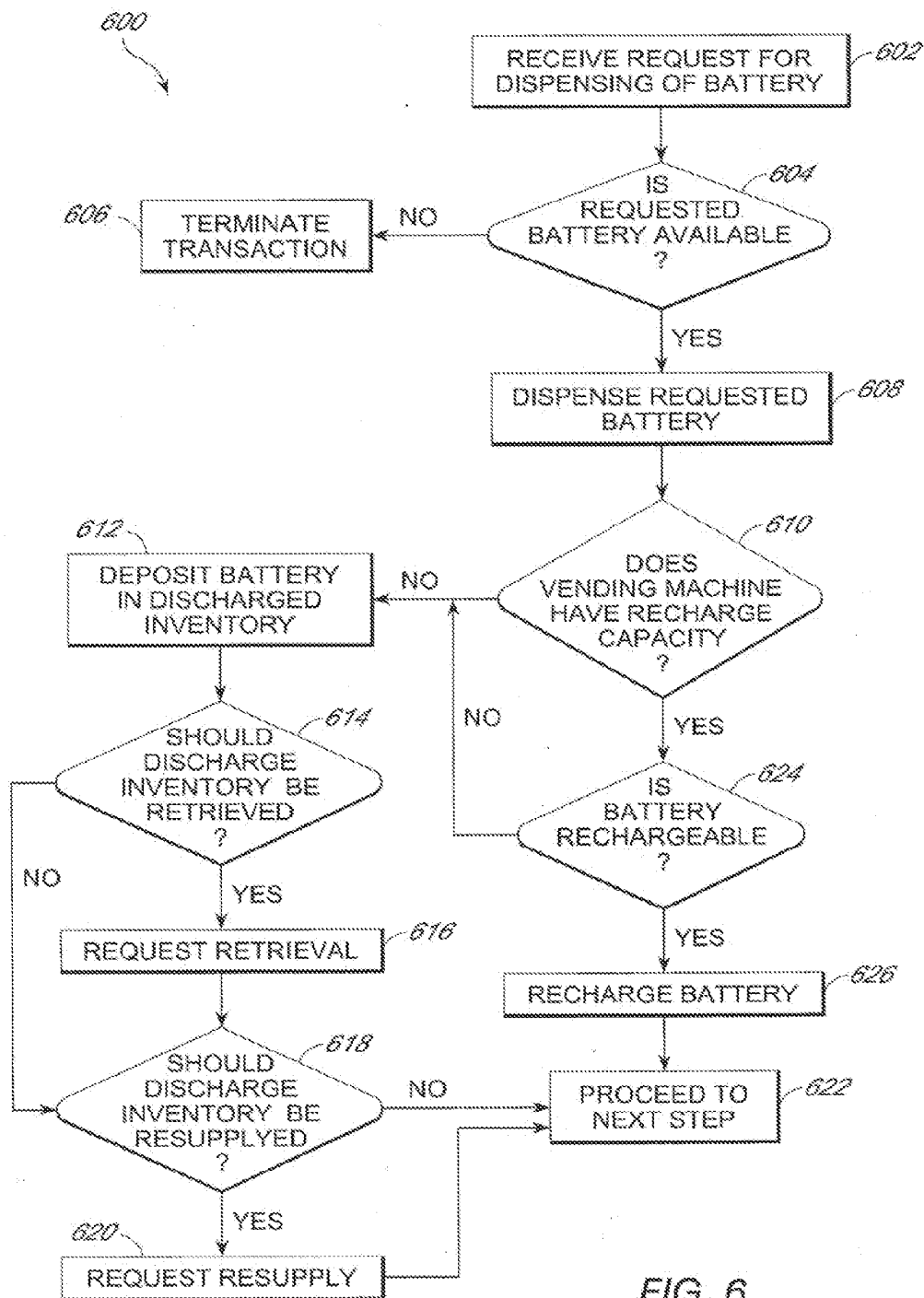


FIG. 6

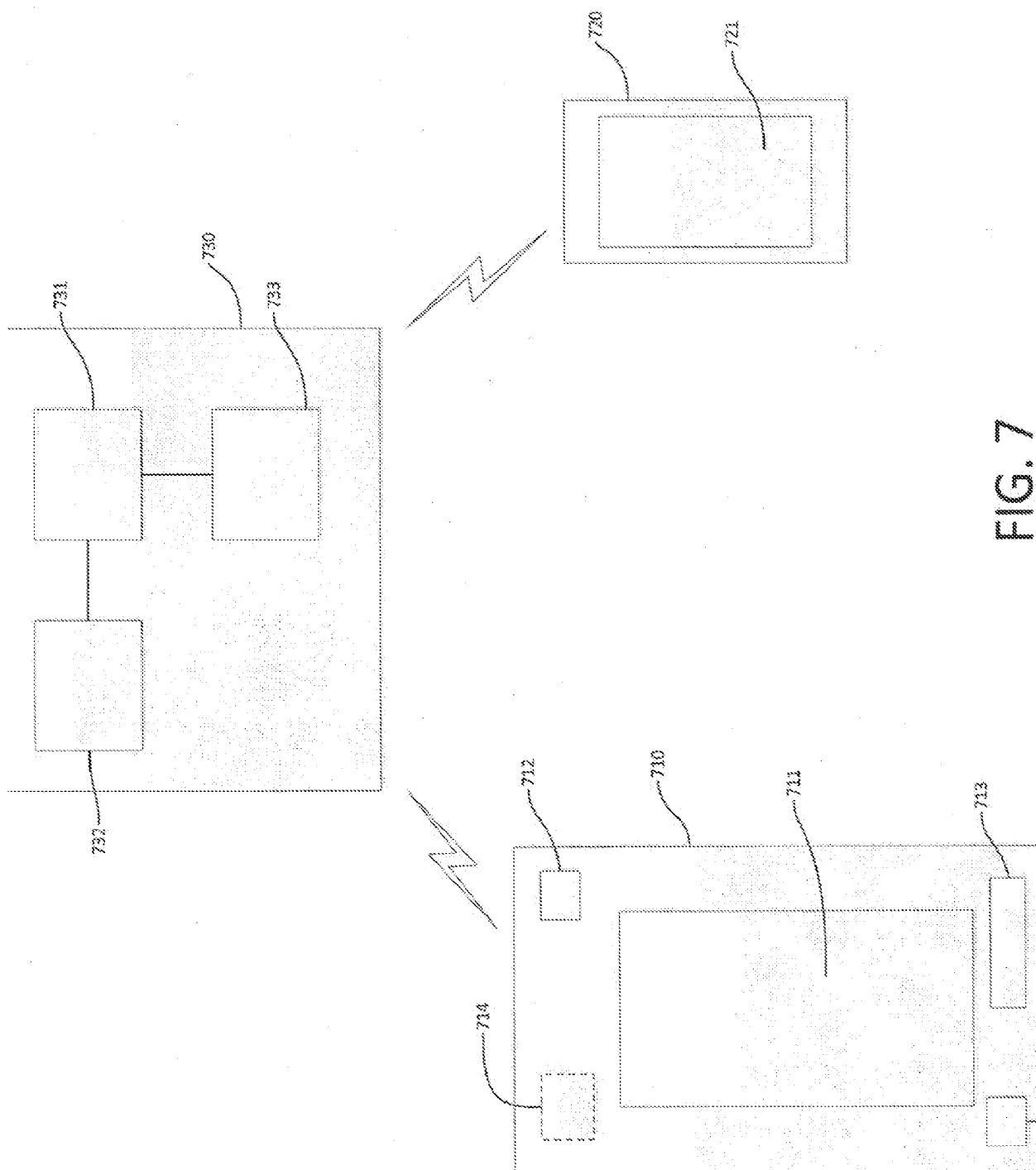


FIG. 7

8/10

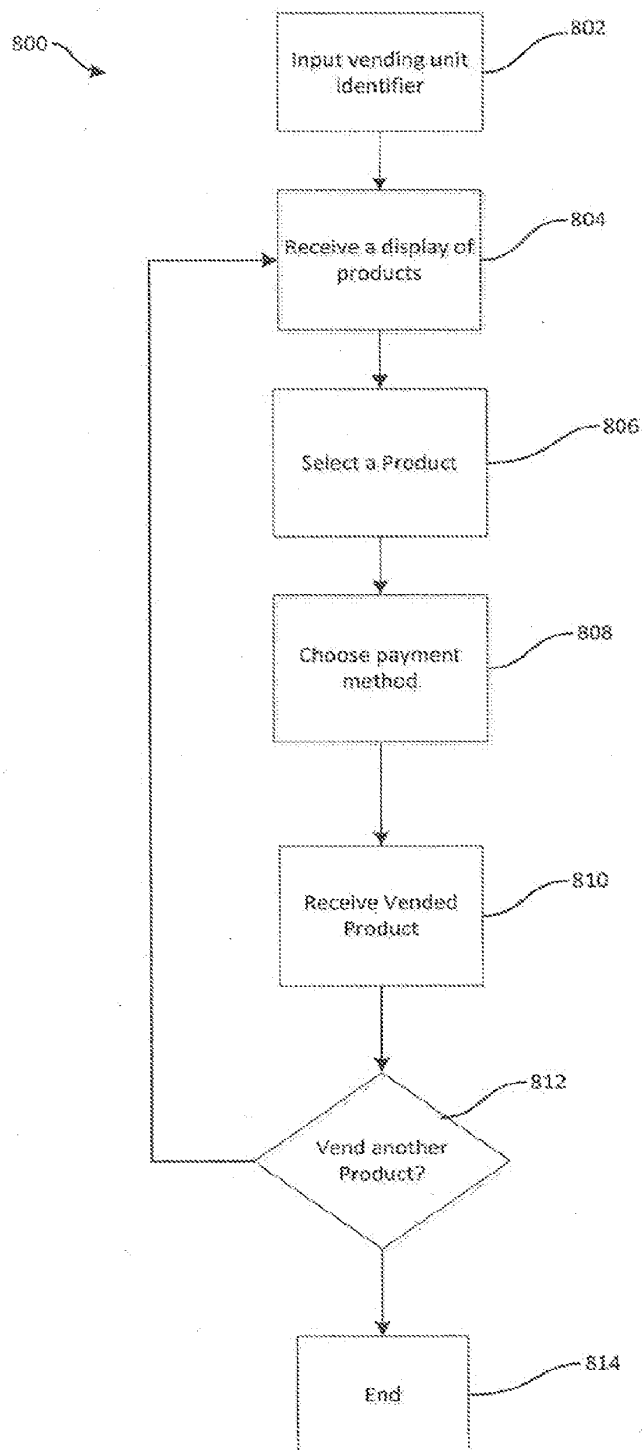


FIG. 8

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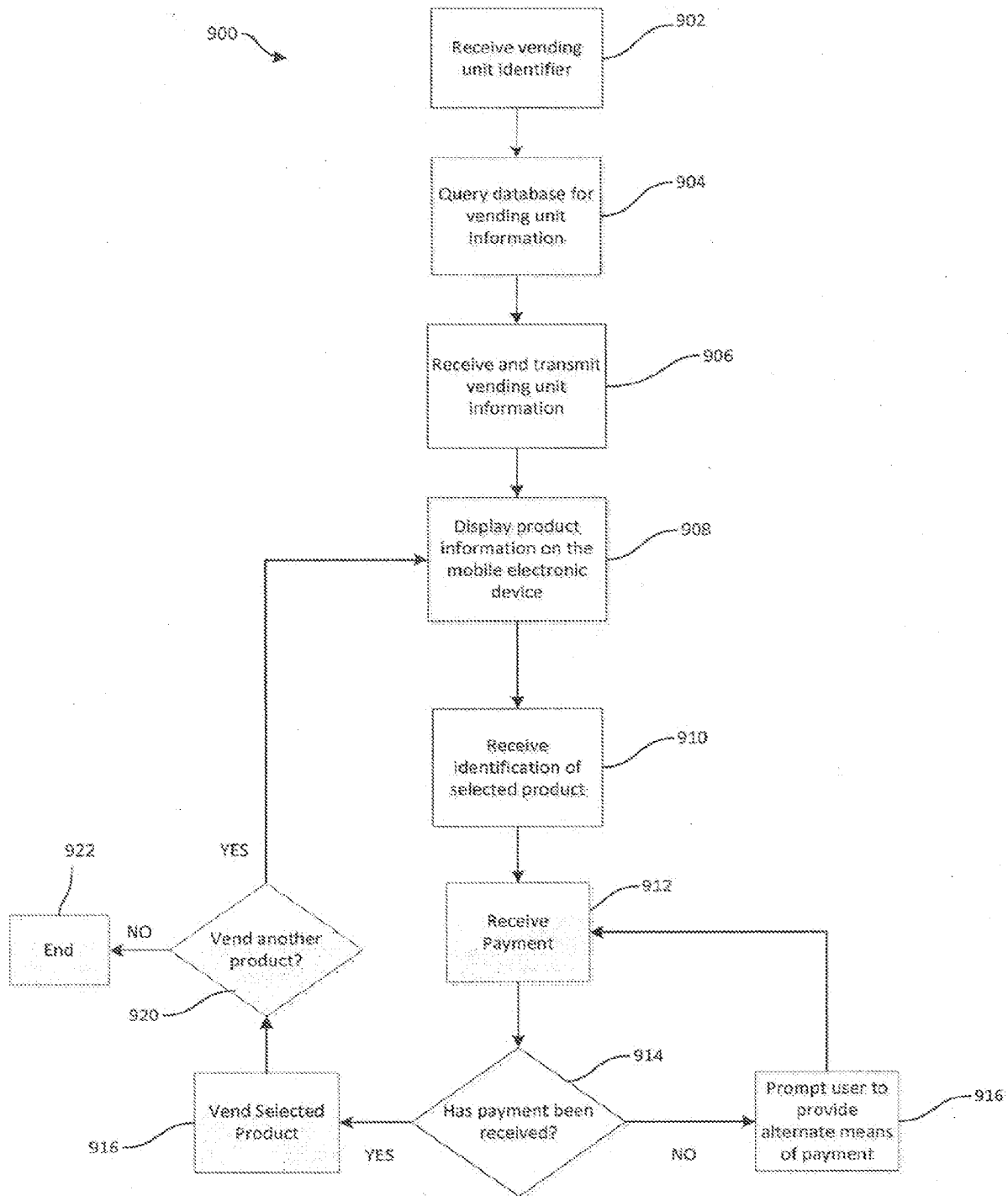


FIG. 9

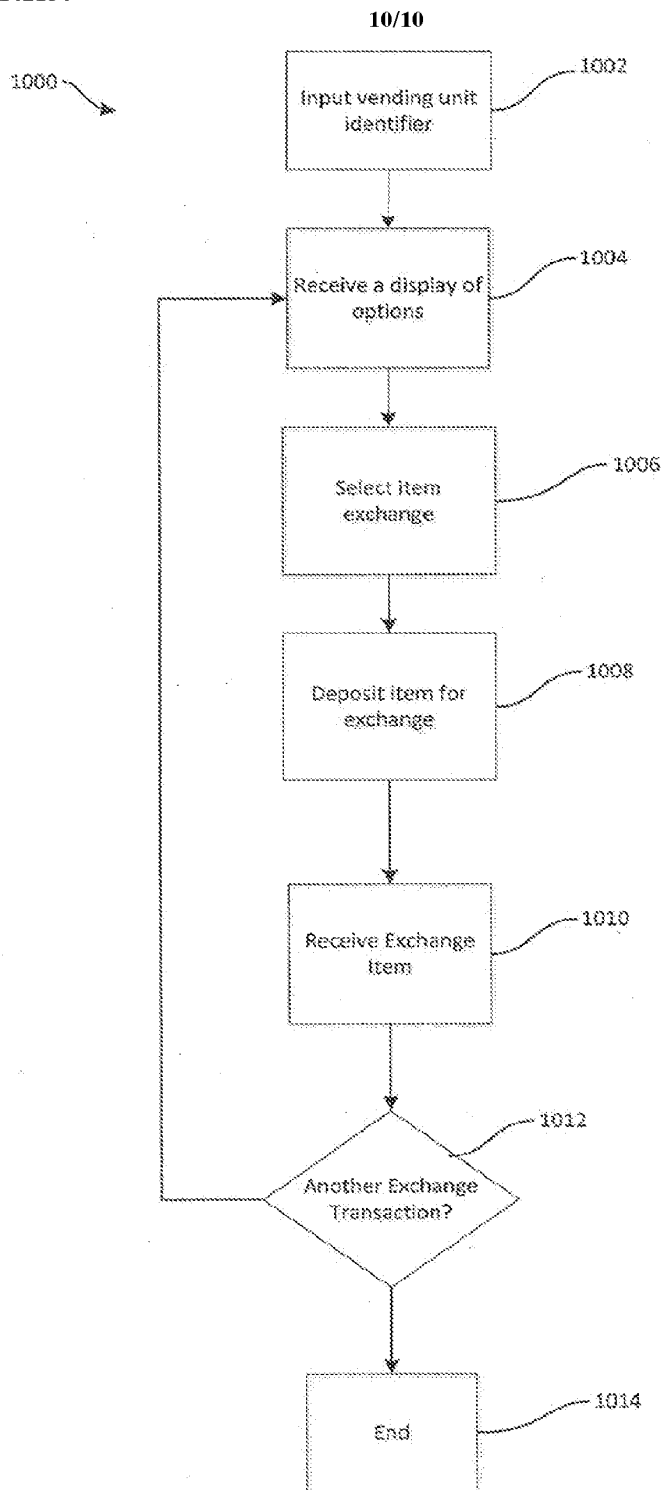


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/030578

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A47F 1/00 (2013.01) USPC - 221/66 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) - A47F 1/00, 1/04, 1/10; B23Q 7/12; G06F 17/00; G07F 11/00 (2013.01) USPC - 221/10, 22, 66, 92, 97, 123, 135, 159, 163; 700/231-233, 240 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC: F25D 2331/803, 31/007; G07F 17/26, G07F 17/42 (2013.01) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patent, Google.com		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,544,784 A (MALASPINA) 13 August 1996 (13.08.1996), entire document	1-32
Y	US 2004/0113588 A1 (MIKURIYA et al) 17 June 2004 (17.06.2004) entire document	1-32
Y	US 2010/0274904 A1 (SCHIRAR et al) 28 October 2010 (28.10.2010) entire document	15-18
A	US 6,822,422 B2 (SAGAWA) 23 November 2004 (23.11.2004), abstract, figures 2-3, col 1, line 45 to col 2, line 10	1-32
☐ 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 30 June 2013		Date of mailing of the international search report 09 JUL 2013
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/US2013/030578

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.:
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.:
1-32

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.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2013/030578

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 1-32, drawn to receiving a battery at a vending machine, collecting and transmitting battery information to determine if the battery is associated with a valid subscription and is acceptable, dispensing a battery in response to the receipt and determination of battery information.

Group II, claims 33-61, drawn to a vending system comprising receiving a unique identifier of a vending unit at a central processor located remotely, retrieving product information from a database and transmitting the information and transmitting to a vending interface remote from vending unit, receiving payment for a product selection at the central processor and communicating the selection and vending instructions to the vending unit with the unique identifier.

The inventions listed as Groups I-II 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: receiving a battery at a vending machine, collecting and transmitting battery information to determine if the battery is associated with a valid subscription and is acceptable, dispensing a battery in response to the receipt and determination of battery information as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: vending system comprising receiving a unique identifier of a vending unit at a central processor located remotely, retrieving product information from a database and transmitting the information and transmitting to a vending interface remote from vending unit, receiving payment for a product selection at the central processor and communicating the selection and vending instructions to the vending unit with the unique identifier as claimed therein is not present in the invention of Groups I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of a vending machine and system for vending products, comprising a processor configured to control the vending machine, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 6,822,422 B2 (SAGAWA) 23 November 2004 (23.11.2004), abstract, figures 2-3, col 1, line 45 to col 2, line 10 and US 5,544,784 A (MALASPINA) 13 August 1996 (13.08.1996), abstract, figure 1, col 2, line 45 to col 3, line 20.

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

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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Organization

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61/686,308 2 April 2012 (02.04.2012) US

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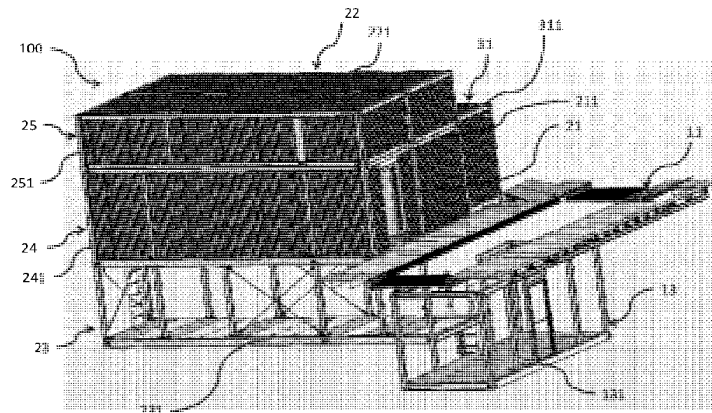


Fig. 2

(57) Abstract: The present disclosure provides a vehicle battery service assembly operable in replacement, storage and charging of vehicle batteries, comprising a plurality of functional modules, at least some of said functional modules being constructed from pre-assembled units a priori contained within separate shipping containers and engageable to one another to form said assembly.

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VEHICLE BATTERY SERVICE SYSTEM FOR AN ELECTRIC VEHICLE

FIELD AND BACKGROUND

This invention relates to an electric vehicle service system for electric vehicles including a battery switch station that can function in the replacement, storage and charging of vehicle batteries.

Electric vehicle service stations including battery switch stations for switching batteries of electric (i.e. at least partially electric) vehicles, for example as disclosed in WO 2010/033883 assigned to the assignee of the present application, stand as a promising equipment to enable large scale development of electrically powered vehicles.

GENERAL DESCRIPTION

In order to ensure proper service to electrical vehicles, large scale deployment of battery service stations is required which creates significant logistical challenges. Indeed, building a battery service station requires integration of a large number of complex mechanical and electrical systems. The term “electric vehicles” used herein refers to vehicles that derive at least a major portion of its energy during transport from batteries, including “entirely electric” or “hybrid” vehicles.

The present invention is based on realization that a battery service station can efficiently and cost-effectively be constructed from modules that are pre-assembled at the site of manufacture, each in a separate transport container; and then brought in this manner to the construction site of a battery service station and engage together on-site in a functional manner, to permit the modules to perform their functions within the station's operation in the replacement, storage, charging of batteries of electric vehicles.

The invention provides by one of its aspects a vehicle battery service assembly operable in replacement, storage and charging of vehicle batteries, comprising a plurality of functional modules, at least some of said functional modules being

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constructed from pre-assembled units a priori contained within separate shipping containers and engageable to one another to form said assembly. The containers may be custom made containers which are used for shipping.

The invention also provides, by another of its aspects, a vehicle battery service station, comprising functional modules, each of the modules being linked to other modules of the station in a functional manner for their function in the replacement, storage and charging of vehicle batteries, being characterized in that the functional modules are being pre-assembled within shipping containers of at least one standard size. The containers may be custom made containers which are used for shipping.

Further provided by the invention is a process for assembling a vehicle battery service station operable in replacement, storage and charging of vehicle batteries, comprising providing shipping containers containing pre-assembled functional modules of said station; and placing them in a pre-determined arrangement and linking the modules with other modules of the station in a functional manner for their function in the replacement, storage and charging of vehicle batteries.

The invention also provides a process for assembling a vehicle battery service station comprising functional modules, each of the modules being linked to other modules of the station in a functional manner for their function in the replacement, storage and charging of vehicle batteries, the process being characterized in that the functional modules are being pre-assembled within shipping containers of at least one standard size.

Provided by the invention are also modules of a battery service station pre-assembled within containers of at least one standard size, for their assembly at a site of station construction being linked to one another in a functional manner for their function in the replacement, storage and charging of vehicle batteries.

By one embodiment of the invention, portions of one or more of said containers constitute at least part of the assembly or the station support structure. By another embodiment, all of said containers constitute at least part of the walls of the assembly or station, which may be external side walls, bottom, top as well as internal walls.

Shipping containers have standardized sizes, conventionally used in international shipping. The two most common sizes used in land and sea transport are so called (i) 20 footers; and (ii) 40 footers; the former container having a volume of 33.2 m³; and the latter of 67.6 m³.

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The modules, in accordance with the invention, may be pre-assembled and contained within shipping containers of standardized sizes, or some may be contained in shipping containers of one standardized size and others in shipping containers of another standardized size. In some cases, custom made shipping containers complying with the standard size of a standard shipping container may be used. In this way, the modules can be effectively pre-assembled at the site of manufacture, shipped as a sealed container to the site of assembly and relatively easily and effectively assembled together to form said assembly or station. As will be appreciated, such functional modules may be prepared already with pre-fitted engagement elements or connecting elements for engaging or connecting, respectively, to respective elements of adjacent modules. The containers may also serve as the structural elements of the station. For example, one or more wall of a container or the roof of a container may act as station walls and roof.

Building a BSS, like any other multi-discipline machine, requires quite a bit of integration time. The integration process can only be completed after assembly process was completed. In traditional BSS, assembly of the BSS is done in the field, thus requiring considerable amount of skilled workers' time to assemble and integrate the system in environmental conditions which may impose delays. The pre-assembled BSS, is assembled in the production facilities and may be integrated and tested by skilled team of workers which do the work in the assembly plant, having the benefit of immunity to environmental effects or lack of suitable testing equipment. After assembly, integration and testing are completed in the assembly plant, the BSS may be separated to small number of pre-assembled modules. The process of deploying the BSS in the field is very short and simple since it may only involve joining back few pre-assembled modules. In this way, many BSS can be deployed in the field in short time without large number of skilled workers. The preassembled BSS does not require additional structures to be built in the field, since the structure is contained within the pre-assembled module.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

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Fig. 1 is a flow diagram illustrating steps of a process for assembling a vehicle battery service station including a battery switch station according to an embodiment of the invention.

Fig. 2 illustrates a perspective view of some elements of a vehicle battery service station including a battery switch station according to an embodiment of the present invention.

Fig. 3 illustrates elements of a modular battery exchange unit of a vehicle battery service station according to an embodiment of the invention.

Fig. 4 illustrates elements of a modular control unit of a vehicle battery service station according to an embodiment of the invention.

Fig. 5 illustrates elements of a battery transport unit of a vehicle battery service station according to an embodiment of the invention.

Fig. 6 illustrates elements of a battery storage unit and of an air conditioned unit of a vehicle battery service station according to an embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

It is noted that the term “upper wall”, “bottom wall”, “lateral wall” are used herein for designating certain surfaces of a container with reference to a standard position of the container and/or with reference to a system contained in the container, the system being held in an appropriate position in view of its assembly and use in the vehicle battery service station.

Further, a container comprises generally a frame structure supporting four lateral walls, a bottom wall and an upper wall. A portion of a shipping container may therefore be any combination of a portion of the frame structure and a portion of one or more walls. As a definition, containers may be generally described as standardized re-sealable transportation box for unitized freight handling with standardized equipment. It is recalled that two most common sizes are used in ground and sea (surface) transportation: (1) Twenty-footer also called 20-foot container which have a typical capacity of 33.2 cubic meter or 1172 cubic feet and a maximum payload of 28180 kilogram or 62130 pounds and (2) Forty-footer also called 40-foot container which have a typical capacity of 67.7 cubic meter or 2392 cubic feet and a maximum payload of 28750 kilogram or 63380 pounds. The typical dimensions of a 20-foot container are:

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internal length 5.90 meter (19 feet 4 inches), internal width 2.35 meter (7 feet 9 inches), internal height 2.40 meter (7 feet 10 inches). The typical dimensions of a 40-foot container are: internal length 12.03 meter (39 feet 6 inches), internal width 2.35 meter (7 feet 9 inches), internal height 2.4 meter (7 feet 10 inches). There are other types of standard containers like open-roof containers which do not include a roof (ceiling) and tall containers which have a standard length and width but are higher than standard 20-footers or 40-footers.

The term *assembly* may be used in the following to refer to the vehicle battery service station as a kit of modular units as opposed to the vehicle battery service station as a finished product, i.e. after the modular units have been engaged/assembled together to form the station.

Traditionally, the installation of the plurality of elements of a vehicle service station is performed at an installation site. The installation site comprises an infrastructure (walls, ceiling, etc.) intended to receive the plurality of elements of the vehicle service station in an appropriate configuration. The calibration of the elements with respect to one another can therefore only be achieved on the installation site, when the infrastructure is finalized. Indeed, the positioning of the elements depends on the infrastructure of the station since certain elements may be attached to the infrastructure (ceiling, floor...) and some elements may require a precise relative positioning.

It should be understood that in order to service at least partially electric vehicles there should be a large number of vehicle battery service stations along the roads, at least because the typical battery has a limited charge level resulting in too limited maximal distance the vehicle can drive with such battery. Accordingly, deployment of vehicle battery service stations requires accurate and fast procedure. In order to improve the building of vehicle battery service stations for servicing at least partially electric vehicles, the present disclosure generally proposes a vehicle battery service assembly comprising a plurality of modular units engageable to one another to form a vehicle battery service station, wherein at least one modular unit comprises a supporting structure (that may include for example an exterior structure of the BSS such as exterior walls) formed by (or comprising) at least a portion of a shipping container thereby enabling said modular unit to be preassembled (and/or integrated) within the shipping container. This enables to preassemble and integrate said at least one modular unit at the fabrication site so as to be "ready-to-be-engaged". This further enables to limit the

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amount of waste in building a vehicle battery service station. The portion of the shipping container forming the structure may collaborate with one or more elements of the modular unit. For example, elements of the modular unit may be attached to the supporting structure. Further, the portion of the shipping container may comprise one or more walls of the shipping container or a frame of the shipping container. The term “pre-assembled” may refer to the feature that the modular unit may be composed of a plurality of elements which are preliminary mounted (assembled) together and/or to the supporting structure formed by said portion of the container. Since the setting (assembly) of the elements relatively to each other and to the structure is preliminary performed, for example on the manufacturing site, only the setting (assembly) of the plurality of the modular units relatively to one another may still be performed on an installation site where the vehicle battery service station is to be installed. The vehicle battery service assembly may advantageously comprise several such modular units preassembled in separate shipping containers. Preferably, all the modular units may be configured for fitting into one type or different types of shipping containers. For example, the type of shipping container into which a modular unit may fit is a 20-foot a 40-foot, an open-roof or a tall container type. Modular unit may also be configured to fit custom made containers complying with standard definition of shipping containers. This way, all the modular units may be transported easily. The present disclosure also concurrently provides a vehicle battery service station comprising a plurality of modular units engaged to one another to form the vehicle battery service station, wherein at least one modular unit comprises a supporting structure (for example exterior walls) formed by (or comprising) at least a portion of a shipping container thereby enabling said modular unit to be preassembled within the shipping container. The present disclosure also provides a modular unit of a vehicle battery service station comprising a supporting structure (for example exterior walls) formed by (or comprising) at least a portion of a shipping container thereby enabling said modular unit to be preassembled within the shipping container.

As explained, a vehicle battery service station/assembly may comprise a plurality of modular units. The modular units may be arranged as functional modules of the vehicle battery service station. For example, a vehicle battery service station may comprise a lane module (functional module for battery replacing) comprising a conveyer unit and a battery exchange unit; a storage module (functional module for

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storing batteries) comprising a storage unit, an air conditioned unit, a battery transport unit and one or more frame units; and a control module (functional module for monitoring the vehicle battery service station) comprising a control unit. As explained, a set of modular units intended to be arranged so as to form a vehicle battery service station forms a kind of kit and may be referred to as a vehicle battery service assembly.

Fig. 1 is a flow diagram generally illustrating a process of assembling a vehicle battery service station including a battery switch station according to an embodiment of the present invention. In a first step **S101**, the process for assembling a vehicle battery service station operable in replacement, storage and charging of vehicle batteries includes providing shipping containers containing modular units of the vehicle battery service station. Some modular units may comprise a supporting structure formed by a portion of the shipping container containing said modular unit, i.e. some modular units are preassembled within a shipping container. In some embodiments, the elements of a modular unit are selected to be put in the same container (being pre-assembled or not) in accordance with their functions and position in the station. In other words, these are elements which are to be assembled and/or put adjacent to one another when in the operation state of the station.

In a second step **S102**, the process may include placing the shipping containers corresponding to said preassembled modular units in a predetermined arrangement. Further, in a third step **S103**, the process may comprise linking the modular units in a functional manner so as to form the vehicle battery service station. The linking may comprise engaging portions of shipping containers containing preassembled modular units to one another so as to form a global station supporting structure. The linking may also include retaining walls of at least some of the shipping containers containing modular units as external walls of the station. The linking may comprise connecting the modular units (i.e. the support structures/shipping containers and/or the internal machinery) by using a pre-arranged set of connectors and cables. It is noted that the process may preliminary include a step of connecting, testing and calibrating all the modular units at the factory site and a step disconnecting the units before shipping the units into shipping containers so to provide them at the installation site. The connections between modular units may be based on mechanical and electrical connections. The mechanical connections includes alignment pins and bolt fasteners that align and connect the modules. Electrical connections are standard high voltage (HV) and low

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voltage (LV) electrical connectors which are joined when the BSS is deployed. This may further reduce the required on site installation time. Further, the process may also include a step of installing decorative covers on top of the modular units supports structures. This may enable to customize the look of the vehicle battery service station. Further the modular design may allow the operator of the BSS to configure the BSS in several different ways; for example with one or two small storage containers or one or two large storage containers. This allows the operator to customize (tailor made) the BSS to a specific installation site according to site size limitation and traffic volume expectations.

Fig. 2 is a perspective view of a vehicle battery service station **100** comprising a first functional module for battery replacing, a second functional module for battery storing and a third functional module for monitoring the operation of the station **100**.

The first functional module for battery replacing may comprise a lane unit **11** and a battery switch unit **13** (the support structure of the battery switch unit **13** is shown on **Fig. 2**, some other battery switch elements of the battery switch unit **13** are shown on **Fig. 3**). The lane unit **11** may be configured to fit in a 40-foot container and may be configured to be assembled at the top of the battery switch unit **13**. The lane container may be an underground container comprising all structural elements to handle both shipping and installation in the site. The lane container structure may remain in the BSS. The lane unit **11** is configured and operable to position a vehicle in an appropriate position with respect to a certain sub-station (e.g. battery replacement) and possibly also move vehicle through different sub-stations (e.g. cleaning station, waiting area, battery replacement station, etc.).

The battery switch unit **13** may comprise a battery switch structure **131** and battery switch elements mounted to the battery switch structure **131**. The battery switch structure **131** may be made of the frame and the bottom wall of a shipping container. The battery switch unit **13** may be preassembled within said shipping container which can be, for example, a 20-foot container. As can be seen on **Fig. 3**, the battery switch elements may comprise a lifter **132**, a hydraulic system **133** and mechanical and electrical tools **134**. The lifter may hold a dedicated battery switch tool that is capable of making contact with the battery and can remove or insert the battery into an electric vehicle positioned over the lifter **132**. It is to be noted that different vehicle/battery types may require different tools for their removal and insertion to the vehicle or a

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single flexible tool may also serve all vehicles. Further, the lifter **132** may move along a single track between four distinct positions. One position may be used for temporary storage of a battery after removal from the vehicle, another position may be used for picking the new battery from a robotic transport system (described hereinafter), a third position may be a battery exchange position below the vehicle and the fourth position may be next to a tool location area where different tools are provided for replacing specific battery types. The elements of the battery switch unit **13** may be calibrated (preassembled) with respect to each other and/or appropriately attached to the structure **131** at the fabrication site. Indeed, the respective position of the elements of the battery switch unit with regard to the battery switch structure **131** can be set within the shipping container. At the installation site, the battery switch unit **13** may be placed underground, for example in an excavation adapted to receive the battery switch structure **131**.

The second module for battery storing (battery storage and charging module) may comprise a storage unit **21**, an air conditioned unit **22**, a battery transport unit **23** (the support structure of the battery transport unit **23** is shown on **Fig. 2**, some other elements of the battery transport unit are shown on **Fig. 5**), a first frame unit **24** and a second frame unit **25**.

The storage unit **21** may comprise a storage structure **211** made of portions of a shipping container and a battery storage facility **212** mounted to the storage structure **211**. As can be seen on **Fig. 6**, the battery storage facility **212** may be designed to have different storage shelves **214** arranged to support a plurality of battery types **210** to match different serviced EV types. The shelves **214** may form racks adapted to receive the batteries of different types/sizes. In some embodiments, all racks (or generally at least some of them) are configured to charge the batteries. A switching board may route charging power to the racks which contain batteries that need to be charged. In some embodiments, the batteries are shuffled between the rack configured to charge and the racks configured to store the batteries. Each rack may be equipped with mechanical and electrical interfaces that are specific to the particular type of battery that the rack supports. For example, a rack may include a battery locating feature **215**, a battery presence sensor, a frame location hole, and a connector actuator arm **218**. The storage bin (rack) may be configured for a specific type of battery, but can be replaced with a bin configured for a second type of battery. The storage bin includes mechanical, electrical and thermal interfaces with the battery. Those interfaces are used to support,

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charge and cool the battery. The battery locating feature may facilitate the positioning of a battery **210** in a specific location. Once the battery presence sensor senses that a battery **210** is in place, the connector actuator arm **218** may connect with the battery **210** and may start charging. In some embodiments, the connector actuator arm **218** may connect to the battery **210** at an electrical connection interface on the battery **210** which is also used to connect electrically the battery to the vehicle when in use. The elements of the storage unit **21** may be calibrated (preassembled) with respect to each other and/or appropriately mounted to the storage structure **211** at the fabrication. Indeed, the respective position of the elements of the battery storage facility **212** with regard to the storage structure **211** can be set within the shipping container. The container used for the storage structure **211** and for transporting the storage unit may be for example a 20-foot or a 40-foot container.

As can be seen on **Fig. 5**, the battery transport unit **23** may comprise a battery transport structure **231** and a robotic transport system **232** mounted to the battery transport structure **231**. The battery transport structure **231** may be formed of portions of a shipping container such as a bottom wall and at least parts of the frame. The robotic transport system **232** may comprise a rail system **233** to enable a robot **234** to move through the battery transport structure **231**. The battery transport unit **23** may be positioned so as to allow the robot **234** to collaborate with both the lifter **132** of the battery switch unit **13** and the storage shelves **214** of the battery storage facility **212**. For example, the battery transport unit **23** may be positioned underground. The robot **234** may have a translation platform **235** and a main body **236**. The robot **234** may have three axis of translation, which corresponds to three degrees of freedom. The robot **234** may travel along the rail system **233**. In some embodiments the translation platform **235** may be slidable in a direction perpendicular to the direction of the rail. The translation platform **235** may also be mounted rotatable around an axis perpendicular to the bottom wall of the battery transport structure **231**. This enables the translation platform to slide under a battery and to displace the battery from one location to another. The translation platform **235** can also travel vertically with respect to the bottom wall of the battery transport structure **231** by means of the central vertical rail **237** as shown. The ladder is part of an automatic storage and retrieval system (ASRS) which is an automatic forklift. The ladder may be attached to vertical guide rails of the ASRS for transportation purposes. The elements of the battery transport unit **23** may be calibrated

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(preassembled) with respect to each other and/or appropriately mounted to the battery transport structure **231** at the fabrication. Indeed, the respective position of the elements of the robotic transport system **232** with regard to the battery transport structure **231** can be set within the shipping container. The container used for the battery transport structure **231** (and for transporting the battery transport unit **23**) is of the same type as the container used for the storage structure **21**.

The air conditioner unit **22** may comprise an air conditioner structure **221** and an air conditioner system **222**. The air conditioner system **222** may be mounted to the air conditioner structure **221**. The air conditioner structure **221** may be formed of portions of a shipping container such as a upper wall, at least parts of the frame and possibly some lateral walls. The air conditioner structure **222** may be linked to a top part of the storage structure **211** so as to form a single exterior cover structure for both the air conditioner system **222** and the battery storage facility **212**. For example, an upper wall of the container containing the storage unit **21** and a bottom wall of the container containing the air conditioner unit **22** may be dismantled and the resulting container structures may be joined so as to form said rigid cover. The container used for the air conditioner structure **221** may be a flat 10-foot container. Such 10-foot container may be 10 feet long and with a height and width identical to the standard 20 and 40 feet containers.

A first frame unit **24** and second frame unit **25** may additionally be provided in order to provide an exterior cover structure for the battery transport unit **23**. The first and second frame units **24**, **25** may comprise first and second frame structures **241**, **251** each made of portions of a shipping container. The first frame structure **241** may be formed of the lateral walls of a 20-foot container and the second frame structure **251** may be formed of an upper wall and lateral walls of flat 10-foot container. The battery transport structure **231**, the first frame structure **241** and the second frame structure **251** may be linked so as to form a rigid cover for the robotic transport system **232**.

The third module for monitoring the operation of the vehicle battery service station **100** may comprise a control unit **31**. The control unit **31** may comprise a control structure **311** and a control system **312**. The control structure **311** may be formed of portions of a shipping container. As can be seen on **Fig. 4**, the control system **312** may include vehicle sensor to detect what kind of electric vehicle/battery is to be serviced and data communication rack **316** to communicate with the robotic transport system **232**

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so as to retrieve from the battery storage facility **212** a battery that matches the electric vehicle type. The data communication rack **316** may also communicate with the battery switch elements in order to adapt the battery switch elements to the type of electric vehicle/battery to be serviced. The control system **312** may also include a smoke exhaust controller **313**, a fire alarm controller **314**, an electrical box **315** and other control and connection equipments, for example a main electrical board **317**.

The above examples and description have of course been provided only for the purpose of illustration, and are not intended to limit the invention in any way. As will be appreciated by the skilled person, the invention can be carried out in a great variety of ways, employing more than one technique from those described above, all without exceeding the scope of the invention.

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CLAIMS:

1. A vehicle battery service assembly operable in replacement, storage and charging of vehicle batteries, comprising a plurality of functional modules, at least some of said functional modules being constructed from pre-assembled units a priori contained within separate shipping containers and engageable to one another to form said assembly.
2. The assembly of claim 1, wherein portions of one or more of said containers are at least a part of the assembly's support structure.
3. The assembly of claim 1, wherein walls of one or more of said containers are at least a part of the assembly's walls.
4. The assembly of claim 1, wherein the shipping containers are all of one standard size.
5. The assembly of claim 1, wherein the shipping containers comprise containers of different standard sizes.
6. The assembly of claim 1, wherein said functional modules comprise one or more of the following: battery storage and charging module, battery switch module with a robotic transport system, vehicle interfacing module, electric power module, control module.
7. A vehicle battery service station, comprising functional modules, each of the modules being linked to other modules of the station in functional manner for their function in the replacement, storage and charging of vehicle batteries, being characterized in that
the functional modules are being pre-assembled within shipping containers of at least one standard size.
8. The station of claim 7, wherein at least some of the shipping containers are engaged with one another to form at least a part of the station's support structure.
9. The station of claim 7, wherein at least some of the walls of the containers are arranged to form walls of the station.
10. A process for assembling a vehicle battery service station operable in replacement, storage and charging of vehicle batteries, comprising
providing shipping containers containing pre-assembled functional modules of said station; and

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placing them in a pre-determined arrangement and linking the modules with other modules of the station in functional manner for their function in the replacement, storage and charging of vehicle batteries.

11. The process of claim 10, comprising engaging portions of adjacent containers to one another to form a station support structure.

12. The process of claim 10, comprising retaining walls of at least some of said containers as external walls of the station.

13. The process of claim 10, wherein the shipping containers are all of one standard size.

14. The process of claim 10, wherein the shipping containers comprise containers of different standard sizes.

15. The process of claim 10, wherein said functional modules comprise one or more of the following: battery storage and charging module, battery replacement module with a robotic transport system, vehicle interfacing module, electric power module, control module.

16. A process for assembling a vehicle battery service station comprising functional modules, each of the modules being linked to other modules of the station in functional manner for their function in the replacement, storage and charging of vehicle batteries, the process being characterized in that the functional modules are being pre-assembled within shipping containers of at least one standard size.

17. Modules of a battery service station pre-assembled within containers of at least one standard size, for their assembly at a site of station construction being linked to one another in a functional manner for their function in the replacement, storage and charging of vehicle batteries.

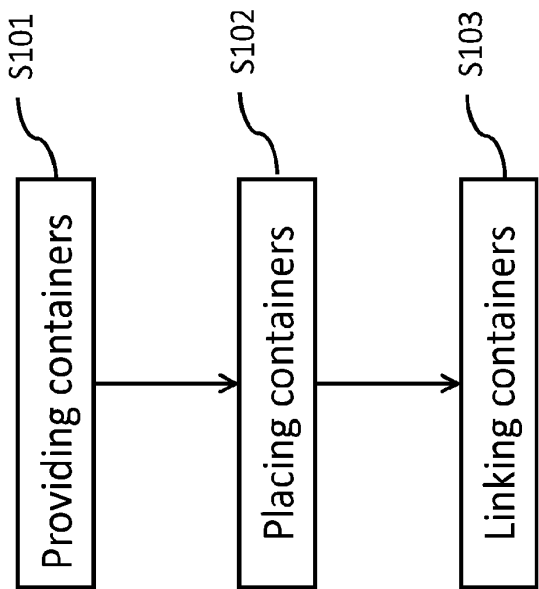


Fig. 1

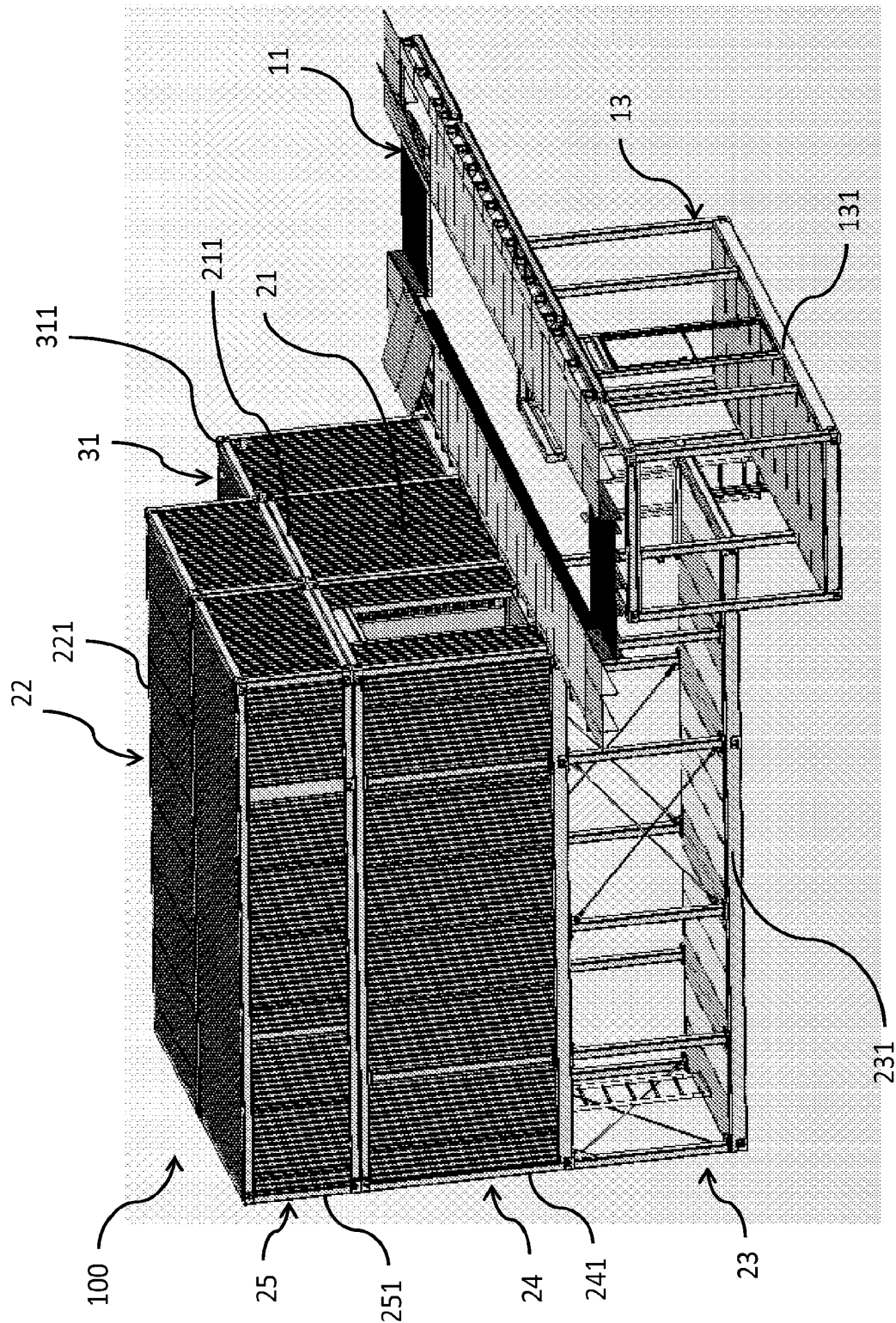


Fig. 2

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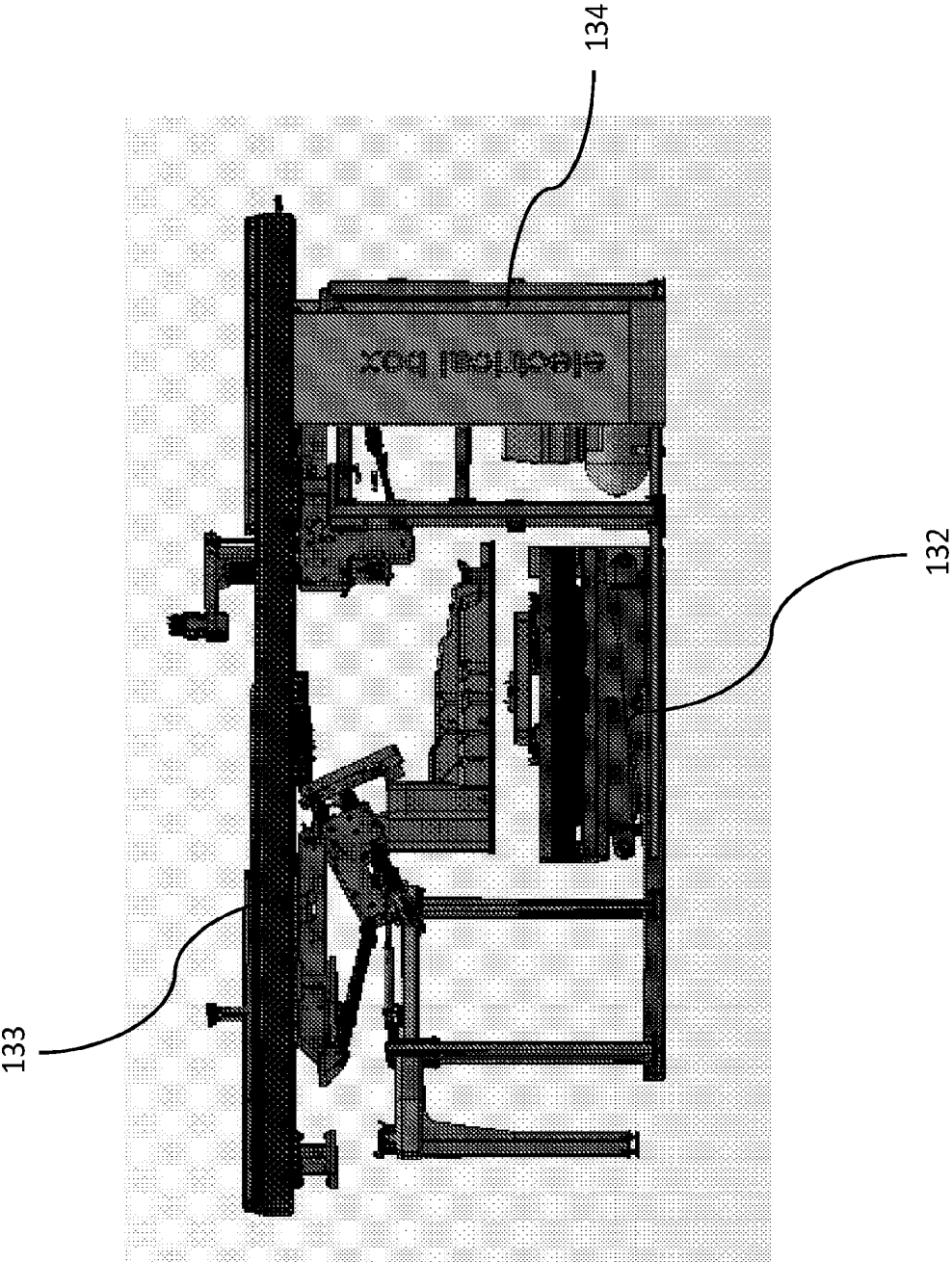
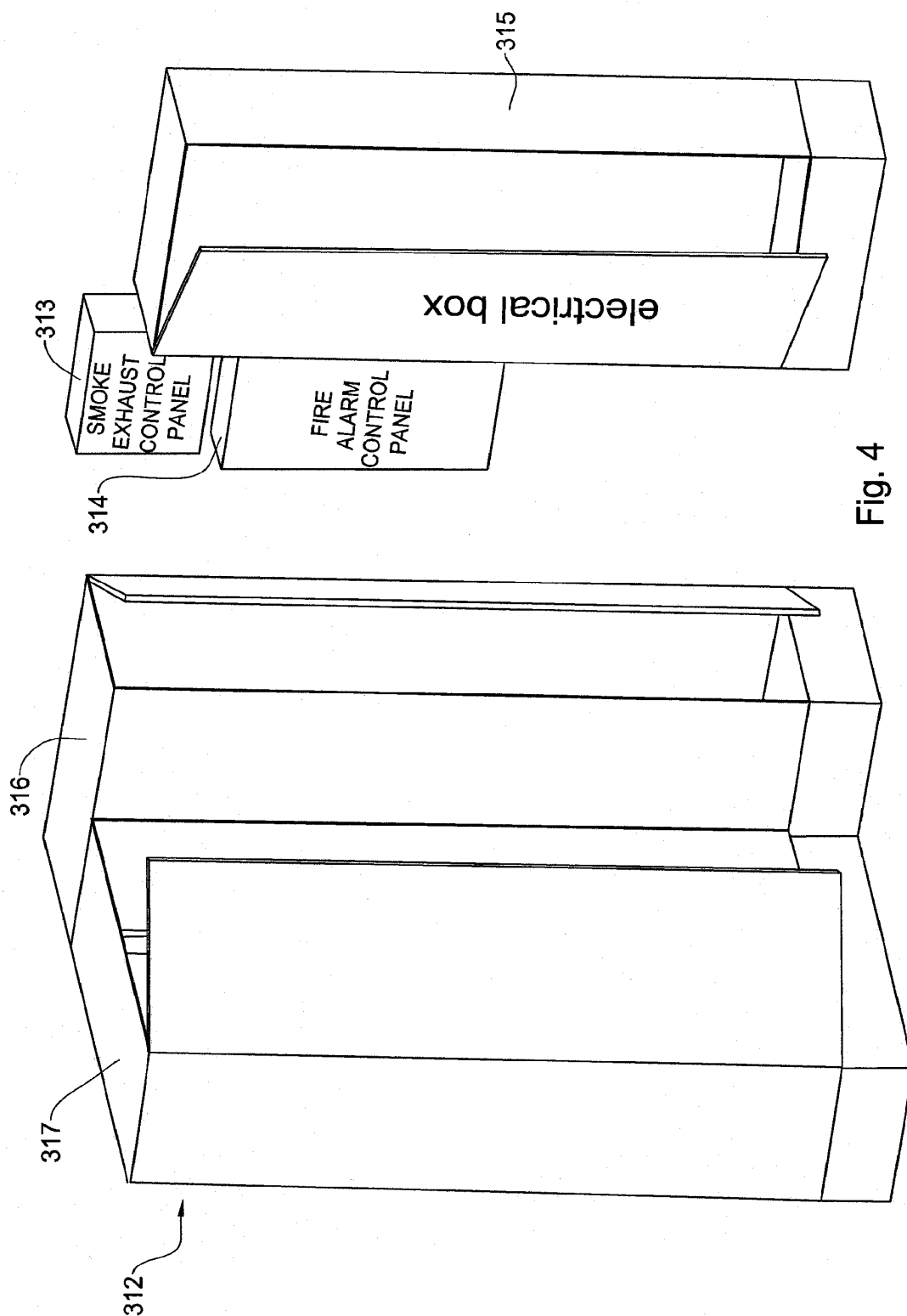


Fig. 3



SUBSTITUTE SHEET (RULE 26)

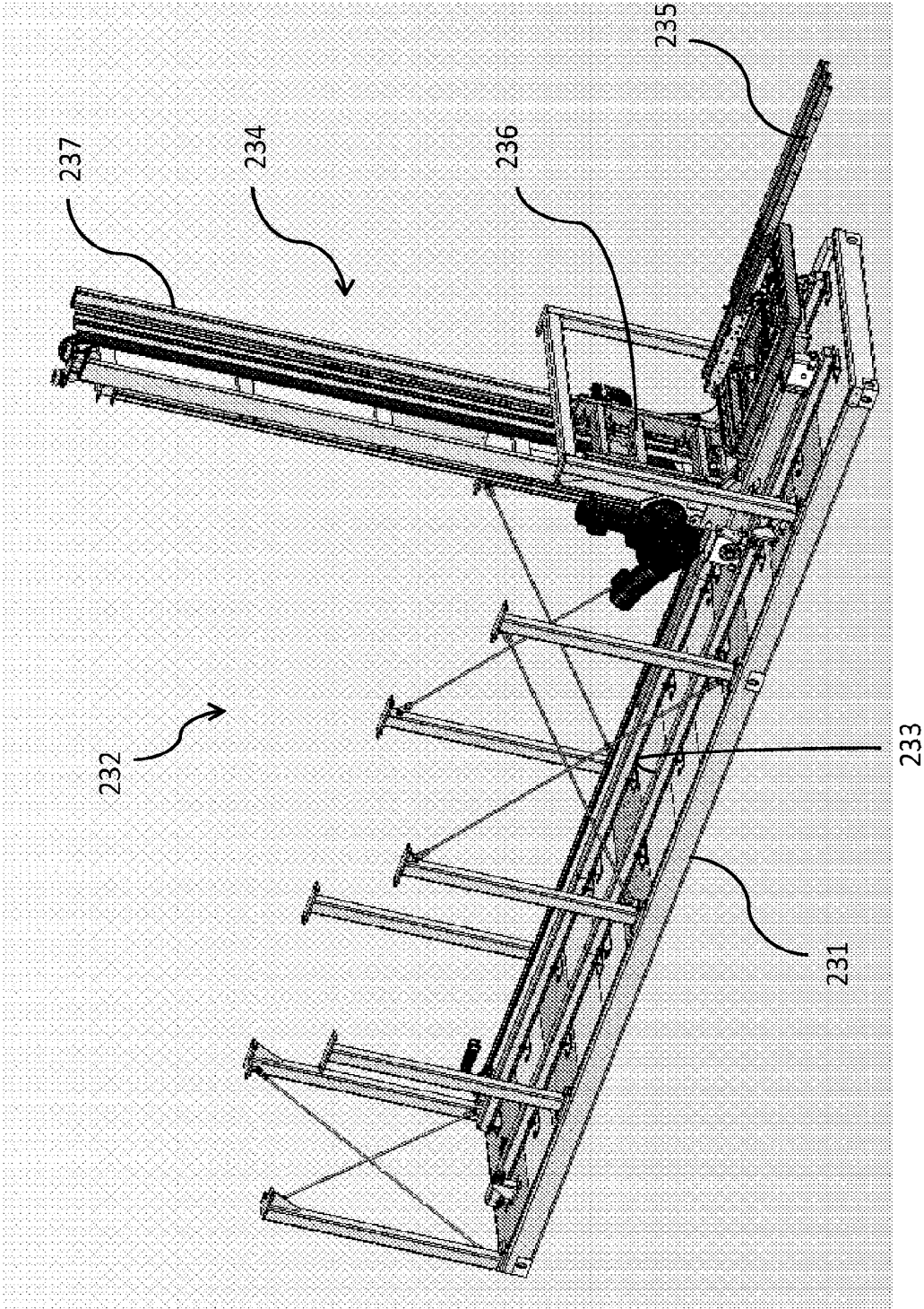
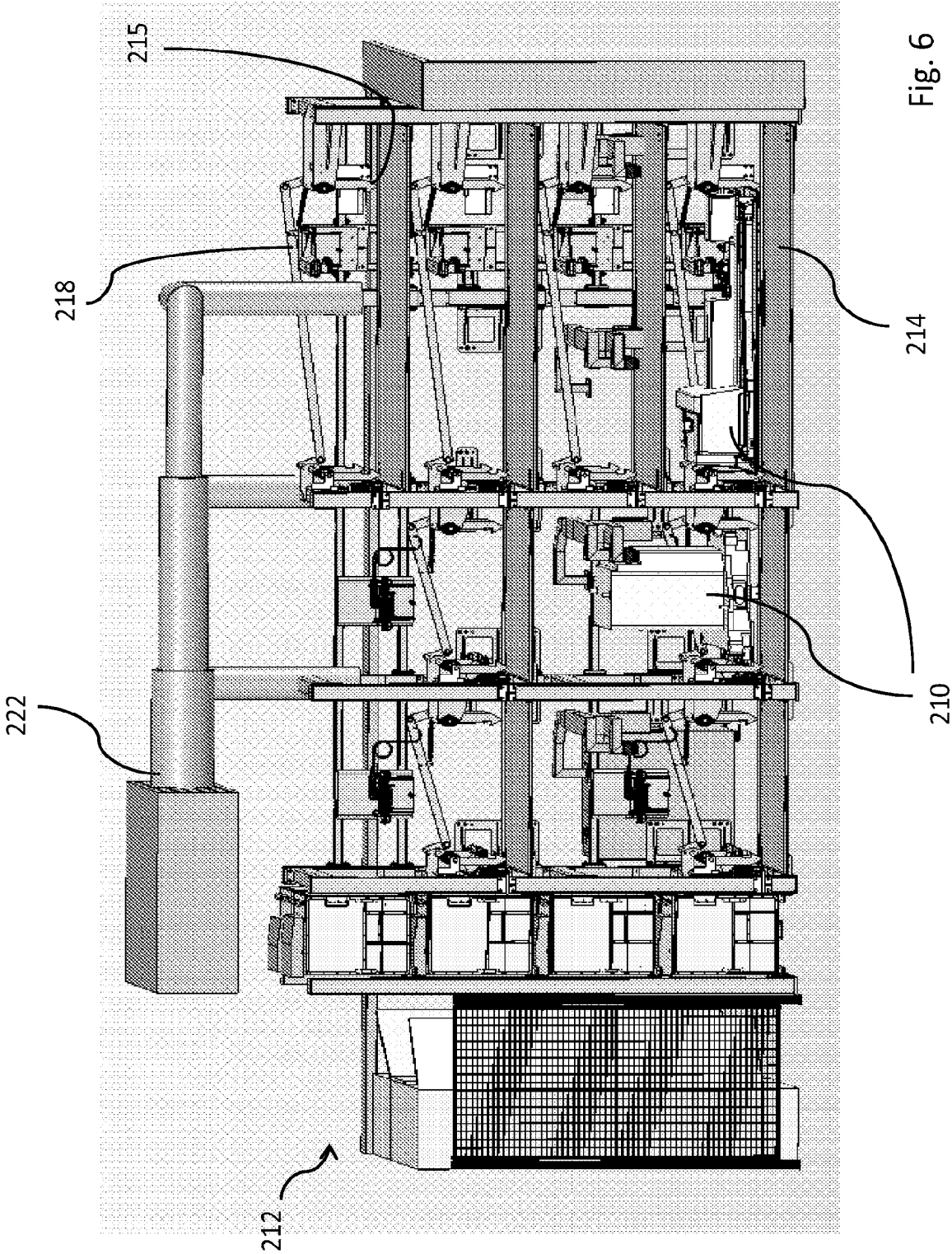


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2013/050270

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B65G 67/00 (2013.01)

USPC - 320/109

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) - B60K 1/00; B60L 1/00; B60S 5/00, 5/06; B65G 1/04, 67/00 (2013.01)

USPC - 174/541; 180/65.1, 68.5; 307/9.1; 320/109

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
CPC - B01L 2200/028; B60L 11/1822, 11/1827 (2013.01)

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Google Patents, Google Scholar, Patbase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2002/0129566 A1 (PICCOLO et al) 19 September 2002 (19.09.2002) entire document	1-17
Y	US 2011/0044791 A1 (AGASSI et al) 24 February 2011 (24.02.2011) entire document	1-17
A	US 2011/0209321 A1 (KILIBARDA et al) 01 September 2011 (01.09.2011) entire document	1-17
A	US 2010/0071979 A1 (HEICHAL et al) 25 March 2010 (25.03.2010) entire document	1-17

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

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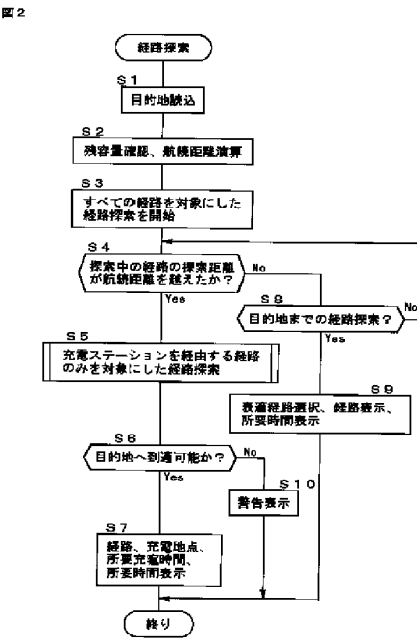
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(54) 【発明の名称】 電気自動車の経路探索装置

(57) 【要約】

【課題】 電気自動車の航続力を考慮して目的地までの最適な誘導経路を探索する。

【解決手段】 充電ステーションに関する情報を含んだ道路地図データに基づいて、車載バッテリーの補充電を考慮した目的地までの誘導経路を探索する。これにより、目的地が遠方にあっても電気自動車の航続力を考慮した誘導経路を探索でき、乗員自ら補充電を行ないながら目的地へ到達できるかどうかを調査する必要がなく、遠方の目的地へ向う場合に安心感を与えることができる。



【特許請求の範囲】

【請求項1】 充電ステーションに関する情報を含んだ道路地図データを記憶する道路地図データ記憶手段と、前記道路地図データに基づいて車載バッテリーの補充電を考慮した目的地までの誘導経路を探索する経路探索手段とを備えることを特徴とする電気自動車の経路探索装置。

【請求項2】 請求項1に記載の電気自動車の経路探索装置において、車載バッテリーの残容量を検出する残容量検出手段と、前記残容量検出値に基づいて航続距離を演算する航続距離演算手段とを備え、前記経路探索手段は、充電ステーションを経由しない経路を含むすべての経路を対象にして経路探索を開始し、目的地までの距離が前記航続距離演算値よりも小さい経路が探索されたら、それらの中から所要時間または所要経費が最小の経路を誘導経路に選択することを特徴とする電気自動車の経路探索装置。

【請求項3】 請求項2に記載の電気自動車の経路探索装置において、前記経路探索手段は、探索中のすべての経路の探索距離が前記航続距離演算値を超えたら、出発地から目的地までの充電ステーションを経由する経路を対象にして経路探索を行なうことを特徴とする電気自動車の経路探索装置。

【請求項4】 請求項3に記載の電気自動車の経路探索装置において、前記経路探索手段は、前記探索結果の経路の中から、出発地から最初の充電ステーションまでの距離が前記航続距離演算値以下で、且つ最初の充電ステーションから目的地までの各充電ステーション区間の距離が満充電の航続距離以下の経路を走行可能な経路として抽出することを特徴とする電気自動車の経路探索装置。

【請求項5】 請求項4に記載の電気自動車の経路探索装置において、前記走行可能な経路上の各充電ステーション区間における所要電力量を見積る所要電力量見積手段と、前記各充電ステーション区間の所要電力量見積値に基づいて、前記走行可能な経路上の充電ステーションの中から、出発地から目的地までの補充電回数が最小で且つ補充電ごとの充電量が均等になるように、実際に充電を行なう充電ステーションを選択して充電地点に決定する充電地点決定手段とを備えることを特徴とする電気自動車の経路探索装置。

【請求項6】 請求項5に記載の電気自動車の経路探索装置において、前記所要電力量見積手段は、道路勾配と道路の渋滞を考慮して所要電力量を見積ることを特徴とする電気自動車の経路探索装置。

【請求項7】 請求項5または請求項6に記載の電気自

動車の経路探索装置において、前記各充電ステーション区間の所要電力量見積値に基づいて前記充電地点間の所要電力量を演算する所要電力量演算手段と、前記各充電地点における充電量に、次の充電地点までの間の前記所要電力量演算値を設定する充電量設定手段とを備えることを特徴とする電気自動車の経路探索装置。

【請求項8】 請求項4～7のいずれかの項に記載の電気自動車の経路探索装置において、前記経路探索手段は、前記走行可能な経路の中から所要時間または所要経費が最小の経路を誘導経路に選択することを特徴とする電気自動車の経路探索装置。

【請求項9】 請求項8に記載の電気自動車の経路探索装置において、前記所要時間には車載バッテリーの充電時間が含まれ、前記所要経費には車載バッテリーの充電費用が含まれることを特徴とする電気自動車の経路探索装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は電気自動車の経路探索装置に関し、特に、電気自動車の航続力を考慮した探索方法を提供するものである。

【0002】

【従来の技術】内燃機関を走行駆動源とする自動車に用いられ、出発地から目的地までの誘導経路を探索する経路探索装置が知られており、すでに実用に供されている。

【0003】

【発明が解決しようとする課題】ところで、一般に、電気自動車は内燃機関を有する自動車に比べて航続距離が短いため、誘導経路上の充電ステーションから次の充電ステーションまでの距離が満充電時の航続距離よりも短いと目的地まで到達できないことになる。

【0004】しかしながら、従来の経路探索装置は、電気自動車に搭載することを前提にしていないので、電気自動車特有の航続距離、充電時間などについては考慮されていない。

【0005】本発明の目的は、電気自動車の航続力を考慮して目的地までの最適な誘導経路を探索する電気自動車の経路探索装置を提供することにある。

【0006】

【課題を解決するための手段】

(1) 請求項1の発明は、充電ステーションに関する情報を含んだ道路地図データを記憶する道路地図データ記憶手段と、充電ステーションに関する情報を含んだ道路地図データに基づいて、車載バッテリーの補充電を考慮した目的地までの誘導経路を探索する経路探索手段とを備える。

(2) 請求項2の電気自動車の経路探索装置は、車載バッテリーの残容量を検出する残容量検出手段と、残容

量検出値に基づいて航続距離を演算する航続距離演算手段とを備え、経路探索手段によって、充電ステーションを経由しない経路を含むすべての経路を対象にして経路探索を開始し、目的地までの距離が航続距離演算値よりも小さい経路が探索されたら、それらの中から所要時間または所要経費が最小の経路を誘導経路に選択するようにしたものである。

(3) 請求項3の電気自動車の経路探索装置は、経路探索手段によって、探索中のすべての経路の探索距離が航続距離演算値を超えたら、出発地から目的地までの充電ステーションを経由する経路を対象にして経路探索を行なうようにしたものである。

(4) 請求項4の電気自動車の経路探索装置は、経路探索手段によって、探索結果の経路の中から、出発地から最初の充電ステーションまでの距離が航続距離演算値以下で、且つ最初の充電ステーションから目的地までの各充電ステーション区間の距離が満充電の航続距離以下の経路を走行可能な経路として抽出するようにしたものである。

(5) 請求項5の電気自動車の経路探索装置は、走行可能な経路上の各充電ステーション区間における所要電力量を見積る所要電力量見積手段と、各充電ステーション区間の所要電力量見積値に基づいて、走行可能な経路上の充電ステーションの中から、出発地から目的地までの補充充電回数が最小で且つ補充電ごとの充電量が均等になるように、実際に充電を行なう充電ステーションを選択して充電地点に決定する充電地点決定手段とを備える。

(6) 請求項6の電気自動車の経路探索装置は、所要電力量見積手段によって、道路勾配と道路の渋滞を考慮して所要電力量を見積るようにしたものである。

(7) 請求項7の電気自動車の経路探索装置は、各充電ステーション区間の所要電力量見積値に基づいて充電地点間の所要電力量を演算する所要電力量演算手段と、各充電地点における充電量に、次の充電地点までの間の所要電力量演算値を設定する充電量設定手段とを備える。

(8) 請求項8の電気自動車の経路探索装置は、経路探索手段によって、走行可能な経路の中から所要時間または所要経費が最小の経路を誘導経路に選択するようにしたものである。

(9) 請求項9の電気自動車の経路探索装置は、所要時間には車載バッテリーの充電時間が含まれ、所要経費には車載バッテリーの充電費用が含まれる。

【0007】

【発明の効果】

(1) 請求項1の発明によれば、充電ステーションに関する情報を含んだ道路地図データに基づいて、車載バッテリーの補充電を考慮した目的地までの誘導経路を探索するようにしたので、目的地が遠方にあっても電気自

動車の航続力を考慮した誘導経路を探索でき、乗員自ら補充電を行ないながら目的地へ到達できるかどうかを調査する必要がなく、遠方の目的地へ向う場合に安心感を与えることができる。

(2) 請求項2の発明によれば、車載バッテリーの残容量検出値に基づいて航続距離を演算し、充電ステーションを経由しない経路を含むすべての経路を対象にして経路探索を開始し、目的地までの距離が航続距離演算値よりも小さい経路が探索されたら、それらの中から所要時間または所要経費が最小の経路を誘導経路に選択するようにしたので、充電ステーションを経由しない経路を含むすべての経路の中から、補充電をせずに目的地に到達できる最適な誘導経路を探索することができる。

(3) 請求項3の発明によれば、探索中のすべての経路の探索距離がバッテリー残容量の航続距離演算値を超えたら、出発地から目的地までの充電ステーションを経由する経路を対象にして経路探索を行なうようにしたので、探索距離が残容量の航続距離を超えるまでは充電ステーションを経由しない経路を含むすべての経路の中から最適な経路を探索できる上に、探索距離が残容量の航続距離を超えたら不必要な充電ステーションを経由しない経路の探索が省かれ、経路探索時間が短縮される。

(4) 請求項4の発明によれば、探索結果の経路の中から、出発地から最初の充電ステーションまでの距離がバッテリー残容量の航続距離演算値以下で、且つ最初の充電ステーションから目的地までの各充電ステーション区間の距離が満充電の航続距離以下の経路を走行可能な経路として抽出するようにしたので、電気自動車の航続力で目的地まで到達可能な経路を正確に探索することができる。

(5) 請求項5の発明によれば、走行可能な経路上の各充電ステーション区間における所要電力量を見積り、各充電ステーション区間の所要電力量見積値に基づいて、走行可能な経路上の充電ステーションの中から、出発地から目的地までの補充充電回数が最小で且つ補充電ごとの充電量が均等になるように、実際に充電を行なう充電ステーションを選択して充電地点に決定するようにしたので、バッテリーがほぼ空状態から補充電を開始でき、補充電ごとの充電時間を短縮することができる。

(6) 請求項6の発明によれば、道路勾配と道路の渋滞を考慮して所要電力量を見積るようにしたので、道路状況に応じた正確な所要電力を見積ることができる。

(7) 請求項7の発明によれば、各充電ステーション区間の所要電力量見積値に基づいて充電地点間の所要電力量を演算し、各充電地点における充電量に、次の充電地点までの間の所要電力量演算値を設定するようにしたので、次の充電地点ではほぼ空状態から補充電を開始でき、補充電ごとの充電時間を最小にすることができる。

(8) 請求項8の発明によれば、走行可能な経路の中から所要時間または所要経費が最小の経路を誘導経路に

選択するようにしたので、補充電を考慮した最適な誘導経路を選択することができる。

(9) 請求項9の発明によれば、所要時間に車載バッテリーの充電時間を含み、所要経費に車載バッテリーの充電費用を含むようにしたので、バッテリーの充電時間と充電費用を考慮した最適な誘導経路を選択することができる。

【0008】

【発明の実施の形態】図1は一実施の形態の構成を示すブロック図である。コントローラ1はマイクロコンピュータとその周辺部品から構成され、後述する制御プログラムを実行して目的地までの最適な誘導経路を探索し、道路地図上に現在地と誘導経路を表示して乗員を誘導する。コントローラ1には、方位センサ2、距離センサ3、GPS受信機4、記憶装置5、入力装置6、残量計7が接続される。方位センサ2は車両の進行方位を検出し、距離センサ3は車両の走行距離を検出する。GPS受信機4は衛星からのGPS信号を受信して車両の現在地、進行方位、走行速度などを検出する。また、記憶装置5は道路地図データを記憶するCD-ROMなどの装置である。この道路地図データには充電ステーションの位置など、充電ステーションに関する情報が含まれる。さらに、入力装置6は目的地などを設定する装置であり、残量計7は車載バッテリー（不図示）の残容量を検出する。なお、バッテリーの残容量の検出方法はすでに種々の方法が提案されているので、ここでは説明を省略する。コントローラ1にはまた、道路地図や文字情報を表示するディスプレイ8と、音声による誘導を行なうためのスピーカ9などが接続される。

【0009】この実施の形態では、充電ステーションから充電ステーションまでの経路において、距離はもちろんのこと、経路上の登坂、降坂、渋滞なども考慮して所要電力量を見積るとともに、走行時間と充電時間を計算し、目的地までの所要時間や所要経費が最小の誘導経路を探索する。なお、目的地までの所要時間には経路の実際の走行時間の他に充電ステーションでの充電時間などが含まれ、目的地までの所要経費には充電料金と有料道路料金などが含まれる。また、この明細書では、経路上の充電ステーションの内、実際に補充電を行なう充電ステーションの位置を充電地点と呼ぶ。

【0010】一般に、バッテリーは、満充電状態に近いほど時間当たりの充電量（充電可能電力量）が小さく、空状態に近いほど時間当たりの充電量が多い。したがって、充電時間を最小にするためには、こまめに充電ステーションに立寄って充電するよりも、できる限りバッテリーが空状態に近くなるまで走行して充電する方がよい。そこでこの実施の形態では、補充電の間隔をできる限り長くして目的地までの補充電回数を減らし、各充電地点における補充電量を均等にするように、経路上の充電ステーションの中から実際に充電に立寄る充電ステ-

ションを選択して充電地点に決定する。

【0011】図2は経路探索処理を示すフローチャートである。このフローチャートにより、一実施の形態の動作を説明する。コントローラ1は、入力装置6により目的地が設定され、経路探索の指示操作が行なわれるとこの処理を実行する。まずステップ1で入力装置6により設定された目的地を読み込み、続くステップ2で残量計7によりバッテリーの残容量を確認するとともに、残容量で走行可能な航続距離を演算する。

【0012】ステップ3において、充電ステーションを経由しない経路を含むすべての経路を探索対象にして出発地から目的地までの経路探索を行なう。一般に電気自動車は内燃機関の自動車に比べて航続力が劣るので、目的地までの走行距離が長い場合は充電ステーションのある経路を走行する必要がある。しかし、目的地までの距離が短く、現在の残容量で到達可能な場合には、充電ステーションがない経路を走行してもなんら問題はない。そこで、まず現在の残容量で目的地まで到達可能かどうかを調査するために、充電ステーションを経由しない経路を含むすべての経路を探索対象にして目的地までの経路探索を開始する。なお、目的地までの経路探索方法は例えばダイクストラ法などを用いることができ、これらはすでに周知であるから説明を省略する。

【0013】ステップ4で、充電ステーションを経由しない経路を含むすべての経路を対象にした経路探索中に、すべての探索途中の経路における探索距離、すなわち出発地から探索ノード（交差点や道路の屈曲点など）までの距離が残容量の航続距離を超えたか否かを確認する。すべての探索途中の経路の探索距離が残容量の航続距離を超えた場合には、これ以上すべての経路を対象にした経路探索を行なっても無駄であるからステップ5へ進み、充電ステーションを経由する経路のみを探索対象にした経路探索を行なう。続くステップ6において、補充電を行ないながら目的地へ到達できる経路が探索されたか否かを確認し、誘導経路が探索されたらステップ7へ進み、道路地図上に車両の現在地、探索した誘導経路、充電地点と充電時間、目的地までの所要時間などを表示する。しかし、経路上の充電ステーションと充電ステーションとの間の距離が満充電の航続距離を超えるなど、目的地まで走行可能な誘導経路が探索できなかった場合にはステップ10へ進み、ディスプレイ8に目的地まで到達不能である旨の警告表示を行なう。

【0014】このように、探索中のすべての経路の探索距離がバッテリー残容量の航続距離演算値を超えたら、出発地から目的地までの充電ステーションを経由する経路を対象にして経路探索を行なうようにしたので、探索距離が残容量の航続距離を超えるまでは充電ステーションを経由しない経路を含むすべての経路の中から最適な経路を探索できる上に、探索距離が残容量の航続距離を超えたら不必要な充電ステーションを経由しない経路の

探索が省かれ、経路探索時間が短縮される。

【0015】一方、探索距離が航続距離以下であればステップ8へ進み、補充電をせずに目的地まで到達できる経路が探索されたか否かを確認する。補充電をせずに目的地へ到達できる経路が探索された場合はステップ9へ進み、探索経路の中から所要時間または所要経費が最小の経路を目的地までの誘導経路に選択し、道路地図上に誘導経路を表示するとともに、目的地までの所要時間を表示する。ここで、補充電をしない場合の目的地までの所要時間は経路の所要走行時間のみであり、例えば経路を法定速度で走行した場合の走行時間や、あるいは法定速度にVICS (Vehicle Information and Communication System) から得られた渋滞情報や交通規制情報などを考慮して求めた走行時間とする。ステップ8で目的地までの経路が探索されていない場合はステップ4へ戻り、充電ステーションを経由しない経路を含むすべての経路を対象にした経路探索を続ける。

【0016】このように、車載バッテリーの残容量検出値に基づいて航続距離を演算し、充電ステーションを経由しない経路を含むすべての経路を対象にして経路探索を開始し、目的地までの距離が航続距離演算値よりも小さい経路が探索されたら、それらの中から所要時間または所要経費が最小の経路を誘導経路に選択するようにしたので、充電ステーションを経由しない経路を含むすべての経路の中から、補充電をせずに目的地に到達できる最適な誘導経路を探索することができる。

【0017】図3は、図2のステップ5で実行される充電ステーションを経由する経路の探索処理を示すフローチャートである。ステップ21で充電ステーションを経由する経路を探索する。記憶装置5に記憶されている道路地図データには充電ステーションに関する情報が含まれており、充電ステーションの位置情報により充電ステーションを経由する経路を探索する。なお、この時点では充電ステーションを経由しない経路を含むすべての経路を対象にした経路探索が途中まで行なわれているので、探索途中の経路の中から経路上に充電ステーションがある経路だけを抽出し、それらの経路の探索を続行すればよい。

【0018】図4は出発地から目的地までの充電ステーションを経由する経路の例を示す。なお、図中の○印は充電ステーションの位置を示す。この実施の形態では、充電ステーションを経由する目的地までの各経路を順に番号 i ($=1, 2, \dots$) で表わし、各経路上の各充電ステーションを順に番号 j ($=1, 2, \dots$) で表わす。そして、経路 i 上の番号 j の充電ステーションを S_{ij} と表わす。図4の例では、経路1上には充電ステーション S_{11} 、 S_{12} 、 S_{13} があり、経路2上には充電ステーション S_{21} と S_{22} がある。また、経路3上には充電ステーション S_{31} 、 S_{32} 、 S_{33} がある。なお、充電ステーションの中には複数の経路で重複

するものがある。また、図4に示す例では充電ステーション S_{13} 、 S_{22} が道路の交差点にあり、その他の充電ステーションは交差点にない。

【0019】ステップ22で経路番号 i に1を設定し、続くステップ23で充電ステーション番号 j に1を設定して、充電ステーションを経由する探索結果の各経路について走行可能かどうかを確認する。まず、ステップ24で出発地から経路 i 上の最寄の充電ステーション S_{i1} までの所要電力量を見積る。所要電力量の見積方法は後述する。ステップ25で、バッテリーの現在の残容量で最寄の充電ステーション S_{i1} まで走行可能かどうかを確認する。最寄の充電ステーション S_{i1} までの距離が現在の残容量の航続距離を超えている場合は、この経路 i を走行することができないから、これ以上経路 i の探索を続けても無駄であり、ステップ29へ進む。ステップ29では全経路の調査を終了したかどうかを確認し、未調査の経路があればステップ30へ進んで経路番号 i をインクリメントし、ステップ22へ戻って次の経路($i+1$)を調査する。

【0020】なお、例えば、出発地が充電装置を設置した自宅もしくは充電ステーションであって、必ず満充電状態で出発することを前提とする場合には、ステップ23～25の処理は不要である。したがって、ステップ22の処理の後で、例えばバッテリーの開放端子電圧を検出して満充電状態か否かを判定し、満充電状態であればステップ23～25の処理を省略してステップ26へ進み、満充電状態でなければステップ23～25の処理を行なうようにしてもよい。

【0021】ステップ26で、出発地から最初の充電ステーション S_{i1} までの区間を除く、経路 i 上の他のすべての充電ステーション区間は満充電で走行可能か、つまり全充電ステーション区間の距離は満充電の航続距離以下であるかどうかを確認する。経路 i 上のいずれかの充電ステーション区間が満充電で走行できなければ、その経路 i は走行不能としてステップ29へ進む。一方、最初の充電ステーション区間を除く経路 i 上の他のすべての充電ステーション区間が満充電で走行できる場合は、その経路 i は走行可能な経路であり、ステップ27へ進む。

【0022】このように、探索結果の経路の中から、出発地から最初の充電ステーションまでの距離がバッテリー残容量の航続距離演算値以下で、且つ最初の充電ステーションから目的地までの各充電ステーション区間の距離が満充電の航続距離以下の経路を走行可能な経路として抽出するようにしたので、電気自動車の航続力で目的地まで到達可能な経路を正確に探索することができる。

【0023】ステップ27において、経路 i 上の各充電ステーション区間の所要電力量を見積る。例えば図4に示す経路1では、出発地～ S_{11} 、 S_{11} ～ S_{12} 、 S_{12} ～ S_{13} 、 S_{13} ～目的地の各区間の所要電力量を

見積る。また、経路2、3についても同様に見積る。この所要電力量の見積方法は後述する。

【0024】ステップ28で、経路*i*上の充電ステーション*S_{i1}*、*S_{i2}*、・・・の中から実際に充電するステーションを選択し、充電地点を決定する。ここで、ある充電地点における充電量は次の充電地点までの所要電力量であり、充電地点間の所要電力量はその区間に含まれる充電ステーション区間の所要電力量を合算したものである。上述したように充電ステーションの選択に際しては、出発地から目的地までの充電ステーションの中から、補充電間隔をできる限り長くして補充電回数を減らし、各充電地点における補充電量が均等になるように選択する。

【0025】このように、走行可能な経路上の各充電ステーション区間における所要電力量を見積り、各充電ステーション区間の所要電力量見積値に基づいて、走行可能な経路上の充電ステーションの中から、出発地から目的地までの補充電回数が最小で且つ補充電ごとの充電量が均等になるように、実際に充電を行なう充電ステーションを選択して充電地点に決定するようにしたので、バッテリーがほぼ空状態から補充電を開始でき、補充電ごとの充電時間を短縮することができる。

【0026】全経路*i*の調査が終了したらステップ31へ進み、目的地まで到達可能な経路ごとの充電時間と充電料金を見積り、続くステップ32で経路ごとの所要時間を演算する。充電時間の見積については後述する。なお、経路ごとの充電時間および充電料金の見積と所要時間の演算は各経路の探索中に行なってもよいが、経路ごとの探索処理が終了して目的地まで到達可能か否かがはっきりしてから行なった方が合理的であり、目的地まで到達不可能な経路に対する無駄な処理を省くことができる。ステップ33で、目的地まで到達可能な探索経路の中から、所要時間が最小の経路、または所要経費が最小の経路を最適な誘導経路として選択する。

【0027】ここで、ある区間における所要電力量の見積方法を説明する。図5に示すように、ある経路上のある充電ステーション*S_{ij}*から次の充電ステーション*S_{i(j+1)}*までの区間において、地点*X*の充電ステーション*S_{ij}*からの距離を*x*とする。また、地点*X*における推定車速を*v* [km/h]とする。車速*v*は、法定速度に*VICS*などの交通情報を考慮して推定してもよいし、市街地走行、郊外の一般道走行あるいは高速道走行かの走行道路種別に応じた10-15モードやHWYモードなどの走行モードを適用して推定してもよい。

【0028】地点*X*を走行している時の電力消費率*N* [Wh/km]は、次式で表わされる。

【数1】*N* (力行時) = *K* / (*e_g* · *e_m*) + *W* / *v*,
N (回生時) = *K* · *e_g* · *e_m* + *W* / *v*

数式1の*K*は次式で表わされる。

【数2】

数2

$$K = [(Wt + Wi) \cdot \frac{1}{3.6} \cdot \frac{dv}{dt} + g \cdot Wt \cdot \sin\{\tan^{-1}(\frac{\theta}{100})\} + g \cdot Wt \cdot \mu + \frac{1}{2} \cdot \rho \cdot Cd \cdot A \cdot (\frac{v}{3.6})^2] \times \frac{1}{3.6}$$

数式1および数式2において、*θ*は地点*X*における道路勾配 [%]である。また、*Wt*は車両重量 [kg]、*Wi*は回転慣性相当重量 [kg]、*μ*は転がり抵抗係数、*Cd*は空気抵抗係数、*A*は前面投影面積 [m²]、*c_g*はギア効率 [%/100]、*e_m*はモーター効率 [%/100]であり、これらは車両に固有の値である。なお、*e_g*と*e_m*は車速とトルクによって定まる。さらに、*g*は重力加速度 [m/sec²]、*ρ*は空気密度 [kg/m³]である。*W*は空調装置やラジオなどの補機負荷 [W]である。

【0029】充電ステーション*S_{ij}*から次の充電ステーション*S_{i(j+1)}*までの所要電力量*E* [Wh]は、数式1で表わされる電力消費率*N* [Wh/km]を充電ステーション間の距離*x_o* [km]で積分すればよいから、

【数3】

数3

$$E = \int_0^{x_0} N dx$$

となる。

【0030】このように、道路勾配と道路の渋滞を考慮して所要電力量を見積るようにしたので、道路状況に応じた正確な所要電力を見積ることができる。

【0031】次に、充電時間の見積方法を説明する。各充電ステーション区間の所要電力量見積値に基づいて充電地点間の所要電力量*E* [Wh]を演算し、各充電地点における充電量に、次の充電地点までの間の所要電力量演算値*E* [Wh]を設定する。つまり、各充電地点における充電量を*E* [Wh]とする。これにより、次の充電地点ではほぼ空状態から補充電を開始でき、補充電ごとの充電時間を最小にすることができる。バッテリーの内部抵抗*r* [Ω]と開放電圧*V_o* [V]は、充電量*E*の関数として実験的に求めた整式の近似式で表わすことができる。

【数4】*r* = *r* (*E*) = *r_e* + *k₁**E* + *k₂**E*² + *k₃**E*³ + ...
V_o = *V_o* (*E*) = *V_e* + *h₁**E* + *h₂**E*² + *h₃**E*³ + ...

ここで、*r_e*と*V_e*は完全放電時の内部抵抗と開放電圧である。

【0032】図6はバッテリーの充電可能電力特性を示す図である。バッテリーの上限電圧を V_t とすると、充電可能電力 P は、

【数5】

$$P(E) = V_t \{ V_t - V_o(E) \} / r(E), \\ V_t = V_o(E_t)$$

と表わすことができる。バッテリーの上限電圧 V_t によって決まる充電受入可能電力で充電することにより、最小時間で充電することができる。したがって、図6に示す E から E' まで充電する場合の時間 t [h]は次式により求められる。

【数6】

数6

$$t = \int_E^{E'} \frac{1}{p(E)} dE$$

このように、バッテリーの内部抵抗、開放電圧および上限電圧のデータに基づいて充電時間を見積ることができる。

【0033】以上説明したように、充電ステーションに関する情報を含んだ道路地図データに基づいて、車載バッテリーの補充電を考慮した目的地までの誘導経路を探索するようにしたので、目的地が遠方であっても電気自動車の航続力を考慮した誘導経路を探索でき、乗員自ら補充電を行ないながら目的地へ到達できるかどうかを調査する必要がなく、遠方の目的地へ向う場合に安心感を与えることができる。また、目的地までの所要時間に車載バッテリーの充電時間を含み、所要経費に車載バッテリーの充電費用を含むようにしたので、バッテリーの充

電時間と充電費用を考慮した最適な誘導経路を選択することができる。

【0034】以上の一実施形態の構成において、記憶装置5が道路地図データ記憶手段を、コントローラ1が経路探索手段、航続距離演算手段、所要電力量見積手段、充電地点決定手段、所要電力量演算手段および充電量設定手段を、残量計7が残容量検出手段をそれぞれ構成する。

【図面の簡単な説明】

【図1】 一実施の形態の構成を示す図である。

【図2】 一実施の形態の経路探索処理を示すフローチャートである。

【図3】 一実施の形態の充電ステーションを経由する経路の探索処理を示すフローチャートである。

【図4】 出発地から目的地までの充電ステーションを経由する経路の一例を示す図である。

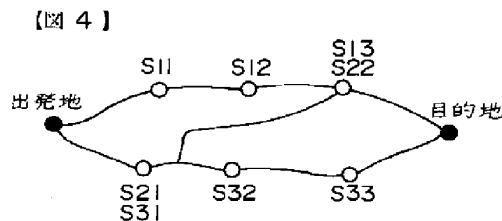
【図5】 ある充電ステーション区間における所要電力量の見積方法を説明する図である。

【図6】 バッテリーの充電可能電力特性を示す図である。

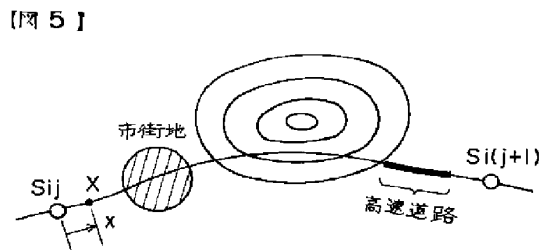
【符号の説明】

- 1 コントローラ
- 2 方位センサー
- 3 距離センサー
- 4 GPS受信機
- 5 記憶装置
- 6 入力装置
- 7 残量計
- 8 ディスプレイ
- 9 スピーカー

【図4】

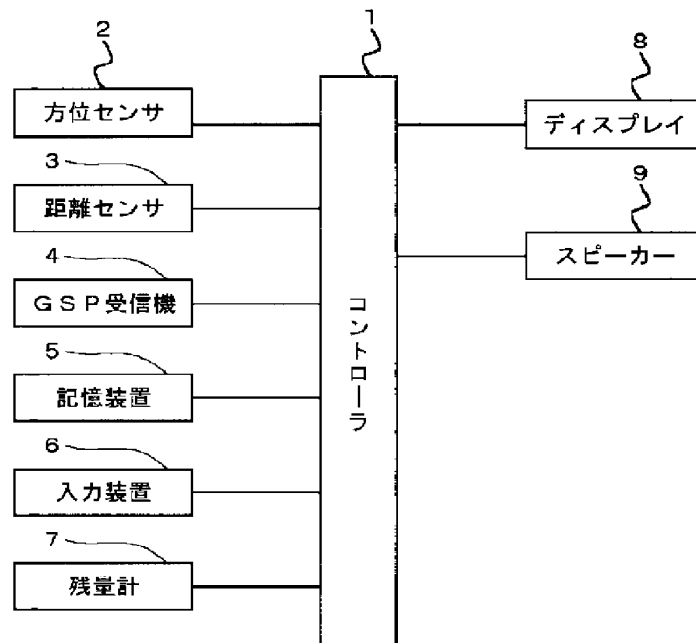


【図5】



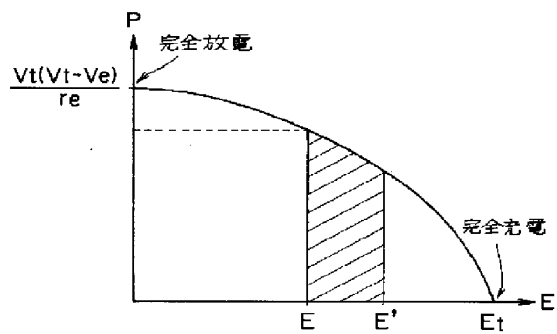
【図1】

J 9 6 0 9 6
図 1



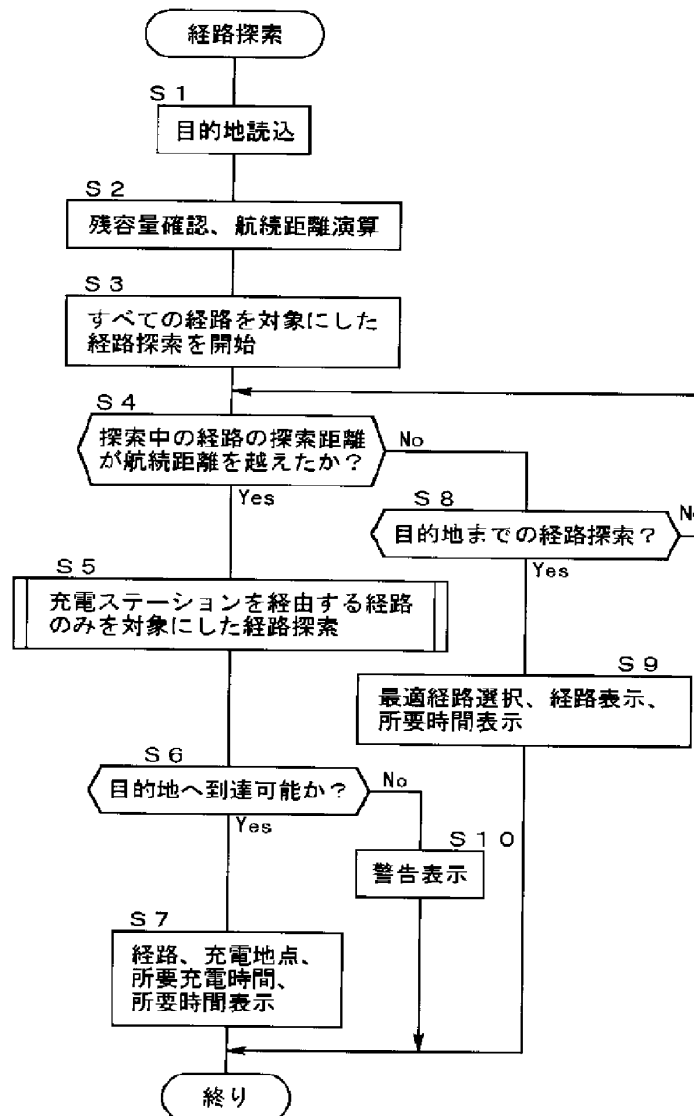
【図6】

【図 6】



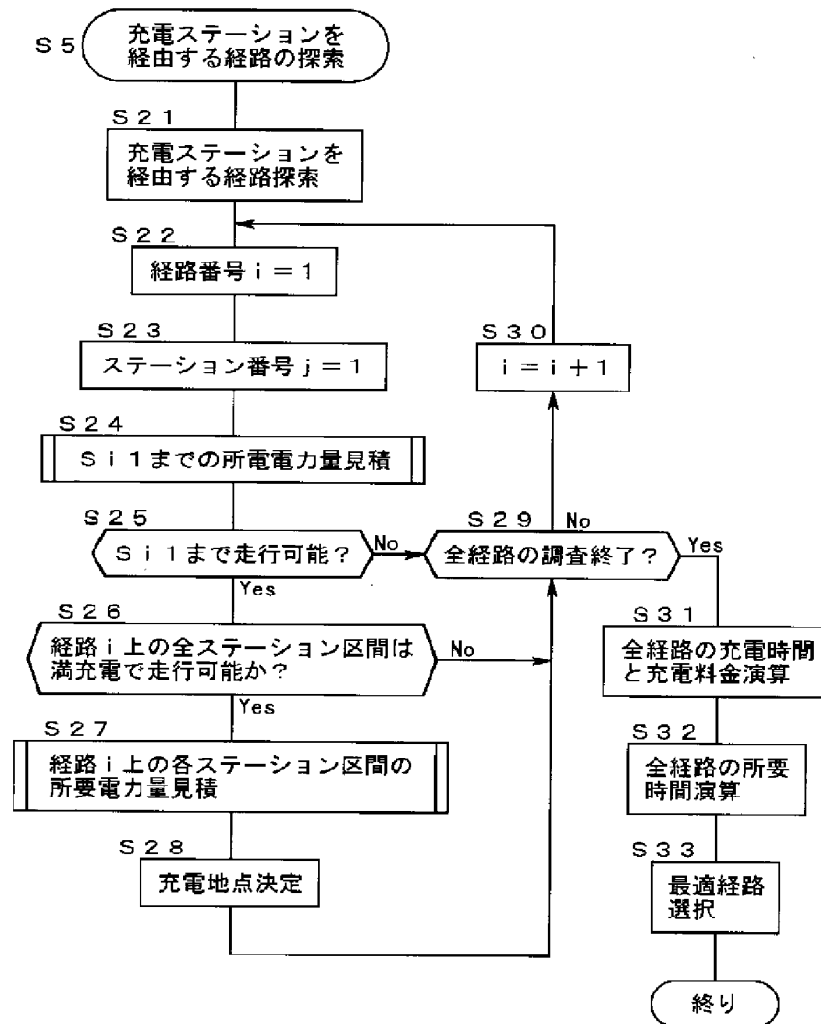
【図2】

図2



【図3】

図3



Thomson Innovation Patent Export, 2013-05-09 18:30:28 -0500

Record 13/25 JP7031008A POWER SUPPLY CONTROLLER FOR ELECTRIC AUTOMOBILE

Publication Number: JP7031008A

Publication Date: 1995-01-31

Title: POWER SUPPLY CONTROLLER FOR ELECTRIC AUTOMOBILE

Application Number: JP1993191912A

Application Date: 1993-07-06

Abstract (English):

PURPOSE: To allow final running over a total target running distance determined by the full charge capacity of battery regardless of the running conditions of electric vehicle.

CONSTITUTION: The power supply controller for electric automobile comprises a first electric facility E1 essential to running and a second electric facility E2 not essential to running. A detector M1 detects the residual power of a battery B, a detector M2 detects the total distance being run actually by the electric automobile after the battery is fully charged, and a detector M3 operates a residual running distance (=a target running distance-the actual total running distance) A unit M4 estimates power consumed by a running motor DM and the first and second electric facilities before the automobile runs through the residual running distance. When the estimated power consumption is higher than the residual power, a unit M5 inhibits power supply to the second electric facility.

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Abstract - DWPI:

Abstract - DWPI Novelty: The power supply control device has a battery (18) which supplies power to the motor (10) of an electric vehicle. A detector checks the power capacity of the battery when power drops to a predetermined value. The run distance detector checks the distance covered by the vehicle from the time that the battery is fully charged up to the time that it starts to be totally discharged. When the presumed power consumption is higher than the stored power of the battery, the power supply is terminated by a power supply prohibitor. The power supply control device aims to direct a motor into a specified running direction that can be reached before the battery is totally discharged.

Abstract - DWPI Advantage: ADVANTAGE

Allows driver to judge whether vehicle can reach its destination based on charge level of battery.



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 (22) 出願日 平成5年(1993)7月6日

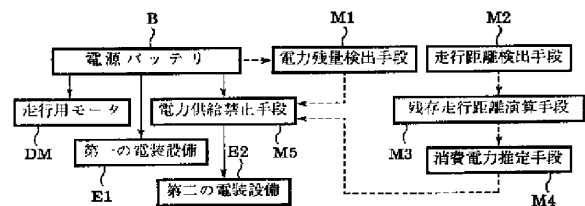
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(54) 【発明の名称】 電気自動車の電力供給制御装置

(57) 【要約】

【目的】 自動車が如何なる状態にて走行しても最終的には必ずバッテリーのフル充電により定まる目標総走行距離の走行を可能にする。

【構成】 走行上必須の第一の電装設備 E 1 及び走行上必須ではない第二の電装設備 E 2 を有する電気自動車の電力供給制御装置。電力残量検出装置 M 1 によりバッテリー B の電力残量を検出し、走行距離検出装置 M 2 によりバッテリーがフル充電された時点よりの実総走行距離を検出し、残存走行距離演算装置 M 3 により残存走行距離 (= 目標総走行距離 - 実総走行距離) を演算する。そして消費電力推定装置 M 4 により残存走行距離走行する間に走行用モータ DM、第一及び第二の電装設備により消費される電力を推定し、推定消費電力が電力残量よりも高いときには電力供給禁止装置 M 5 により第二の電装設備への電力供給を禁止する。



【特許請求の範囲】

【請求項 1】 走行用モータと、走行上必須の第一の電装設備と、走行上必須ではない第二の電装設備と、これらに電力を供給する電源バッテリーとを有する電気自動車の電力供給制御装置にして、前記バッテリーの電力残量を検出する電力残量検出手段と、前記バッテリーがフル充電された時点よりの実総走行距離を検出する走行距離検出手段と、前記バッテリーのフル充電により定まる目標総走行距離より前記実総走行距離を減算することにより残存走行距離を演算する残存走行距離演算手段と、前記電気自動車が前記残存走行距離走行する間に前記走行用モータ、前記第一及び第二の電装設備により消費される電力を推定する消費電力推定手段と、推定される消費電力が前記電力残量よりも高いときには前記バッテリーより前記第二の電装設備への電力の供給を禁止する電力供給禁止手段とを有することを特徴とする電気自動車の電力供給制御装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、走行用モータ及び種々の電装設備を有する電気自動車に係り、更に詳細には電気自動車の電力供給制御装置に係る。

【0002】

【従来の技術】 電気自動車の一つとして、例えば特開昭 64-12802 号公報に記載されている如く、電源バッテリーと、バッテリーより電力が供給される走行用モータと、バッテリーの電力残量が所定の許容値に低下したことを検出する電力残量低下検出手段と、自動車の行先を指定する行先指定手段とを有し、電力残量低下検出手段よりの信号に基づき自動車の行先を行先指定手段により指示された行先へ変更するよう構成された電気自動車が従来より知られている。

【0003】 かかる電気自動車によれば、バッテリーの電力残量が所定の許容値に低下するとそのことが電力残量低下検出手段により検出され、自動車の行先が行先指定手段により指示された行先へ変更されるので、バッテリーの電力消耗により自動車が走行途中に於て走行不能になることを確実に防止することができる。

【0004】

【発明が解決しようとする課題】 しかし上述の如き従来の電気自動車に於ては、バッテリーの電力残量が所定の許容値に低下すると、自動車の行先が自動車の乗員の意志に拘らず行先指定手段により指示された行先へ変更されてしまうので、乗員が行きたい目的地へ到達することができない事態が生じるという問題がある。

【0005】 本発明は、上述の如き従来の電気自動車に於ける叙上の如き問題に鑑み、自動車が如何なる状態にて走行しても最終的には必ずバッテリーのフル充電により定まる目標総走行距離の走行が可能であり、これにより乗員が目標総走行距離と実総走行距離との差、即ち残存

走行距離より行きたい目的地へ到達し得るか否かを正確に判定することができるよう改良された電気自動車を提供することを目的としている。

【0006】

【課題を解決するための手段】 上述の如き目的は、本発明によれば、図 1 に示されている如く、走行用モータ D と、走行上必須の第一の電装設備 E 1 と、走行上必須ではない第二の電装設備 E 2 と、これらに電力を供給する電源バッテリー B とを有する電気自動車の電力供給制御装置にして、前記バッテリーの電力残量を検出する電力残量検出手段 M 1 と、前記バッテリーがフル充電された時点よりの実総走行距離を検出する走行距離検出手段 M 2 と、前記バッテリーのフル充電により定まる目標総走行距離より前記実総走行距離を減算することにより残存走行距離を演算する残存走行距離演算手段 M 3 と、前記電気自動車が前記残存走行距離走行する間に前記走行用モータ、前記第一及び第二の電装設備により消費される電力を推定する消費電力推定手段 M 4 と、推定される消費電力が前記電力残量よりも高いときには前記バッテリーより前記第二の電装設備への電力の供給を禁止する電力供給禁止手段 M 5 とを有することを特徴とする電気自動車の電力供給制御装置によって達成される。

【0007】

【作用】 上述の如き構成によれば、電力残量検出手段 M 1 によりバッテリーの電力残量が検出され、走行距離検出手段 M 2 によりバッテリーがフル充電された時点よりの実総走行距離が検出され、残存走行距離演算手段 M 3 によってバッテリーのフル充電により定まる目標総走行距離より実総走行距離が減算されることにより残存走行距離が演算される。そして消費電力推定手段 M 4 により電気自動車が残存走行距離走行する間に走行用モータ、第一及び第二の電装設備により消費される電力が推定され、推定される消費電力が電力残量よりも高いときには電力供給禁止手段 M 5 によってバッテリーより第二の電装設備への電力の供給が禁止される。

【0008】 従って推定される消費電力が電力残量以下であるときには第二の電装設備への電力の供給が許容されることにより第二の電装設備は使用可能な状態に維持されるが、推定される消費電力が電力残量よりも高いときには第二の電装設備への電力の供給が禁止されることによりこれらの設備により電力が消費されることが阻止され、これにより最終的な実総走行距離が少なくとも目標総走行距離になることが確保される。

【0009】

【課題を解決するための手段の補足説明】 本発明に於ける「走行上必須の第一の電装設備」とは、例えばクラクション、ブレーキランプ、方向指示器、ヘッドライト、車幅灯、ワイパーの如く昼夜及び天候を問わず電気自動車が安全に走行するために必要な電装設備を意味し、また「走行上必須ではない第二の電装設備」とは、カーオ

オーディオ、カーエアコン、カーテレビの如く快適な走行に必要であるが作動させなくても電気自動車の走行は可能である快適走行用の電装設備や、電動式パワーステアリング装置、パワーウィンド、パワーシート等の如く運転者や乗員の負担を軽減するために必要であるが人力によっても駆動し得る代替可能な電装設備を意味する。

【0010】

【実施例】以下に添付の図を参照しつつ、本発明を実施例について詳細に説明する。

【0011】図2は電動式パワーステアリング装置を備えた電気自動車に適用された本発明による電力供給制御装置の一つの実施例を示す概略構成図、図3は図2に示された走行用電子制御装置を示すブロック線図である。

【0012】図2に於て、10は走行用モータ（DM）を示しており、モータ10は差動装置12及び左右のアクスル14、16を介して図2には示されていない左右の駆動輪を回転駆動するようになっている。モータ10は電源バッテリー18より走行用電子制御装置20の駆動回路22を経て供給される駆動電流によって回転駆動されるようになっており、駆動電流は図2には示されていないアクセルペダルの踏み込み量を検出する踏み込み量検出センサ24よりの信号に基づき電子制御装置20のマイクロコンピュータ26によりアクセルペダルの踏み込み量に応じて制御されるようになっている。

【0013】図示の実施例の電気自動車は電動式パワーステアリング装置28を有し、パワーステアリング装置は補助操舵用モータ（PM）30を有している。モータ30はバッテリー18より補助操舵用電子制御装置32の駆動回路34を経て供給される駆動電流によって回転駆動されるようになっており、駆動電流は電子制御装置32のマイクロコンピュータ36により少なくともトルクセンサ38により検出される操舵トルクに応じて制御されるようになっている。モータ30の回転は電磁クラッチ40を経て図には示されていない操舵装置へ伝達され、これにより補助操舵が行われるようになっている。電磁クラッチ40は制御装置32よりの制御信号により係合及び解放の切換えが行われ、これによりパワーステアリング装置28は必要に応じ電磁クラッチの解放によりマニュアルステアリング装置に切換えられるようになっている。

【0014】また図示の実施例に於ては、走行上必須の電装設備として上述の走行用モータ10に加えて、クラクション42、ヘッドライト、ブレーキランプ、車幅灯、方向指示器等の照明装置44及びワイパー46が設けられており、これらの電装設備にはバッテリー18より図には示されていない対応するスイッチを経てそれらを作動させるための電力が乗員によるスイッチの操作に応じて供給されるようになっている。

【0015】更に図示の実施例に於ては、走行上必須ではない電装設備として上述のパワーステアリング装置2

8に加えて、カーエアコン48、カーオーディオ50、パワーウィンド52が設けられており、これらの電装設備にはバッテリー18よりそれぞれノーマルクローズ型のリレー54、56、58及び図には示されていない対応するスイッチを経てそれらを作動させるための電力がスイッチの操作に応じて供給されるようになっている。尚ウィンドガラスはパワーウィンド52によらず手動によっても開閉し得るようになっている。

【0016】図3に詳細に示されている如く、走行用電子制御装置20のマイクロコンピュータ26は中央処理ユニット（CPU）70と、リードオンリメモリ（ROM）72と、ランダムアクセスメモリ（RAM）74と、入力ポート装置76と、出力ポート装置78とを有し、これらは双方向性のコモンバス80により互いに接続されている。

【0017】入力ポート装置76には踏み込み量検出センサ24により検出されたアクセルペダルの踏み込み量を示す信号、車速センサ82により検出された車速Vを示す信号、電力残量検出装置84により検出されたバッテリー18の電力残量WHを示す信号、及び走行距離検出装置86により検出された自動車の実総走行距離Lr（バッテリーがフル充電された時点よりの実総走行距離）を示す信号が入力されるようになっている。入力ポート装置76はそれに入力された信号を適宜に処理し、ROM72に記憶されている制御プログラムに基づくCPU70の指示に従い、CPU及びRAM74へ処理された信号を出力するようになっている。

【0018】ROM72は図には示されていない走行制御プログラム、図4に示された電力供給制御プログラム及び図5に示されたグラフに対応するマップを記憶している。CPU70は図4に示された制御プログラム等に基づき種々の演算及び信号の処理を行うようになっている。出力ポート装置78はCPU70の指示に従いアクセルペダルの踏み込み量に応じて走行用モータ10へ駆動電流を出力し、必要に応じてリレー54、56、58へそれらを開閉する制御信号を出力し、また補助操舵用モータ30への駆動電流の供給を停止すると共に電磁クラッチ40を解放する指令信号を補助操舵用電子制御装置32へ出力し、更にバッテリー18の電力残量が低下したときにはそのことを示す警報ランプ88へ指令信号を出力しこれを点灯するようになっている。

【0019】尚補助操舵用電子制御装置32のマイクロコンピュータ36も上述の走行用電子制御装置20のマイクロコンピュータ26と同様に構成されているが、補助操舵用電子制御装置の構造及び作動自体は本発明の要旨をなすものではなく、また当技術分野に於てよく知られているので、これらについての詳細な説明を省略する。

【0020】次に図4に示されたフローチャートを参照して図示の実施例に於ける電力供給制御について説明す

る。尚電子制御装置20による電力供給制御ルーチンは図には示されていないイグニッションスイッチが閉成されることにより開始され、所定時間毎の割込みにより実行される。

【0021】まず最初のステップ10に於ては車速センサ82により検出された車速Vを示す信号、電力残量検出装置84により検出されたバッテリー18の電力残量WHを示す信号、及び走行距離検出装置86により検出された自動車の実総走行距離Lrを示す信号の読込みが行われ、ステップ20に於てはバッテリーのフル充電により定まる目標総走行距離Lo（ROM72に記憶されている）より実総走行距離Lrを減算することにより残存走行距離Lが演算される。

【0022】ステップ30に於ては残存走行距離L及び車速Vに基き残存走行時間tが下記の数1に従って演算され、ステップ40に於ては車速Vに基き図5に示されたグラフに対応するマップより後述の数2～数5の演算に供される係数Koが演算される。

【数1】 $t = L / V$

【0023】ステップ50に於ては下記の数2に従って

$$WH_o = (K_o \cdot W_o + K_1 \cdot W_1 + K_2 \cdot W_2 + K_3 \cdot W_3 + K_4 \cdot W_4 + K_5 \cdot W_5 + K_6 \cdot W_6 + K_7 \cdot W_7 + K_8 \cdot W_8) \cdot t$$

【0024】尚数2に於て、Wo～W8はそれぞれ走行用モータ10、クラクション42、照明装置44、ワイパー46、補助操舵用モータ30、カーエアコン48、カーオーディオ50、パワーウインド52により単位時間当りに消費される電力であり、係数K1～K8はそれぞれクラクション42等についての走行中の使用頻度に対応する係数（正の定数）である。これらは後述の数3～数5に於ても同様である。

【0025】ステップ80に於ては下記の数3に従って自動車が残存走行時間t走行する間にパワーウインド52以外の走行用モータ10等の電装設備により消費される電力WH1が演算されると共に、電力残量検出装置84により検出された電力残量WHと推定消費電力WH1

$$WH_1 = (K_o \cdot W_o + K_1 \cdot W_1 + K_2 \cdot W_2 + K_3 \cdot W_3 + K_4 \cdot W_4 + K_5 \cdot W_5 + K_6 \cdot W_6 + K_7 \cdot W_7) \cdot t$$

【0026】ステップ110に於ては下記の数4に従って自動車が残存走行時間t走行する間にパワーウインド52及びカーオーディオ50以外の走行用モータ10等の電装設備により消費される電力WH2が演算されると共に、電力残量検出装置84により検出された電力残量WHと推定消費電力WH2との差が正であるか否かの判別が行われる。WH-WH2 > 0ではない旨の判別が行われたときにはステップ120に於てリレー54へ制御信号が出力されることによりカーエアコン48への電力

$$WH_2 = (K_o \cdot W_o + K_1 \cdot W_1 + K_2 \cdot W_2 + K_3 \cdot W_3 + K_4 \cdot W_4 + K_5 \cdot W_5 + K_6 \cdot W_6) \cdot t$$

【0027】ステップ140に於ては下記の数5に従って自動車が残存走行時間t走行する間にパワーウインド

自動車が残存走行時間t走行する間に走行用モータ10、クラクション42、照明装置44、ワイパー46、電動式パワーステアリング装置28の補助操舵用モータ30、カーエアコン48、カーオーディオ50、パワーウインド52により消費される電力WHoが演算されると共に、電力残量検出装置84により検出された電力残量WHと推定消費電力WHoとの差が正であるか否かの判別が行われる。WH-WHo > 0ではない旨の判別が行われたときにはステップ60に於てリレー58へ制御信号が出力されることによりパワーウインド52への電力の供給が禁止されると共に警報ランプ88が作動されることによりパワーウインドを使用することができない旨の警報が発せられ、WH-WHo > 0である旨の判別が行われたときにはステップ70に於てパワーウインド52、カーオーディオ50、カーエアコン48、補助操舵用モータ30への電力の供給が禁止されている場合はその禁止が解除されると共に警報ランプ88の作動が停止される。

【数2】

との差が正であるか否かの判別が行われる。WH-WH1 > 0ではない旨の判別が行われたときにはステップ90に於てリレー56へ制御信号が出力されることによりカーオーディオ50への電力の供給が禁止されると共に警報ランプ88が作動されることによりカーオーディオを使用することができない旨の警報が発せられ、WH-WH1 > 0である旨の判別が行われたときにはステップ100に於てカーオーディオ50、カーエアコン48、補助操舵用モータ30への電力の供給が禁止されている場合はその禁止が解除されると共に警報ランプ88の作動が停止される。

【数3】

の供給が禁止されると共に警報ランプ88が作動されることによりカーエアコンを使用することができない旨の警報が発せられ、WH-WH2 > 0である旨の判別が行われたときにはステップ130に於てカーエアコン48若しくは補助操舵用モータ30への電力の供給が禁止されている場合はその禁止が解除されると共に警報ランプ88の作動が停止される。

【数4】

52、カーオーディオ50及びカーエアコン48以外の走行用モータ10等の電装設備により消費される電力W

H3 が演算されると共に、電力残量検出装置 8 4 により検出された電力残量 WH と推定消費電力 WH3 との差が正であるか否かの判別が行われる。WH－WH3 > 0 ではない旨の判別が行われたときにはステップ 1 5 0 に於て補助操舵用電子制御装置 3 2 のマイクロコンピュータ 3 6 へ制御信号が出力されることにより補助操舵用モータ 3 0 への電力の供給が禁止され且電磁クラッチ 4 0 が解放されることによってパワーステアリング装置がマニュアルステアリング装置に切換えられと共に、警報ラ

$$\text{WH3} = (\text{K0} \cdot \text{W0} + \text{K1} \cdot \text{W1} + \text{K2} \cdot \text{W2} + \text{K3} \cdot \text{W3} + \text{K4} \cdot \text{W4} + \text{K5} \cdot \text{W5}) \cdot t$$

【0 0 2 8】かくして図示の実施例によれば、電力残量 WH が推定消費電力 WH0 よりも大きいときには、ステップ 5 0 に於てイエスの判別が行われることによりステップ 7 0 に於てパワーウィンド 5 2 等の第二の電装設備が使用可能な状態に維持されるので、運転者や乗員は余分な負担を強いられることなく快適な走行をすることができる。

【0 0 2 9】これに対し電力残量 WH が推定消費電力以下になると、ステップ 5 0、8 0、1 1 0、又は 1 4 0 に於てノーの判別が行われることにより、それぞれ対応するステップ 6 0、9 0、1 2 0、又は 1 5 0 に於て対応する第二の電装設備への電力の供給が禁止され、これらによる電力の消費が確実に阻止されるので、最終的な実総走行距離 Lr は少なくとも目標総走行距離 Lo になり、これにより最終的には必ず目標総走行距離の走行を達成することができる。

【0 0 3 0】また図示の実施例によれば、パワーウィンド 5 2 等の第二の電装設備には走行上の影響度の低い順に電力の供給禁止の優先順位が与えられており、各第二の電装設備は優先順位に従って順次段階的に電力の供給が禁止されるので、電力残量 WH が推定消費電力以下になると全ての第二の電装設備に対する電力の供給が禁止される場合に比して、バッテリーの電力残量が少なくなった段階に於ける運転者や乗員の負担を軽減し快適な走行に対する影響を低減することができる。

【0 0 3 1】更に図示の実施例によれば、何れかの第二の電装設備に対する電力の供給が禁止されている場合に於ても、ステップ 5 0、8 0、1 1 0 又は 1 4 0 に於て自動車の走行状態により実際の消費電力量が少く電力残量 WH が推定消費電力よりも大きい旨の判別が行われると、ステップ 7 0、1 0 0、1 3 0、又は 1 6 0 に於て対応する第二の電装設備への電力供給禁止が解除されそれらの第二の電装設備が使用可能な状態に切換えられるので、一旦第二の電装設備に対する電力の供給が禁止されると電力供給禁止が解除されない場合に比して運転者や乗員の負担を軽減し走行時の快適性を向上させることができる。

【0 0 3 2】以上に於ては本発明を特定の実施例について詳細に説明したが、本発明はかかる実施例に限定され

ンブ 8 8 が作動されることによりパワーステアリング装置を使用することができない旨の警報が発せられ、WH－WH3 > 0 である旨の判別が行われたときにはステップ 1 6 0 に於て補助操舵用モータ 3 0 への電力の供給が禁止されている場合はその禁止が解除され且電磁クラッチ 4 0 が係合されることによってパワーステアリング装置が作動可能な状態に切換えられと共に警報ランプ 8 8 の作動が停止される。

【数 5】

るものではなく、本発明の範囲内にて他の種々の実施例が可能であることは当業者にとって明らかであろう。

【0 0 3 3】例えば上述の実施例に於ては第二の電装設備として特定の電装設備の例が示されているが、第二の電装設備は電気自動車に応じて任意の電装設備の組合せであってよく、また第二の電装設備に対する電力の供給禁止の優先順位も上述の順位に限定されるものではなく、必要に応じ任意に設定されてよいものである。

【0 0 3 4】また上述の実施例に於ては残存走行距離は表示されないようになっているが、運転者が目標総走行距離より実総走行距離を減算することなく残存走行距離を用意に且確実に認識し得るよう、例えばステップ 2 0 に於て演算された残存走行距離が車室内に設けられた表示手段に表示されるよう構成されてもよい。

【0 0 3 5】

【発明の効果】以上の説明より明らかである如く、本発明によれば、推定される消費電力が電力残量以下であるときには第二の電装設備への電力の供給が許容されることによりこれらの使用が可能な状態が継続されるが、推定される消費電力が電力残量よりも高いときには第二の電装設備への電力の供給が禁止されることによりこれらの設備により電力が消費されることが阻止され、これにより最終的な実総走行距離が少なくともバッテリーのフル充電により定まる目標総走行距離になることが確保されるので、自動車が如何なる状態にて走行しても最終的には必ず目標総走行距離の走行を達成することができ、乗員は残存走行距離より行きたい目的地へ到達し得るか否かを正確に判定することができ、またバッテリーの充電の要否を正確に判定することができる。

【図面の簡単な説明】

【図 1】本発明による電気自動車の電力供給制御装置の構成を特許請求の範囲の記載に対応させて示す説明図である。

【図 2】電動式パワーステアリング装置を備えた電気自動車に適用された本発明による電力供給制御装置の一つの実施例を示す概略構成図である。

【図 3】図 2 に示された走行用電子制御装置を示すブロック線図である。

【図 4】図 2 及び図 3 に示された走行用電子制御装置に

より達成される電力供給制御ルーチンを示すフローチャートである。

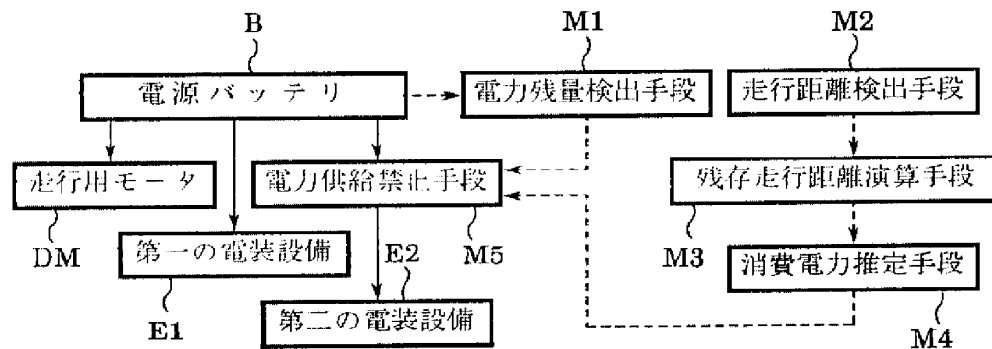
【図5】 車速センサにより検出される車速Vと係数Koとの間の関係を示すグラフである。

【符号の説明】

10…走行用モータ
18…電源バッテリー
20…走行用電子制御装置
28…電動式パワーステアリング装置

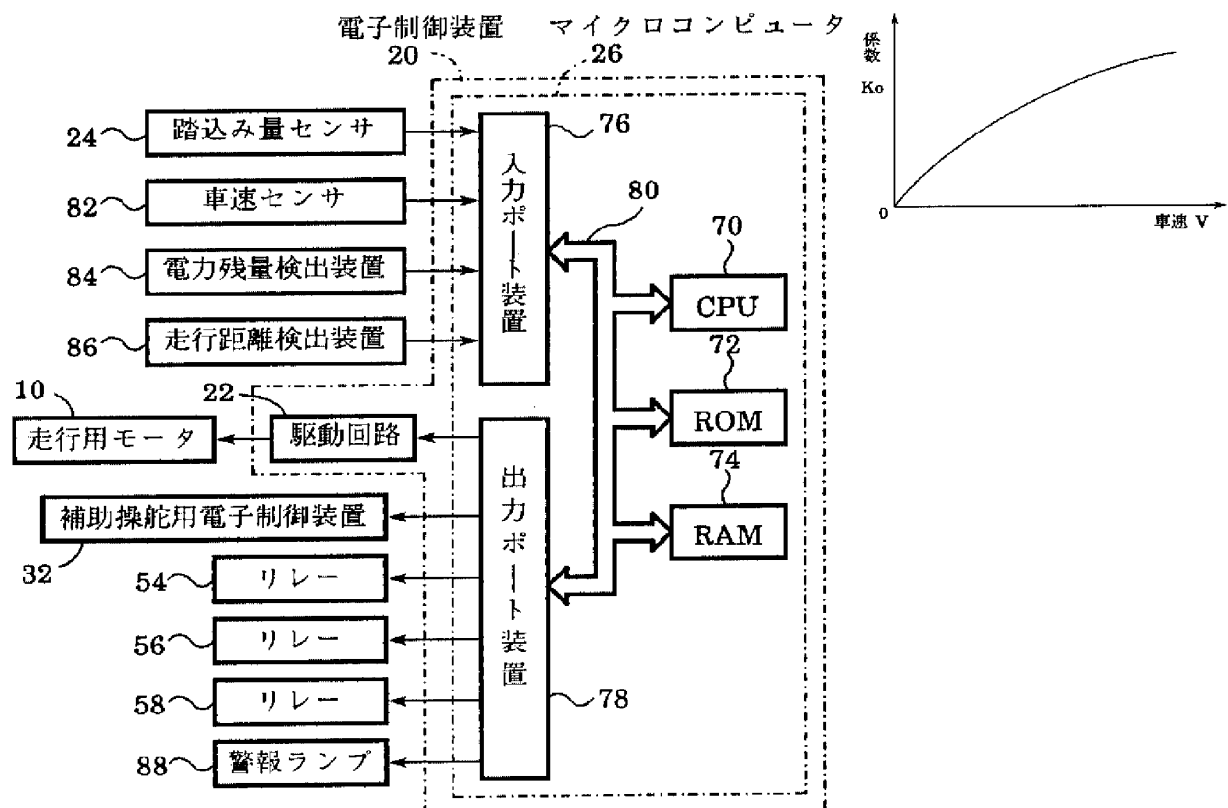
30…補助操舵用モータ
32…補助操舵用電子制御装置
48…カーエアコン
50…カーオーディオ
52…パワーウインド
82…車速センサ
84…電力残量検出装置
86…走行距離検出装置
88…警報ランプ

【図1】

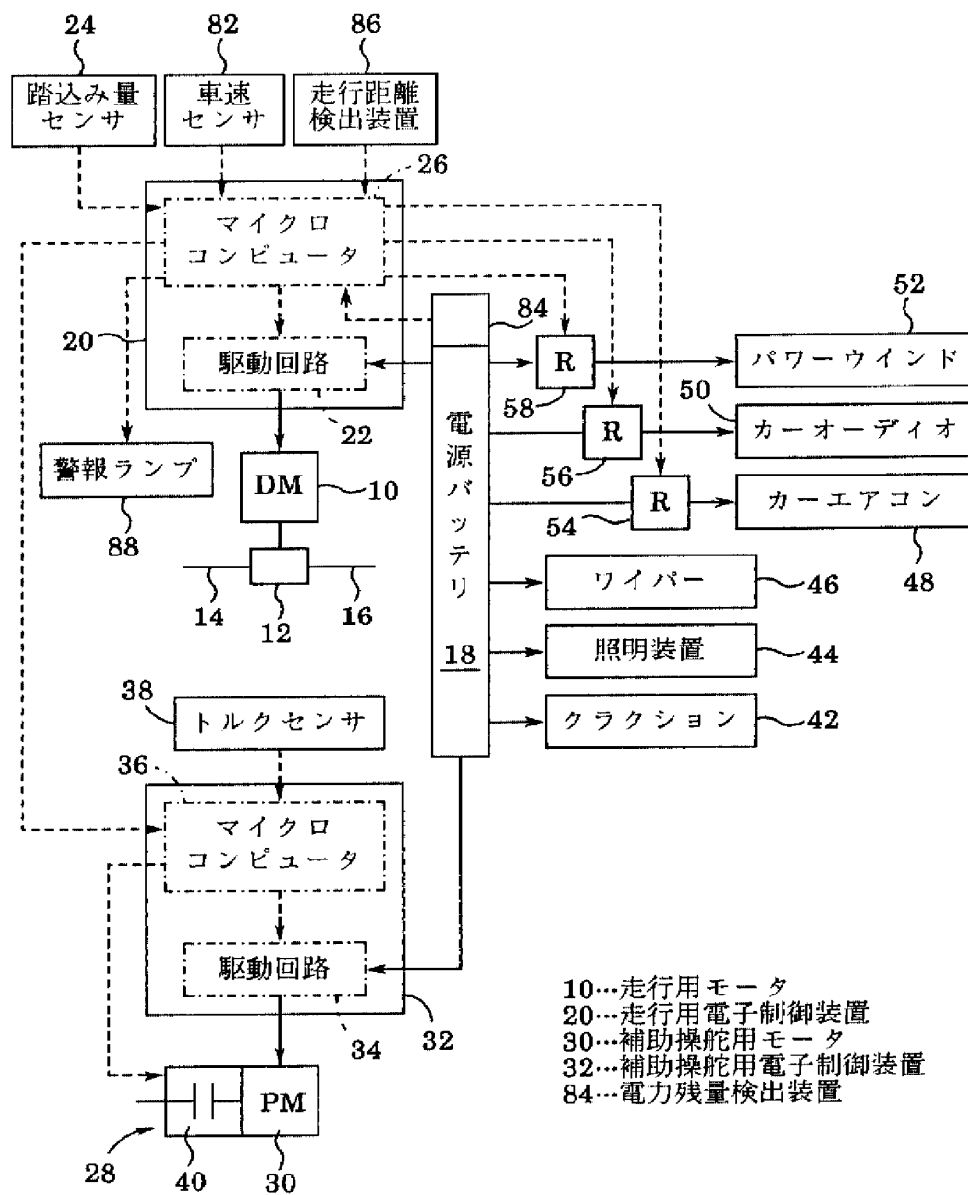


【図3】

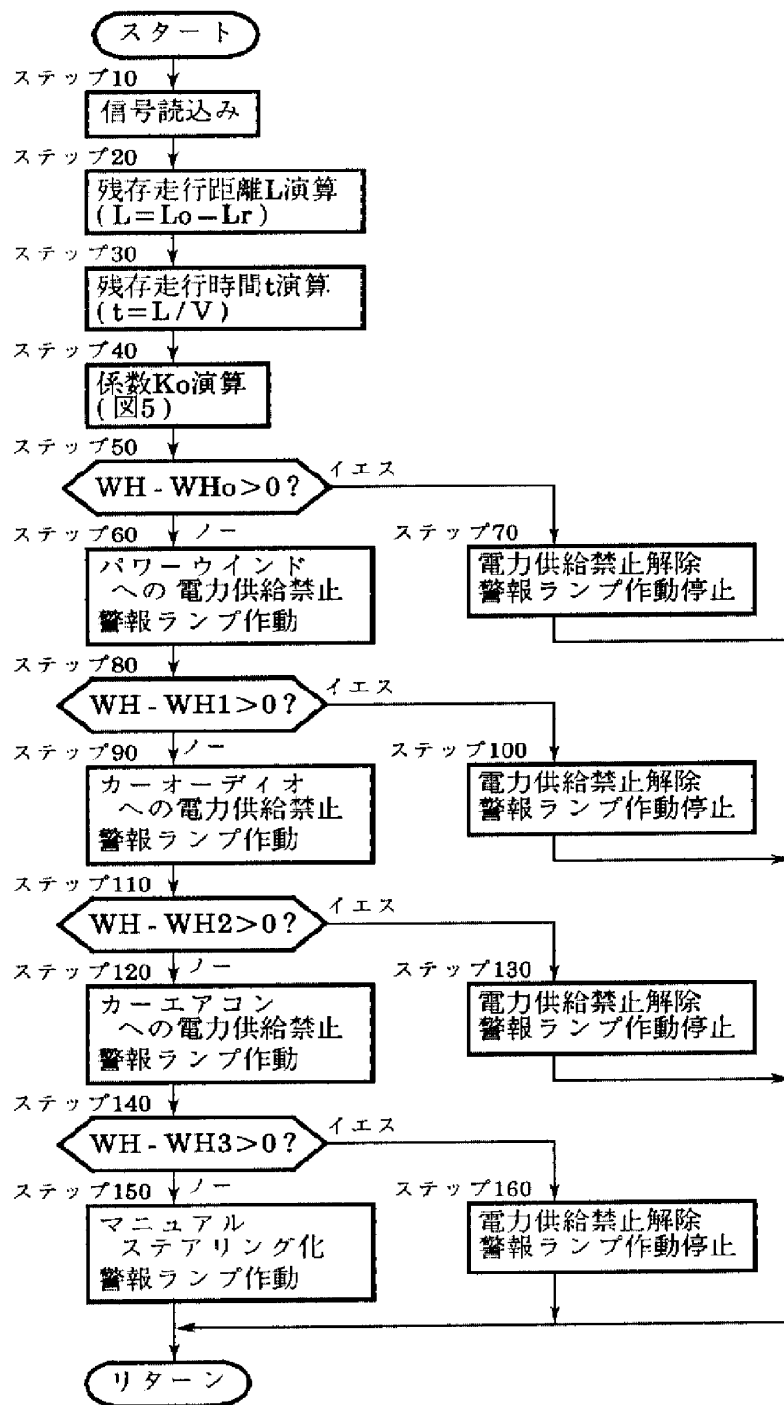
【図5】



【図2】



【図4】



PATENT ABSTRACTS OF JAPAN

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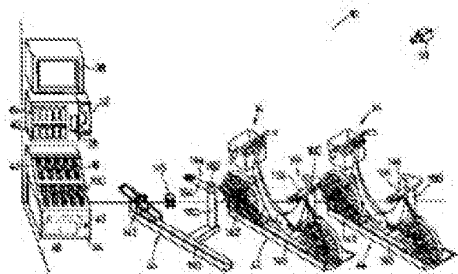
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(54) **BATTERY SUPPLY DEVICE FOR MOTOR-DRIVEN VEHICLE RENTAL SYSTEM**

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a battery supply device in a motor-driven vehicle rental system which can effectively lend a battery that is freely attached to and detached from a motor-driven vehicle to a user.

SOLUTION: A user who is identified by a user identifier device 36 takes a charged battery 18 out of a battery supply device 42 and loads the battery 18 into a motor-driven bicycle 14. The device 42 has the loading parts 100 in number larger than the number of rental bicycles 14 and accordingly the user can always select a fully charged battery 18. As a result, the user is never kept waiting for the charging of the battery 18 and the bicycles 14 are effectively lent to the users.



CLAIMS

[Claim(s)]

[Claim 1]In an electric motor rental system which makes it park where an electric motor which a battery can detach and attach freely, and which can rent two or more sets is locked, and rents the aforementioned electric motor to a contract user,

A battery feeder characterized by comprising the following in an electric motor rental system.

Two or more battery loading sections which can hold more numbers than the number of an electric motor which can be rented of batteries.

A charge circuit which charges the aforementioned battery which is provided by each aforementioned battery loading section, and with which it is loaded.

[Claim 2]A battery feeder in an electric motor rental system having a displaying means which shows a charging state of the aforementioned battery in the equipment according to claim 1.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]The present invention is made to park, where the electric motor which a battery can detach and attach freely and which can rent two or more sets is locked, and relates to the battery feeder in the electric motor rental system which rents the aforementioned electric motor to a contract user.

[0002]

[Description of the Prior Art]Many systems which rent vehicles, such as a bicycle and an automobile, exist conventionally. For example, as for the rental system of an automobile, after a user describes necessary information in documents in a rental company, receives a key, borrows a desired automobile and does predetermined time use, returning to the rental company is common. In this case, delivery processing of a rental contract or a key, the adjustment processing at the time of return further, etc. are fairly complicated for the authorized personnel of a user or a rental company.

[0003]Then, for example, in the system described in JP,H6-68095,A, The propriety of use of a car is judged by reading the identification device of the magnetic card etc. which a member possesses by the decision means equipped in the automobile, and if use is good, while unlocking a door and making a rental possible, the position of the automobile concerned is made traceable with the prime controller via automobile identification-of-position equipment. In this case, while facilitation of a rental is attained, the advantage that the flexibility of return improves is acquired from the position of an automobile being discriminable.

[0004]In the system described in JP,H7-325959,A, He rents a desired cellular phone using the

card which a user has, and is trying to compute at the loan station which stores two or more cellular phones based on the integrated value of the number of availability in which the use price was built by the cellular phone.

[0005]However, in these prior arts, it does not have the composition that the vehicles which a user can choose, the kind of cellular phone, etc. can be grasped simple. One side and JP,H2-93796,A has disclosed the equipment which enabled at the charge charge of the battery which a user owns. However, reference is made by this prior art about neither management of a key, nor management of the battery. Furthermore, the prior art disclosed about the system which rents the battery itself which can be detached and attached freely is not found.

[0006]

[Problem to be solved by the invention]The present invention is made in consideration of a situation mentioned above, and is a thing.

The purpose is to provide a battery feeder in an electric motor rental system which can rent efficiently a battery which can be detached and attached, and with which it is loaded.

[0007]

[Means for solving problem]The battery feeder in the electric motor rental system of the present invention, It is made to park, where the electric motor which a battery can detach and attach freely and which can rent two or more sets is locked. Are an electric motor rental system which rents the aforementioned electric motor to a contract user, and Two or more battery loading sections which can hold more numbers than the number of the electric motor which can be rented of batteries, It has a charge circuit which is provided by each aforementioned battery loading section and charges the aforementioned battery with which it is loaded.

[0008]In this case, the battery feeder is provided with many numbers of battery loading sections rather than the number of the electric motor which can be rented, and makes the always excessive battery the charging state by the charge circuit. Therefore, since the charged battery can be immediately lent out when the aforementioned electric motor is rented, an efficient rental is attained. It can be judged easily whether since the charging state of the aforementioned battery is displayed by the displaying means with which the battery feeder was equipped, it can rent the battery concerned.

[0009]

[Mode for carrying out the invention]Fig.1 shows the rental system of the electric motor in which the battery feeder which is one embodiment of the present invention is applied.

[0010]A rental system of this electric motor is provided with the following.

The parking lot for bicycles 10 currently parked in the state which can rent two or more sets of electric motors.

The central control room 12 which manages a situation and a user of the aforementioned parking lot for bicycles 10.

[0011]Here, Fig.2 shows the electric bicycle 14 which is an example of the electric motor rented

with this rental system. This electric bicycle 14 is provided with the following.

The auxiliary drive part 16 which assists driving force by the pedal 15.

The battery 18 which supplies electric power to the aforementioned auxiliary drive part 16.

The battery 18 is stored by the battery case 20 with which the front part of the handle 19 was equipped, enabling free attachment and detachment. In order that the battery case 20 may prevent the theft of the stored battery 18, it has the lid 24 provided with the locking mechanism 22. The U-shaped engagement part 28 by which the circle lock with which the mainframe 26 under the saddle 25 was equipped in the parking lot for bicycles 10, and which is mentioned later is locked is provided. The circle lock 32 for preventing the theft in any parking part of the electric bicycle 14 is provided by the rear wheel 30. The circle lock with which the locking mechanism 22 of the battery 18 and the parking lot for bicycles 10 were equipped and which is mentioned later, and the circle lock 32 of the rear wheel 30 can be unlocked by the same key.

[0012]The parking lot for bicycles 10 is provided with the following.

The lending controller 34 which controls the whole lending processing of the electric bicycle 14 in the parking lot for bicycles 10 concerned to be shown in Fig.1 and Fig.3.

The user identification device 36 which identifies a user by user certificates, such as a noncontact IC card.

The display device 38 with a touch panel which displays and chooses selection information concerning the selectable electric bicycle 14.

The key which holds two or more keys of the electric bicycle 14 currently parked to the parking lot for bicycles 10, and starts the desired electric bicycle 14 The selectable key supply device 40, The battery feeder 42 holding two or more batteries 18, and the charging control device 43 which controls charge over an electric bicycle of a type with a built-in battery, The parking equipment 44 which makes two or more electric bicycles 14 park by a locked state, and the inventory answerback 48 which answers a stock condition of the electric bicycle 14 in the parking lot for bicycles 10 concerned according to an inquiry from the user telephone 46, The parking-lot-for-bicycles monitoring instrument 50 which consists of CCD cameras etc. and supervises a situation of the parking lot for bicycles 10, and the emergency phone 52.

[0013]The central control room 12 is provided with the following.

The user controlling device 54 provided with a user's add function, a settlement-of-accounts function, and a controlling function of the parking lot for bicycles 10 as shown in Fig.1.

The user certificate issuing device 56 which publishes a user certificate which consists of noncontact IC cards etc.

Emergency-phone answerback 58 which responds to an inquiry from the emergency phone 52 installed in the parking lot for bicycles 10.

The user controlling device 54 and the lending controller 34 of the parking lot for bicycles 10 deliver and receive information via the modem 60.

[0014]Next, it describes in detail about specific constitution of the key supply device 40 and the battery feeder 42 which are arranged in the parking lot for bicycles 10, and the parking

equipment 44.

[0015]The key supply device 40 is provided with two or more key boxes 64 which hold the key of the electric bicycle 14 to the casing 62 as shown in Fig.4. The key box 64 consists of the body part 66 and the key door 68 which store a key. While the magnet 72 which adsorbs the receiving part 70 of the key door 68, and maintains a closed state is arranged by the side part in the body part 66, the sensor 74 consisting of the microswitch etc. which detect the closed state of the key door 68 is arranged by it. The key cylinder 76 equipped with a key is arranged by the approximately center part of the body part 66. The solenoid 78 is arranged by the upper part of the body part 66, and the rod 80 driven by it is constituted so that an attitude in the body part 66 is possible. On the other hand, when the key door 68 concerned is in a closed state, the engagement part 82 with which the aforementioned rod 80 engages is arranged by the upper part of the key door 68 with which it is equipped via the hinge 81 to the body part 66. The concave part 84 is formed in the side part of the key door 68 that opening and closing should be made easy. The light emitting devices 86 and 88 which consist of LED etc. which show the loan of a key and a return state are arranged by the upper part of the key box 64 constituted in this way. And the sensor 74, the key cylinder 76, the solenoid 78, and the light emitting devices 86 and 88 are connected to the lending controller 34, respectively.

[0016]Fig.5 shows the battery 18 with which the electric bicycle 14 or the battery feeder 42 is loaded. This battery 18 is constituted by box shape with the handle 90 in the upper part, and the electrode which is not illustrated at the bottom part which opposes to the aforementioned handle 90 is arranged. The two projection parts 96 from which one surface by the side of the handle 90 turns into the planate engagement face 92 which intersects perpendicularly to the side part concerned, and the surface of another side separated from the handle 90 turns into the inclined plane 94 sloping in the aforementioned engagement face 92 side are formed in the side part.

[0017]As shown in Fig.6, two or more loading sections 100 by which the body part 98 is loaded with the battery 18 constituted as mentioned above are provided by the battery feeder 42 (refer to Fig.3).In this case, only the number with more loading sections 100 than the number of the electric bicycle 14 lent out in the parking lot for bicycles 10 concerned is prepared. While the electrode 104 connected to the bottom part in the charge circuit 102 is arranged by the aforementioned loading section 100, the sensors 106, such as a microswitch which detects being loaded with the battery 18, are arranged by it. The locking mechanism 108 which prevents the sampling of the battery 18 concerned by engaging with one of the projection parts 96 provided by the side part of the battery 18 is arranged by the inner portion of the loading section 100. The light emitting devices 110, such as LED which shows the locked state of the battery 18 concerned, and the light emitting device 112 which are displaying means, such as LED which shows the charging state of the battery 18 concerned, are arranged by the opening of the loading section 100. These charge circuits 102, the sensor 106, the locking mechanism 108, and the light emitting devices 110 and 112 are connected to the lending controller 34.

[0018]Here, the locking mechanism 108 provided by the battery feeder 42 is constituted as shown in Fig.7 - Fig.9.That is, the locking mechanism 108 is provided with the following.

The claw member 114 which engages with one of the projection parts 96 provided by side part of the battery 18.

The holder 116 holding the claw member 114.

The brackets 118 and 120 which support the holder 116.

The solenoid 122 for controlling operation of the holder 116.

[0019]The claw member 114 has the inclined plane 124 where the inclined plane 94 (refer to Fig.5) of the projection part 96 ****s at the time of the charge of the battery 18 to the loading section 100, and the engagement face 126 which engages with the engagement face 92 of the aforementioned projection part 96, and the opening 128 of the holder 116 is equipped with it. The holder 116 has the suspending portion 130 projected to the side, and a surface opposite to the surface where it is equipped with the claw member 114 is formed in a circular curved surface. In this circular curved surface, the bracket 118 which becomes roughly U-shaped is arranged. The one end part of the bracket 120 which becomes abbreviated L character-like engages with the aforementioned opening 128 by the side of the side surface of the holder 116 which abbreviated-intersects perpendicularly with the aforementioned suspending portion 130. And between the surface by the side of the other end of the aforementioned bracket 120, and the aforementioned bracket 118, the spring 132 for maintaining the claw member 114 in the state of Fig.8 is arranged. On the other hand, the rod 134 of the solenoid 122 which constitutes the locking mechanism 108 is equipped with the stopper 138 via the spring 136. In the state where the rod 134 projected, this stopper 138 engages with the suspending portion 130 of the holder 116 that the claw member 114 should be maintained in the state of Fig.8.

[0020]Two or more parking equipment 44 which makes two or more electric bicycles 14 park is provided by the parking lot for bicycles 10. This parking equipment 44 is provided with the following.

The guide rail 140 which positions a side direction of the electric bicycle 14 as shown in Fig.3.

The positioning mechanism 142 which positions a front wheel.

The locking mechanism 144 which locks the electric bicycle 14.

The electric socket 145 for charging an electric bicycle which a type with a built-in battery parked to the parking equipment 44 concerned does not illustrate.

It reaches [whether the electric bicycle of the type with a built-in battery is connected to the electric socket 145, and], and the charging state is controlled by the charging control device 43 under management of the lending controller 34.

[0021]The support 160 set up between the guide rails 140 as the locking mechanism 144 was shown in Fig.3 and Fig.10,It comprises the fixed pivot part 162 arranged by the upper end part of the support 160, the turning arm 164 by which a one end part is fixed to the fixed pivot part 162, and the circle lock 166 with which the other end of the turning arm 164 is equipped. As shown in Fig.10, the circle lock 166 is engaging with the U-shaped engagement part 28 of the mainframe 26 of the electric bicycle 14, and it prevents the fall under parking while it prevents the theft of the electric bicycle 14 concerned. When the mainframe 26 is thin pipe state, it may be made to

carry out engagement of this circle lock 166 to the mainframe 26 directly.

[0022]The rental system of the electric motor of this embodiment is constituted as mentioned above fundamentally, and is described about loan and return processing of the electric bicycle 14 and the battery 18 in which this rental system was used next.

[0023]In advance of use of a rental system, first Under control of the user controlling device 54, Using the user certificate issuing device 56 of the central control room 12, information, including the bank account number for settlement of accounts of the kind (range) of a contract user's address, a name, and loan vehicles and a utilization charge, a card ID number, a user ID number, a password, a shelf-life, etc., is registered, and user certificates, such as a noncontact IC card, are published. These pieces of information is registered into the "user lists" of the user controlling device 54.

[0024]Next, the user who owns a user certificate calls the inventory answerback 48 of the parking lot for bicycles 10 by user telephone 46, for example. In this case, the parking equipment 44 of the parking lot for bicycles 10 is carrying out the firm gas of the signal concerning the existence data of the electric bicycle 14 which the vehicle sensor which is not illustrated detected to the lending controller 34, The aforementioned lending controller 34 converts this existence data to the voice information which shows the kind and the number of inventory of the electric bicycle 14, for example, and provides the inventory answerback 48 with it in real time. Then, the user can judge the existence of the desired electric bicycle 14 according to the audio response from the aforementioned inventory answerback 48.

[0025]If stock is checked, a user will check out the desired electric bicycle 14 in the parking lot for bicycles 10 next. In this case, a user's check is first performed by the user identification device 36. A user's confirming processing is performed according to the flow chart shown in Fig.11.

[0026]That is, a user brings user certificates, such as a noncontact IC card, close to the user identification device 36 with which the parking lot for bicycles 10 was equipped. The lending controller 34 reads user data, such as a card ID number and a user ID number, via the user identification device 36 (Step S1), and extracts a user ID number from these user data (Step S2). The check of whether the extracted user ID number is that comparative collation is carried out to the user ID number which is transmitted to the user controlling device 54 and registered into it via the modem 60, and the user concerned is a normal user is performed (Step S3). Here, exception processing is performed when it is not a normal user (step S4).

[0027]On the other hand, if it is checked that he is a normal user, user data, such as a kind (range) of the password concerning the aforementioned user ID number and loan vehicles, a shelf-life, and lending status, will be read from the user controlling device 54, and will be transmitted to the lending controller 34 via the modem 60 (Step S5). And it is checked whether based on the data of the aforementioned lending status, the user concerned is lending out the electric bicycle 14 (Step S6). In this case, if it is under loan, the user concerned will judge with returning the electric bicycle 14, and will perform processing in in the "return mode" mentioned later (Step S7).

[0028]When not having lent out is checked, the right of use which shows whether it is in the state where the user concerned can use now, based on the aforementioned user data is checked (Step S8). A check of the right of use will check [next] whether the user certificate of the user concerned is within the term of validity (step S9). Exception processing is performed, when there is no right of use or it is over the term of validity (Step S10). It has the right of use, and in being within the term of validity, it performs the following "loan mode" (Step S11).

[0029]Then, processing of "loan mode" is described according to the flow chart shown in Fig.12 - Fig.14.

[0030]First, a user inputs a password using the display device 38 with a touch panel (Step S101). The lending controller 34 is compared with the password of user data which is having the input password registered while it starts the count of the input frequency of a password (Step S102) (Step S103). Here, when the input frequency of a password is 3 times or more (Step S104), it is regarded as that where a mistake is in a number, and exception processing is performed (Step S105).

[0031]On the other hand, when a password corresponds, while reading the vehicles selection propriety data based on the data from the parking equipment 44 (Step S106), the kind (range) of loan vehicles of user data is read (Step S107). That is, the parking equipment 44 supplies the existence data of the electric bicycle 14 to the lending controller 34 as a signal from the vehicle sensor which is not illustrated. In this case, the lending controller 34 creates the vehicles selection propriety data showing the ability whether the electric bicycle 14 can be in use or not to be used by whether to be usable, failure, etc. in the range of the loan vehicles of the user concerned based on the aforementioned existence data. And based on these data, usable vehicles are displayed on the display device 38 with a touch panel (Step S108).

[0032]While the usable electric bicycle 14 in the parking lot for bicycles 10 is displayed with a picture (photograph) etc. for example, so that a color, size, the height of a saddle, etc. may be known, information, including a utilization charge, utilization time, etc., is displayed on the display device 38 with a touch panel. A user chooses the desired electric bicycle 14 by operating the display device 38 with a touch panel based on this display (Step S109). It is checked whether the lending controller 34 has the usable electric bicycle 14 which the user chose (Step S110).

[0033]If the electric bicycle 14 with the selected user is usable, the lending controller 34 will choose the fleet number (Step S111), and the vehicle data corresponding to the fleet number concerned will be read (Step S112).

[0034]Next, the lending controller 34 outputs an unlocking signal to the key box 64 (refer to Fig.4) which holds the key of the selected electric bicycle 14 according to the aforementioned fleet number. The solenoid 78 of the key box 64 makes the rod 80 leave the engagement part 82 of the key door 68 according to the aforementioned unlocking signal (Step S113). Thereby, the key box 64 is unlocked. At this time, the light emitting device 88 arranged by the upper part of the aforementioned key box 64 blinks, and a user is told about having unlocked. A sound can also perform instead of the light emitting device 88 performing the instruction holding an available key of the key box 64.

[0035]If a user opens the key door 68 of the key box 64 which the light emitting device 88 blinks (Step S114), the sensor 74 will operate, the light emitting device 86 will blink, and it will tell that the key door 68 was opened wide (Step S115). If a user rotates the key cylinder 76 to the "loan" side and it extracts a key (Step S116), while the light emitting device 86 will be in lighting status, the lending controller 34 will be told about having extracted the key (Step S117). In this case, in the lending controller 34, it is checked that the loan of the electric bicycle 14 of the fleet number corresponding to the key concerned has been started.

[0036]If a user closes the key door 68 of the key box 64 (Step S118), while the sensor 74 will operate and the light emitting devices 86 and 88 will go out, the lending controller 34 is told about the key door 68 having been closed (Step S119). Then, the lending controller 34 outputs a locking signal to the solenoid 78, by this locking signal, the rod 80 descends, it engages with the engagement part 82, and locking is performed (Step S120).

[0037]Next, the lending controller 34 checks the vehicle type of the electric bicycle 14 which carries out a loan from a fleet number (Step S121). In this case, when it is checked whether it is what needs the battery 18 which the selected electric bicycle 14 can detach and attach freely and you need, it reads battery selection propriety data (Step S122). When it is an electric bicycle which the battery 18 cannot detach and attach freely, in the parking lot for bicycles 10 shown in [Fig.3](#), it charges directly from the electric socket 145, therefore it is not necessary to choose the battery 18.

[0038]Here, battery selection propriety data expresses the data applied to the selectable battery 18 created with the existence data of the battery 18 in each loading section 100 of the battery feeder 42, and the use propriety data based on a charging state, for example. The existence of the battery 18 can be checked by the sensor 106 shown in [Fig.6](#), and a charging state can be checked by the charge circuit 102.

[0039]Based on the read battery selection propriety data, the display device 38 with a touch panel displays it, as the battery 18 which can be lent out is shown in [Fig.15](#) (Step S123). That is, in order to make selection by a user easy, the battery 18 which charge can complete and can be lent out, for example, and the battery 18 which charge during a loan has not completed are displayed on the display device 38 with a touch panel in the identifiable state by classification by color etc. For example, the non-charging state can use things other than a completely charged state, when red and a half-charging state will use blue and a completely charged state at a short distance, even if there is nothing of a completely charged state yellow and the charging state of 3/4 by displaying as green.

[0040]Then, a user chooses the key of decision, after choosing the number of the battery 18 of an available request from the displayed battery 18 (Step S124). In this case, check whether the lending controller 34 is charged to the state with the usable selected battery 18 (Step S125), and if usable, While releasing the locking mechanism 108 of the loading section 100 to which the battery feeder 42 corresponds (Step S126), the light emitting device 110 is turned on.

[0041]Here, the battery feeder 42 is provided with the loading section 100 which can charge and hold many numbers of batteries 18 in the parking lot for bicycles 10 rather than the number of

the electric bicycle 14 which can be rented. Therefore, when a user tries to check out the electric bicycle 14 immediately after return from the state where all the electric bicycles 14 were lent out, for example, he can check out immediately the intact battery 18 by which power receiving is carried out sufficiently from the battery feeder 42. In this case, in order to charge the battery 18 concerned, a user is not kept waiting for a long time, and the electric bicycle 14 can be checked out very efficiently. Although the number of the batteries 18 is set up the less than twice of the number of the electric bicycle 14 which can be rented, for example, it simulates a busy condition and it may be made to set up the optimal number.

[0042]As shown in Fig.6, the battery 18 with which the loading section 100 was loaded is locked because the engagement face 92 of the projection part 96 arranged by the side part engages with the engagement face 126 of the claw member 114 which constitutes the locking mechanism 108. The electrode in which a bottom part does not illustrate the battery 18 in this state touches the electrode 104 of the charge circuit 102, and charging treatment is continued. And a charging state is detectable from outside by the light emitting device 112.

[0043]Then, when a lock release signal is supplied to the predetermined loading section 100 from the lending controller 34, as shown in Fig.7, the solenoid 122 will operate, the rod 134 will retract and the stopper 138 will separate from the suspending portion 130 of the holder 116 (Step S126). In this state, when a worker extracts the battery 18 from the loading section 100, as the holder 116 shows Fig.9 via the claw member 114 of the locking mechanism 108 by the projection part 96 of the battery 18, it inclines. Therefore, the aforementioned projection part 96 will get over the claw member 114, and it will extract the battery 18 (Step S127).

[0044]If it extracts the battery 18, it will detect that there is no sensor 106 of 18 battery arranged by the bottom part of the loading section 100, and the detection signal will be transmitted to the lending controller 34 (Step S128). Subsequently, the solenoid 122 of the locking mechanism 108 will operate, the stopper 138 will engage with the suspending portion 130 of the holder 116 via the rod 134, and the locking mechanism 108 concerned will be in a locked state again, and the light emitting device 110 is switched off (Step S129).

[0045]After the above processing is completed, on the other hand, the lending controller 34, The fleet number of the electric bicycle 14 lent out to the user data currently held at the register, loan time, the flag that shows that it is under loan, etc. are transmitted to the user controlling device 54 via the write (Step S130) modem 60 (Step S131). The user ID number of the user who uses the electric bicycle 14 concerned to the vehicle data currently held at the register, loan start time, etc. are transmitted to the user controlling device 54 via the write (Step S132) modem 60 (Step S133).

[0046]After a lending process is completed as mentioned above, a user unlocks the electric bicycle 14 with which the parking equipment 44 corresponds using the key taken out from the key supply device 40. In this case, the electric bicycle 14 is locked by the parking equipment 44 with the circle lock 166 provided by the point of the turning arm 164 which constitutes the locking mechanism 144 arranged between the electric bicycles 14, as shown in Fig.3 and Fig.10. Then, the aforementioned circle lock 166 is unlocked using a key, and it removes from

the U-shaped engagement part 28 of the mainframe 26. In this case, since the guide rail 140 is aslant installed as shown in Fig.3, the locking mechanism 144 over the adjoining electric bicycle 14 does not become obstructive [unlocking]. The turning arm 164 by which the circle lock 166 was unlocked is made to rotate around the center of the support 160, and is evacuated to the position shown as the solid line of Fig.10. After unlocking as mentioned above, the electric bicycle 14 concerned is picked out from the parking equipment 44.

[0047]After a user loads with the battery 18 picked out from the battery feeder 42 to the battery case 20 of the taken-out electric bicycle 14 next and closes the lid 24, he locks the locking mechanism 22 by the key which unlocked the aforementioned circle lock 166. A user will ride on the electric bicycle 14 which was used in this way and loaded with the battery 18, and will move to a desired place.

[0048]Next, it describes about the processing in the case of returning the used electric bicycle 14. A user brings a user certificate close to the user identification device 36 first like the case where the electric bicycle 14 is checked out, in the parking lot for bicycles 10. The lending controller 34 is carrying out comparative collation to the user ID number which is having the user ID number which read user data via the user identification device 36, and was extracted from this user data registered, and it is checked whether the user concerned is a normal user. The password which will start the aforementioned user ID number if it is checked that he is a normal user, User data, such as a kind (range) of loan vehicles, a shelf-life, and lending status, is read from the user controlling device 54, and it is checked whether based on the data of the aforementioned lending status, the user concerned is lending out the electric bicycle 14. In this case, since it is under loan, the user concerned judges with returning the electric bicycle 14, and performs processing in "return mode."

[0049]Next, according to the flow chart shown in Fig.16 and Fig.17, it describes about processing in in this "return mode."

[0050]First, the lending controller 34 reads the vehicle data containing a fleet number, a user ID number, loan start time, loan finish time, etc. (Step S201), and checks whether the electric bicycle 14 concerning the aforementioned fleet number has been returned (Step S202). When the electric bicycle 14 concerned is not returned, the display device 38 with a touch panel displays a vehicles return demand screen, and return is urged to it (Step S203).

[0051]Then, a user returns the electric bicycle 14 to the position of the parking equipment 44. That is, after carrying out engagement of the wheel of order to the guide rail 140, ranking second and positioning a front wheel according to the positioning mechanism 142, the turning arm 162 is made to rotate and the circle lock 166 which constitutes the locking mechanism 144 in the U-shaped engagement part 28 of the mainframe 26 is locked.

[0052]If the electric bicycle 14 is returned to the predetermined parking equipment 44 as mentioned above, the vehicle sensor which was provided by the positioning mechanism 142 and which is not illustrated will detect a return state, and will transmit a return detection signal to the lending controller 34. Therefore, the lending controller 34 is judged to be that to which the predetermined electric bicycle 14 was returned (Step S202), and the kind of return vehicles is

checked based on vehicle data (Step S204).

[0053]When it is the electric bicycle 14 which has here the battery 18 which return vehicles can detach and attach freely, The proper inventory figures of the battery 18 are calculated based on the number of batteries and the aforementioned vehicle number under loan which calculates the vehicle number under loan and which was detected by the sensor 106 of the battery feeder 42 on the other hand (Step S205) (Step S206), It is checked whether the battery 18 has been returned (Step S207). When the battery 18 is not returned, the display device 38 with a touch panel displays a battery return demand screen, and return is urged to it (Step S208).

[0054]After return of the electric bicycle 14 and the battery 18 is completed, a user returns a key. In this case, the lending controller 34 outputs an unlocking signal to the key box 64 (refer to Fig.4) applicable according to the fleet number of the returned electric bicycle 14. The solenoid 78 of the key box 64 makes the rod 80 leave the engagement part 82 of the key door 68 according to the aforementioned unlocking signal (Step S209). Thereby, the key box 64 is unlocked. At this time, the light emitting device 88 arranged by the upper part of the aforementioned key box 64 blinks, and a user is told about having unlocked.

[0055]If a user opens the key door 68 of the key box 64 which the light emitting device 88 blinks (Step S210), the sensor 74 will operate, the light emitting device 86 will blink, and it will tell that the key door 68 was opened wide (Step S211). If a user inserts a key in the key cylinder 76 and makes it rotate to the "return" side (Step S212), while the light emitting device 86 will be in lighting status, the lending controller 34 will be told about the key having been returned (Step S213).

[0056]If a user closes the key door 68 of the key box 64 (Step S214), while the sensor 74 will operate and the light emitting devices 86 and 88 will go out, the lending controller 34 is told about the key door 68 having been closed (Step S215). Then, the lending controller 34 supplies a locking signal to the solenoid 78, by this locking signal, the rod 80 descends, it engages with the engagement part 82, and locking is performed (Step S216).

[0057]On the other hand, while performing clear processing of the fleet number of the returned electric bicycle 14, and the flag which shows that it is under loan to the user data currently held at the register, the lending controller 34, Loan finish time is transmitted to the user controlling device 54 via the write (Step S217) modem 60 (Step S218). While performing a user's user ID number and clear processing of the flag which shows that it is under loan to the vehicle data currently held at the register, loan finish time is transmitted to the user controlling device 54 via the write (Step S219) modem 60 (Step S220).

[0058]Return processing of the electric bicycle 14 is completed as mentioned above. The Assessment on Search Report by Designated Searching Authority of the user who lent out the electric bicycle 14, While being managed with the user controlling device 54 based on the aforementioned user data, for example, totaling a contract user's Assessment on Search Report by Designated Searching Authority for every unit time period and displaying accounting information via the display device 38 with a touch panel, processing of issue of use details, fee collection, etc. is performed.

[0059]In the embodiment mentioned above, since the battery 18 serves as the same form, can return to any vacant loading section 100 in two or more loading sections 100 provided by the battery feeder 42, but. When this battery 18 has two or more kinds, it is also possible to constitute so that the loading section 100 which should be returned according to that kind may be instructed.

[0060]

[Effect of the Invention]As described above, the battery feeder in the electric motor rental system concerning the present invention is provided with many numbers of battery loading sections rather than the number of the electric motor which can be rented, and makes the always excessive battery the charging state by the charge circuit. Therefore, since the charged battery can be immediately lent out when the aforementioned electric motor is rented, it becomes possible to rent efficiently the battery with which an electric motor and it are loaded. It can be judged easily whether since the charging state of the aforementioned battery is displayed by the displaying means with which the battery feeder was equipped, it can rent the battery concerned.

TECHNICAL FIELD

[Field of the Invention]The present invention is made to park, where the electric motor which a battery can detach and attach freely and which can rent two or more sets is locked, and relates to the battery feeder in the electric motor rental system which rents the aforementioned electric motor to a contract user.

PRIOR ART

[Description of the Prior Art]Many systems which rent vehicles, such as a bicycle and an automobile, exist conventionally. For example, as for the rental system of an automobile, after a user describes necessary information in documents in a rental company, receives a key, borrows a desired automobile and does predetermined time use, returning to the rental company is common. In this case, delivery processing of a rental contract or a key, the adjustment processing at the time of return further, etc. are fairly complicated for the authorized personnel of a user or a rental company.

[0003]Then, for example, in the system described in JP,H6-68095,A, The propriety of use of a car is judged by reading the identification device of the magnetic card etc. which a member possesses by the decision means equipped in the automobile, and if use is good, while unlocking a door and making a rental possible, the position of the automobile concerned is made traceable with the prime controller via automobile identification-of-position equipment. In this case, while facilitation of a rental is attained, the advantage that the flexibility of return improves is acquired from the position of an automobile being discriminable.

[0004]In the system described in JP,H7-325959,A, He rents a desired cellular phone using the card which a user has, and is trying to compute at the loan station which stores two or more

cellular phones based on the integrated value of the number of availability in which the use price was built by the cellular phone.

[0005]However, in these prior arts, it does not have the composition that the vehicles which a user can choose, the kind of cellular phone, etc. can be grasped simple. One side and JP,H2-93796,A has disclosed the equipment which enabled at the charge charge of the battery which a user owns. However, reference is made by this prior art about neither management of a key, nor management of the battery. Furthermore, the prior art disclosed about the system which rents the battery itself which can be detached and attached freely is not found.

EFFECT OF THE INVENTION

[Effect of the Invention]As described above, a battery feeder in an electric motor rental system concerning the present invention is provided with more numbers than the number of an electric motor which can be rented of battery loading sections.

An always excessive battery is made into a charging state by a charge circuit.

Therefore, since the charged battery can be immediately lent out when the aforementioned electric motor is rented, it becomes possible to rent efficiently the battery with which an electric motor and it are loaded. It can be judged easily whether since the charging state of the aforementioned battery is displayed by the displaying means with which the battery feeder was equipped, it can rent the battery concerned.

TECHNICAL PROBLEM

[Problem to be solved by the invention]The present invention is made in consideration of a situation mentioned above, and is a thing.

The purpose is to provide a battery feeder in an electric motor rental system which can rent efficiently a battery which can be detached and attached, and with which it is loaded.

MEANS

[Means for solving problem]The battery feeder in the electric motor rental system of the present invention, It is made to park, where the electric motor which a battery can detach and attach freely and which can rent two or more sets is locked. Are an electric motor rental system which rents the aforementioned electric motor to a contract user, and Two or more battery loading sections which can hold more numbers than the number of the electric motor which can be rented of batteries, It has a charge circuit which is provided by each aforementioned battery loading section and charges the aforementioned battery with which it is loaded.

[0008]In this case, the battery feeder is provided with many numbers of battery loading sections rather than the number of the electric motor which can be rented, and makes the always excessive battery the charging state by the charge circuit. Therefore, since the charged battery

can be immediately lent out when the aforementioned electric motor is rented, an efficient rental is attained. It can be judged easily whether since the charging state of the aforementioned battery is displayed by the displaying means with which the battery feeder was equipped, it can rent the battery concerned.

[0009]

[Mode for carrying out the invention]Fig.1 shows the rental system of the electric motor in which the battery feeder which is one embodiment of the present invention is applied.

[0010]A rental system of this electric motor is provided with the following.

The parking lot for bicycles 10 currently parked in the state which can rent two or more sets of electric motors.

The central control room 12 which manages a situation and a user of the aforementioned parking lot for bicycles 10.

[0011]Here, Fig.2 shows the electric bicycle 14 which is an example of the electric motor rented with this rental system. This electric bicycle 14 is provided with the following.

The auxiliary drive part 16 which assists driving force by the pedal 15.

The battery 18 which supplies electric power to the aforementioned auxiliary drive part 16.

The battery 18 is stored by the battery case 20 with which the front part of the handle 19 was equipped, enabling free attachment and detachment. In order that the battery case 20 may prevent the theft of the stored battery 18, it has the lid 24 provided with the locking mechanism 22. The U-shaped engagement part 28 by which the circle lock with which the mainframe 26 under the saddle 25 was equipped in the parking lot for bicycles 10, and which is mentioned later is locked is provided. The circle lock 32 for preventing the theft in any parking part of the electric bicycle 14 is provided by the rear wheel 30. The circle lock with which the locking mechanism 22 of the battery 18 and the parking lot for bicycles 10 were equipped and which is mentioned later, and the circle lock 32 of the rear wheel 30 can be unlocked by the same key.

[0012]The parking lot for bicycles 10 is provided with the following.

The lending controller 34 which controls the whole lending processing of the electric bicycle 14 in the parking lot for bicycles 10 concerned to be shown in Fig.1 and Fig.3.

The user identification device 36 which identifies a user by user certificates, such as a noncontact IC card.

The display device 38 with a touch panel which displays and chooses selection information concerning the selectable electric bicycle 14.

The key which holds two or more keys of the electric bicycle 14 currently parked to the parking lot for bicycles 10, and starts the desired electric bicycle 14 The selectable key supply device 40, The battery feeder 42 holding two or more batteries 18, and the charging control device 43 which controls charge over an electric bicycle of a type with a built-in battery, The parking equipment 44 which makes two or more electric bicycles 14 park by a locked state, and the inventory answerback 48 which answers a stock condition of the electric bicycle 14 in the parking lot for bicycles 10 concerned according to an inquiry from the user telephone 46, The parking-lot-for-

bicycles monitoring instrument 50 which consists of CCD cameras etc. and supervises a situation of the parking lot for bicycles 10, and the emergency phone 52.

[0013]The central control room 12 is provided with the following.

The user controlling device 54 provided with a user's add function, a settlement-of-accounts function, and a controlling function of the parking lot for bicycles 10 as shown in Fig.1.

The user certificate issuing device 56 which publishes a user certificate which consists of noncontact IC cards etc.

Emergency-phone answerback 58 which responds to an inquiry from the emergency phone 52 installed in the parking lot for bicycles 10.

The user controlling device 54 and the lending controller 34 of the parking lot for bicycles 10 deliver and receive information via the modem 60.

[0014]Next, it describes in detail about specific constitution of the key supply device 40 and the battery feeder 42 which are arranged in the parking lot for bicycles 10, and the parking equipment 44.

[0015]The key supply device 40 is provided with two or more key boxes 64 which hold the key of the electric bicycle 14 to the casing 62 as shown in Fig.4. The key box 64 consists of the body part 66 and the key door 68 which store a key. While the magnet 72 which adsorbs the receiving part 70 of the key door 68, and maintains a closed state is arranged by the side part in the body part 66, the sensor 74 consisting of the microswitch etc. which detect the closed state of the key door 68 is arranged by it. The key cylinder 76 equipped with a key is arranged by the approximately center part of the body part 66. The solenoid 78 is arranged by the upper part of the body part 66, and the rod 80 driven by it is constituted so that an attitude in the body part 66 is possible. On the other hand, when the key door 68 concerned is in a closed state, the engagement part 82 with which the aforementioned rod 80 engages is arranged by the upper part of the key door 68 with which it is equipped via the hinge 81 to the body part 66. The concave part 84 is formed in the side part of the key door 68 that opening and closing should be made easy. The light emitting devices 86 and 88 which consist of LED etc. which show the loan of a key and a return state are arranged by the upper part of the key box 64 constituted in this way. And the sensor 74, the key cylinder 76, the solenoid 78, and the light emitting devices 86 and 88 are connected to the lending controller 34, respectively.

[0016]Fig.5 shows the battery 18 with which the electric bicycle 14 or the battery feeder 42 is loaded. This battery 18 is constituted by box shape with the handle 90 in the upper part, and the electrode which is not illustrated at the bottom part which opposes to the aforementioned handle 90 is arranged. The two projection parts 96 from which one surface by the side of the handle 90 turns into the planate engagement face 92 which intersects perpendicularly to the side part concerned, and the surface of another side separated from the handle 90 turns into the inclined plane 94 sloping in the aforementioned engagement face 92 side are formed in the side part.

[0017]As shown in Fig.6, two or more loading sections 100 by which the body part 98 is loaded with the battery 18 constituted as mentioned above are provided by the battery feeder 42 (refer to

Fig.3).In this case, only the number with more loading sections 100 than the number of the electric bicycle 14 lent out in the parking lot for bicycles 10 concerned is prepared. While the electrode 104 connected to the bottom part in the charge circuit 102 is arranged by the aforementioned loading section 100, the sensors 106, such as a microswitch which detects being loaded with the battery 18, are arranged by it. The locking mechanism 108 which prevents the sampling of the battery 18 concerned by engaging with one of the projection parts 96 provided by the side part of the battery 18 is arranged by the inner portion of the loading section 100. The light emitting devices 110, such as LED which shows the locked state of the battery 18 concerned, and the light emitting device 112 which are displaying means, such as LED which shows the charging state of the battery 18 concerned, are arranged by the opening of the loading section 100. These charge circuits 102, the sensor 106, the locking mechanism 108, and the light emitting devices 110 and 112 are connected to the lending controller 34.

[0018]Here, the locking mechanism 108 provided by the battery feeder 42 is constituted as shown in Fig.7 - Fig.9.That is, the locking mechanism 108 is provided with the following. The claw member 114 which engages with one of the projection parts 96 provided by side part of the battery 18.

The holder 116 holding the claw member 114.

The brackets 118 and 120 which support the holder 116.

The solenoid 122 for controlling operation of the holder 116.

[0019]The claw member 114 has the inclined plane 124 where the inclined plane 94 (refer to Fig.5) of the projection part 96 ****s at the time of the charge of the battery 18 to the loading section 100, and the engagement face 126 which engages with the engagement face 92 of the aforementioned projection part 96, and the opening 128 of the holder 116 is equipped with it. The holder 116 has the suspending portion 130 projected to the side, and a surface opposite to the surface where it is equipped with the claw member 114 is formed in a circular curved surface. In this circular curved surface, the bracket 118 which becomes roughly U-shaped is arranged. The one end part of the bracket 120 which becomes abbreviated L character-like engages with the aforementioned opening 128 by the side of the side surface of the holder 116 which abbreviated-intersects perpendicularly with the aforementioned suspending portion 130. And between the surface by the side of the other end of the aforementioned bracket 120, and the aforementioned bracket 118, the spring 132 for maintaining the claw member 114 in the state of Fig.8 is arranged. On the other hand, the rod 134 of the solenoid 122 which constitutes the locking mechanism 108 is equipped with the stopper 138 via the spring 136. In the state where the rod 134 projected, this stopper 138 engages with the suspending portion 130 of the holder 116 that the claw member 114 should be maintained in the state of Fig.8.

[0020]Two or more parking equipment 44 which makes two or more electric bicycles 14 park is provided by the parking lot for bicycles 10. This parking equipment 44 is provided with the following.

The guide rail 140 which positions a side direction of the electric bicycle 14 as shown in Fig.3.

The positioning mechanism 142 which positions a front wheel.

The locking mechanism 144 which locks the electric bicycle 14.

The electric socket 145 for charging an electric bicycle which a type with a built-in battery parked to the parking equipment 44 concerned does not illustrate.

It reaches [whether the electric bicycle of the type with a built-in battery is connected to the electric socket 145, and], and the charging state is controlled by the charging control device 43 under management of the lending controller 34.

[0021]The support 160 set up between the guide rails 140 as the locking mechanism 144 was shown in Fig.3 and Fig.10,It comprises the fixed pivot part 162 arranged by the upper end part of the support 160, the turning arm 164 by which a one end part is fixed to the fixed pivot part 162, and the circle lock 166 with which the other end of the turning arm 164 is equipped. As shown in Fig.10, the circle lock 166 is engaging with the U-shaped engagement part 28 of the mainframe 26 of the electric bicycle 14, and it prevents the fall under parking while it prevents the theft of the electric bicycle 14 concerned. When the mainframe 26 is thin pipe state, it may be made to carry out engagement of this circle lock 166 to the mainframe 26 directly.

[0022]The rental system of the electric motor of this embodiment is constituted as mentioned above fundamentally, and is described about loan and return processing of the electric bicycle 14 and the battery 18 in which this rental system was used next.

[0023]In advance of use of a rental system, first Under control of the user controlling device 54, Using the user certificate issuing device 56 of the central control room 12, information, including the bank account number for settlement of accounts of the kind (range) of a contract user's address, a name, and loan vehicles and a utilization charge, a card ID number, a user ID number, a password, a shelf-life, etc., is registered, and user certificates, such as a noncontact IC card, are published. These pieces of information is registered into the "user lists" of the user controlling device 54.

[0024]Next, the user who owns a user certificate calls the inventory answerback 48 of the parking lot for bicycles 10 by user telephone 46, for example. In this case, the parking equipment 44 of the parking lot for bicycles 10 is carrying out the firm gas of the signal concerning the existence data of the electric bicycle 14 which the vehicle sensor which is not illustrated detected to the lending controller 34, The aforementioned lending controller 34 converts this existence data to the voice information which shows the kind and the number of inventory of the electric bicycle 14, for example, and provides the inventory answerback 48 with it in real time. Then, the user can judge the existence of the desired electric bicycle 14 according to the audio response from the aforementioned inventory answerback 48.

[0025]If stock is checked, a user will check out the desired electric bicycle 14 in the parking lot for bicycles 10 next. In this case, a user's check is first performed by the user identification device 36. A user's confirming processing is performed according to the flow chart shown in Fig.11.

[0026]That is, a user brings user certificates, such as a noncontact IC card, close to the user identification device 36 with which the parking lot for bicycles 10 was equipped. The lending

controller 34 reads user data, such as a card ID number and a user ID number, via the user identification device 36 (Step S1), and extracts a user ID number from these user data (Step S2). The check of whether the extracted user ID number is that comparative collation is carried out to the user ID number which is transmitted to the user controlling device 54 and registered into it via the modem 60, and the user concerned is a normal user is performed (Step S3). Here, exception processing is performed when it is not a normal user (step S4).

[0027]On the other hand, if it is checked that he is a normal user, user data, such as a kind (range) of the password concerning the aforementioned user ID number and loan vehicles, a shelf-life, and lending status, will be read from the user controlling device 54, and will be transmitted to the lending controller 34 via the modem 60 (Step S5). And it is checked whether based on the data of the aforementioned lending status, the user concerned is lending out the electric bicycle 14 (Step S6). In this case, if it is under loan, the user concerned will judge with returning the electric bicycle 14, and will perform processing in in the "return mode" mentioned later (Step S7).

[0028]When not having lent out is checked, the right of use which shows whether it is in the state where the user concerned can use now, based on the aforementioned user data is checked (Step S8). A check of the right of use will check [next] whether the user certificate of the user concerned is within the term of validity (step S9). Exception processing is performed, when there is no right of use or it is over the term of validity (Step S10). It has the right of use, and in being within the term of validity, it performs the following "loan mode" (Step S11).

[0029]Then, processing of "loan mode" is described according to the flow chart shown in [Fig.12](#) - Fig.14.

[0030]First, a user inputs a password using the display device 38 with a touch panel (Step S101). The lending controller 34 is compared with the password of user data which is having the input password registered while it starts the count of the input frequency of a password (Step S102) (Step S103). Here, when the input frequency of a password is 3 times or more (Step S104), it is regarded as that where a mistake is in a number, and exception processing is performed (Step S105).

[0031]On the other hand, when a password corresponds, while reading the vehicles selection propriety data based on the data from the parking equipment 44 (Step S106), the kind (range) of loan vehicles of user data is read (Step S107). That is, the parking equipment 44 supplies the existence data of the electric bicycle 14 to the lending controller 34 as a signal from the vehicle sensor which is not illustrated. In this case, the lending controller 34 creates the vehicles selection propriety data showing the ability whether the electric bicycle 14 can be in use or not to be used by whether to be usable, failure, etc. in the range of the loan vehicles of the user concerned based on the aforementioned existence data. And based on these data, usable vehicles are displayed on the display device 38 with a touch panel (Step S108).

[0032]While the usable electric bicycle 14 in the parking lot for bicycles 10 is displayed with a picture (photograph) etc. for example, so that a color, size, the height of a saddle, etc. may be known, information, including a utilization charge, utilization time, etc., is displayed on the

display device 38 with a touch panel. A user chooses the desired electric bicycle 14 by operating the display device 38 with a touch panel based on this display (Step S109). It is checked whether the lending controller 34 has the usable electric bicycle 14 which the user chose (Step S110).

[0033]If the electric bicycle 14 with the selected user is usable, the lending controller 34 will choose the fleet number (Step S111), and the vehicle data corresponding to the fleet number concerned will be read (Step S112).

[0034]Next, the lending controller 34 outputs an unlocking signal to the key box 64 (refer to [Fig.4](#)) which holds the key of the selected electric bicycle 14 according to the aforementioned fleet number. The solenoid 78 of the key box 64 makes the rod 80 leave the engagement part 82 of the key door 68 according to the aforementioned unlocking signal (Step S113). Thereby, the key box 64 is unlocked. At this time, the light emitting device 88 arranged by the upper part of the aforementioned key box 64 blinks, and a user is told about having unlocked. A sound can also perform instead of the light emitting device 88 performing the instruction holding an available key of the key box 64.

[0035]If a user opens the key door 68 of the key box 64 which the light emitting device 88 blinks (Step S114), the sensor 74 will operate, the light emitting device 86 will blink, and it will tell that the key door 68 was opened wide (Step S115). If a user rotates the key cylinder 76 to the "loan" side and it extracts a key (Step S116), while the light emitting device 86 will be in lighting status, the lending controller 34 will be told about having extracted the key (Step S117). In this case, in the lending controller 34, it is checked that the loan of the electric bicycle 14 of the fleet number corresponding to the key concerned has been started.

[0036]If a user closes the key door 68 of the key box 64 (Step S118), while the sensor 74 will operate and the light emitting devices 86 and 88 will go out, the lending controller 34 is told about the key door 68 having been closed (Step S119). Then, the lending controller 34 outputs a locking signal to the solenoid 78, by this locking signal, the rod 80 descends, it engages with the engagement part 82, and locking is performed (Step S120).

[0037]Next, the lending controller 34 checks the vehicle type of the electric bicycle 14 which carries out a loan from a fleet number (Step S121). In this case, when it is checked whether it is what needs the battery 18 which the selected electric bicycle 14 can detach and attach freely and you need, it reads battery selection propriety data (Step S122). When it is an electric bicycle which the battery 18 cannot detach and attach freely, in the parking lot for bicycles 10 shown in [Fig.3](#), it charges directly from the electric socket 145, therefore it is not necessary to choose the battery 18.

[0038]Here, battery selection propriety data expresses the data applied to the selectable battery 18 created with the existence data of the battery 18 in each loading section 100 of the battery feeder 42, and the use propriety data based on a charging state, for example. The existence of the battery 18 can be checked by the sensor 106 shown in [Fig.6](#), and a charging state can be checked by the charge circuit 102.

[0039]Based on the read battery selection propriety data, the display device 38 with a touch panel displays it, as the battery 18 which can be lent out is shown in [Fig.15](#) (Step S123). That is,

in order to make selection by a user easy, the battery 18 which charge can complete and can be lent out, for example, and the battery 18 which charge during a loan has not completed are displayed on the display device 38 with a touch panel in the identifiable state by classification by color etc. For example, the non-charging state can use things other than a completely charged state, when red and a half-charging state will use blue and a completely charged state at a short distance, even if there is nothing of a completely charged state yellow and the charging state of 3/4 by displaying as green.

[0040]Then, a user chooses the key of decision, after choosing the number of the battery 18 of an available request from the displayed battery 18 (Step S124). In this case, check whether the lending controller 34 is charged to the state with the usable selected battery 18 (Step S125), and if usable, While releasing the locking mechanism 108 of the loading section 100 to which the battery feeder 42 corresponds (Step S126), the light emitting device 110 is turned on.

[0041]Here, the battery feeder 42 is provided with the loading section 100 which can charge and hold many numbers of batteries 18 in the parking lot for bicycles 10 rather than the number of the electric bicycle 14 which can be rented. Therefore, when a user tries to check out the electric bicycle 14 immediately after return from the state where all the electric bicycles 14 were lent out, for example, he can check out immediately the intact battery 18 by which power receiving is carried out sufficiently from the battery feeder 42. In this case, in order to charge the battery 18 concerned, a user is not kept waiting for a long time, and the electric bicycle 14 can be checked out very efficiently. Although the number of the batteries 18 is set up the less than twice of the number of the electric bicycle 14 which can be rented, for example, it simulates a busy condition and it may be made to set up the optimal number.

[0042]As shown in Fig.6, the battery 18 with which the loading section 100 was loaded is locked because the engagement face 92 of the projection part 96 arranged by the side part engages with the engagement face 126 of the claw member 114 which constitutes the locking mechanism 108. The electrode in which a bottom part does not illustrate the battery 18 in this state touches the electrode 104 of the charge circuit 102, and charging treatment is continued. And a charging state is detectable from outside by the light emitting device 112.

[0043]Then, when a lock release signal is supplied to the predetermined loading section 100 from the lending controller 34, as shown in Fig.7, the solenoid 122 will operate, the rod 134 will retract and the stopper 138 will separate from the suspending portion 130 of the holder 116 (Step S126). In this state, when a worker extracts the battery 18 from the loading section 100, as the holder 116 shows Fig.9 via the claw member 114 of the locking mechanism 108 by the projection part 96 of the battery 18, it inclines. Therefore, the aforementioned projection part 96 will get over the claw member 114, and it will extract the battery 18 (Step S127).

[0044]If it extracts the battery 18, it will detect that there is no sensor 106 of 18 battery arranged by the bottom part of the loading section 100, and the detection signal will be transmitted to the lending controller 34 (Step S128). Subsequently, the solenoid 122 of the locking mechanism 108 will operate, the stopper 138 will engage with the suspending portion 130 of the holder 116 via the rod 134, and the locking mechanism 108 concerned will be in a locked state again, and the

light emitting device 110 is switched off (Step S129).

[0045]After the above processing is completed, on the other hand, the lending controller 34, The fleet number of the electric bicycle 14 lent out to the user data currently held at the register, loan time, the flag that shows that it is under loan, etc. are transmitted to the user controlling device 54 via the write (Step S130) modem 60 (Step S131). The user ID number of the user who uses the electric bicycle 14 concerned to the vehicle data currently held at the register, loan start time, etc. are transmitted to the user controlling device 54 via the write (Step S132) modem 60 (Step S133).

[0046]After a lending process is completed as mentioned above, a user unlocks the electric bicycle 14 with which the parking equipment 44 corresponds using the key taken out from the key supply device 40. In this case, the electric bicycle 14 is locked by the parking equipment 44 with the circle lock 166 provided by the point of the turning arm 164 which constitutes the locking mechanism 144 arranged between the electric bicycles 14, as shown in [Fig.3](#) and [Fig.10](#). Then, the aforementioned circle lock 166 is unlocked using a key, and it removes from the U-shaped engagement part 28 of the mainframe 26. In this case, since the guide rail 140 is aslant installed as shown in [Fig.3](#), the locking mechanism 144 over the adjoining electric bicycle 14 does not become obstructive [unlocking]. The turning arm 164 by which the circle lock 166 was unlocked is made to rotate around the center of the support 160, and is evacuated to the position shown as the solid line of [Fig.10](#). After unlocking as mentioned above, the electric bicycle 14 concerned is picked out from the parking equipment 44.

[0047]After a user loads with the battery 18 picked out from the battery feeder 42 to the battery case 20 of the taken-out electric bicycle 14 next and closes the lid 24, he locks the locking mechanism 22 by the key which unlocked the aforementioned circle lock 166. A user will ride on the electric bicycle 14 which was used in this way and loaded with the battery 18, and will move to a desired place.

[0048]Next, it describes about the processing in the case of returning the used electric bicycle 14. A user brings a user certificate close to the user identification device 36 first like the case where the electric bicycle 14 is checked out, in the parking lot for bicycles 10. The lending controller 34 is carrying out comparative collation to the user ID number which is having the user ID number which read user data via the user identification device 36, and was extracted from this user data registered, and it is checked whether the user concerned is a normal user. The password which will start the aforementioned user ID number if it is checked that he is a normal user, User data, such as a kind (range) of loan vehicles, a shelf-life, and lending status, is read from the user controlling device 54, and it is checked whether based on the data of the aforementioned lending status, the user concerned is lending out the electric bicycle 14. In this case, since it is under loan, the user concerned judges with returning the electric bicycle 14, and performs processing in "return mode."

[0049]Next, according to the flow chart shown in [Fig.16](#) and [Fig.17](#), it describes about processing in in this "return mode."

[0050]First, the lending controller 34 reads the vehicle data containing a fleet number, a user ID

number, loan start time, loan finish time, etc. (Step S201), and checks whether the electric bicycle 14 concerning the aforementioned fleet number has been returned (Step S202). When the electric bicycle 14 concerned is not returned, the display device 38 with a touch panel displays a vehicles return demand screen, and return is urged to it (Step S203).

[0051]Then, a user returns the electric bicycle 14 to the position of the parking equipment 44. That is, after carrying out engagement of the wheel of order to the guide rail 140, ranking second and positioning a front wheel according to the positioning mechanism 142, the turning arm 162 is made to rotate and the circle lock 166 which constitutes the locking mechanism 144 in the U-shaped engagement part 28 of the mainframe 26 is locked.

[0052]If the electric bicycle 14 is returned to the predetermined parking equipment 44 as mentioned above, the vehicle sensor which was provided by the positioning mechanism 142 and which is not illustrated will detect a return state, and will transmit a return detection signal to the lending controller 34. Therefore, the lending controller 34 is judged to be that to which the predetermined electric bicycle 14 was returned (Step S202), and the kind of return vehicles is checked based on vehicle data (Step S204).

[0053]When it is the electric bicycle 14 which has here the battery 18 which return vehicles can detach and attach freely, The proper inventory figures of the battery 18 are calculated based on the number of batteries and the aforementioned vehicle number under loan which calculates the vehicle number under loan and which was detected by the sensor 106 of the battery feeder 42 on the other hand (Step S205) (Step S206), It is checked whether the battery 18 has been returned (Step S207). When the battery 18 is not returned, the display device 38 with a touch panel displays a battery return demand screen, and return is urged to it (Step S208).

[0054]After return of the electric bicycle 14 and the battery 18 is completed, a user returns a key. In this case, the lending controller 34 outputs an unlocking signal to the key box 64 (refer to Fig.4) applicable according to the fleet number of the returned electric bicycle 14. The solenoid 78 of the key box 64 makes the rod 80 leave the engagement part 82 of the key door 68 according to the aforementioned unlocking signal (Step S209). Thereby, the key box 64 is unlocked. At this time, the light emitting device 88 arranged by the upper part of the aforementioned key box 64 blinks, and a user is told about having unlocked.

[0055]If a user opens the key door 68 of the key box 64 which the light emitting device 88 blinks (Step S210), the sensor 74 will operate, the light emitting device 86 will blink, and it will tell that the key door 68 was opened wide (Step S211). If a user inserts a key in the key cylinder 76 and makes it rotate to the "return" side (Step S212), while the light emitting device 86 will be in lighting status, the lending controller 34 will be told about the key having been returned (Step S213).

[0056]If a user closes the key door 68 of the key box 64 (Step S214), while the sensor 74 will operate and the light emitting devices 86 and 88 will go out, the lending controller 34 is told about the key door 68 having been closed (Step S215). Then, the lending controller 34 supplies a locking signal to the solenoid 78, by this locking signal, the rod 80 descends, it engages with the engagement part 82, and locking is performed (Step S216).

[0057]On the other hand, while performing clear processing of the fleet number of the returned electric bicycle 14, and the flag which shows that it is under loan to the user data currently held at the register, the lending controller 34, Loan finish time is transmitted to the user controlling device 54 via the write (Step S217) modem 60 (Step S218). While performing a user's user ID number and clear processing of the flag which shows that it is under loan to the vehicle data currently held at the register, loan finish time is transmitted to the user controlling device 54 via the write (Step S219) modem 60 (Step S220).

[0058]Return processing of the electric bicycle 14 is completed as mentioned above. The Assessment on Search Report by Designated Searching Authority of the user who lent out the electric bicycle 14, While being managed with the user controlling device 54 based on the aforementioned user data, for example, totaling a contract user's Assessment on Search Report by Designated Searching Authority for every unit time period and displaying accounting information via the display device 38 with a touch panel, processing of issue of use details, fee collection, etc. is performed.

[0059]In the embodiment mentioned above, since the battery 18 serves as the same form, can return to any vacant loading section 100 in two or more loading sections 100 provided by the battery feeder 42, but. When this battery 18 has two or more kinds, it is also possible to constitute so that the loading section 100 which should be returned according to that kind may be instructed.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a configuration block figure of the rental system of an electric motor.

[Drawing 2]It is an explanatory view of an electric bicycle.

[Drawing 3]It is a configuration diagram of a parking lot for bicycles.

[Drawing 4]It is a configuration diagram of a key supply device.

[Drawing 5]It is a configuration diagram of a battery.

[Drawing 6]It is a section configuration diagram of a battery feeder.

[Drawing 7]It is a configuration diagram of the locking mechanism in a battery feeder.

[Drawing 8]It is a section explanatory view showing the locked state of the locking mechanism in a battery feeder.

[Drawing 9]It is a section explanatory view showing the unlocked state of the locking mechanism in a battery feeder.

[Drawing 10]It is a related explanatory view of a locking mechanism and an electric bicycle.

[Drawing 11]It is a flow chart which performs a user's confirming processing.

[Drawing 12]It is a flow chart of loan mode.

[Drawing 13]It is a flow chart of loan mode.

[Drawing 14]It is a flow chart of loan mode.

[Drawing 15]It is an explanatory view of the battery lending information displayed on the

display device with a touch panel.

[Drawing 16] It is a flow chart in return mode.

[Drawing 17] It is a flow chart in return mode.

[Explanations of letters or numerals]

10 -- Parking-lot-for-bicycles 12 -- Central control room

14 -- Electric bicycle 18 -- Battery

38 -- Display-device 40 with a touch panel -- Key supply device

42 -- Battery feeder 44 -- Parking equipment

48 -- Inventory answerback 50 -- Parking-lot-for-bicycles monitoring instrument

54 -- User controlling device 56 -- User certificate issuing device

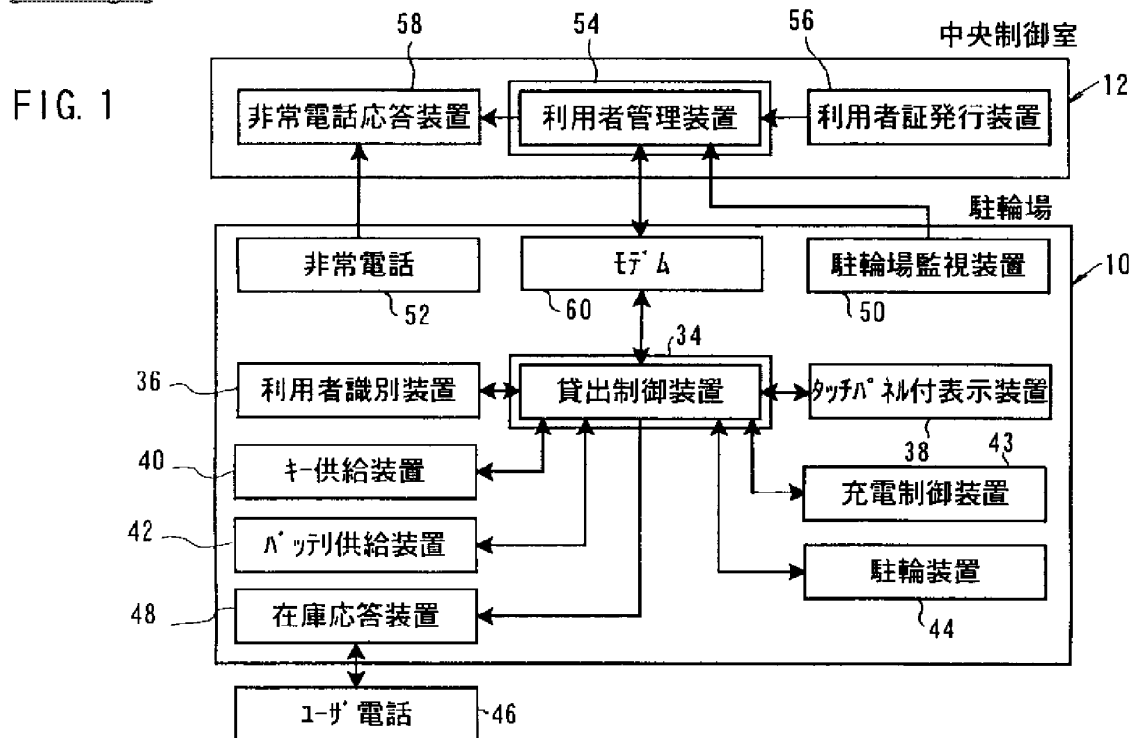
58 -- Emergency-phone answerback 60 -- Modem

64 -- key box 108, 144 -- locking mechanism

142 -- Positioning mechanism

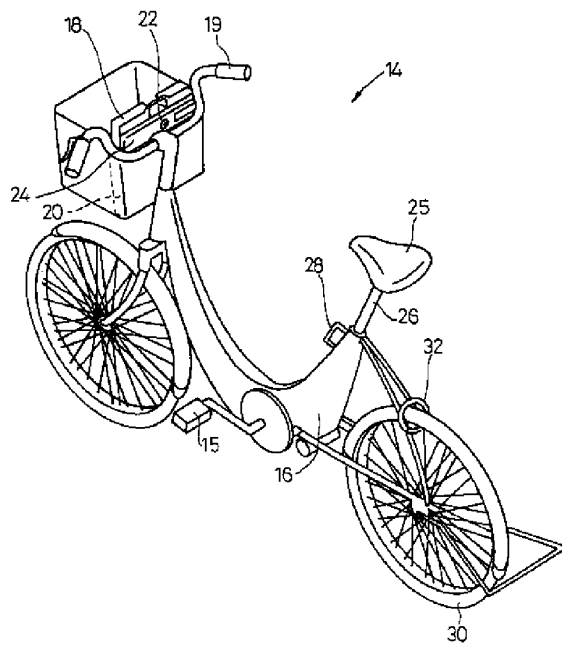
DRAWINGS

[Drawing 1]



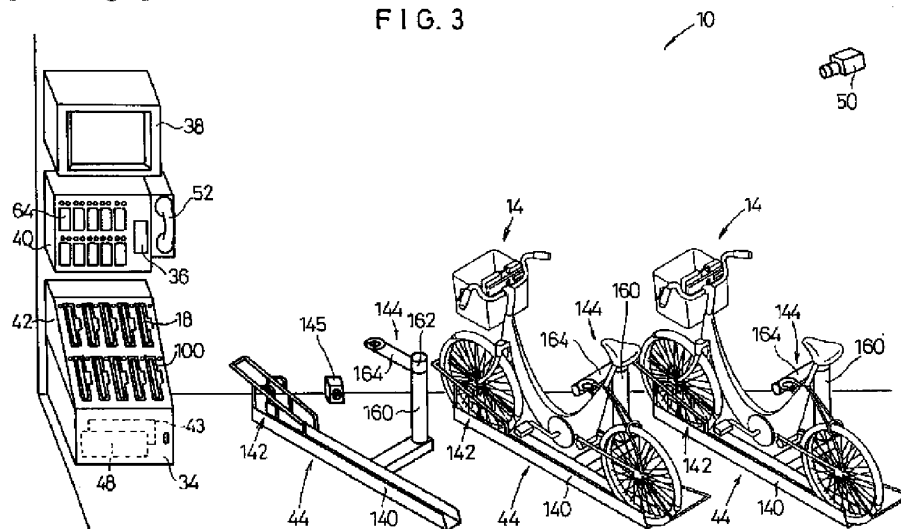
[Drawing 2]

FIG. 2



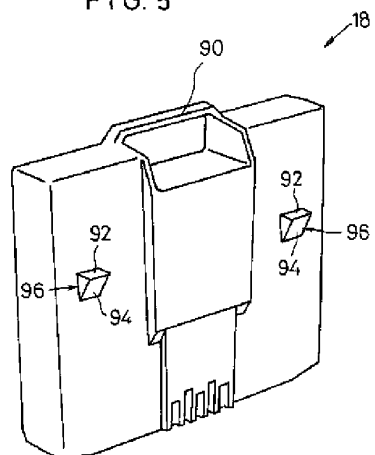
[Drawing 3]

FIG. 3



[Drawing 5]

FIG. 5



[Drawing 4]

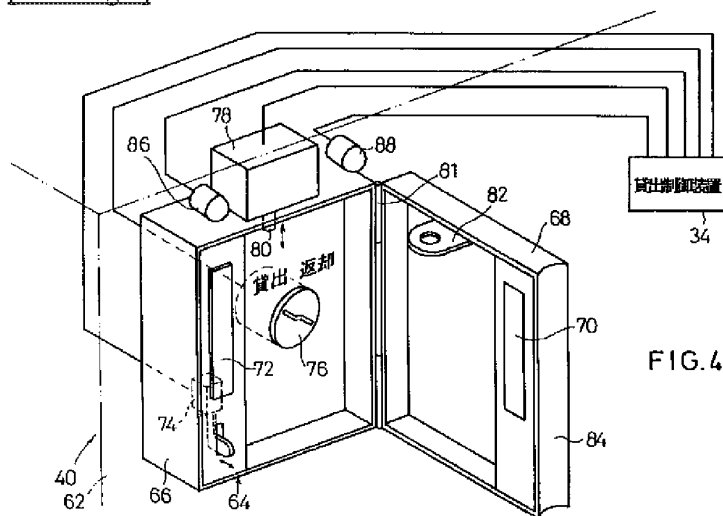
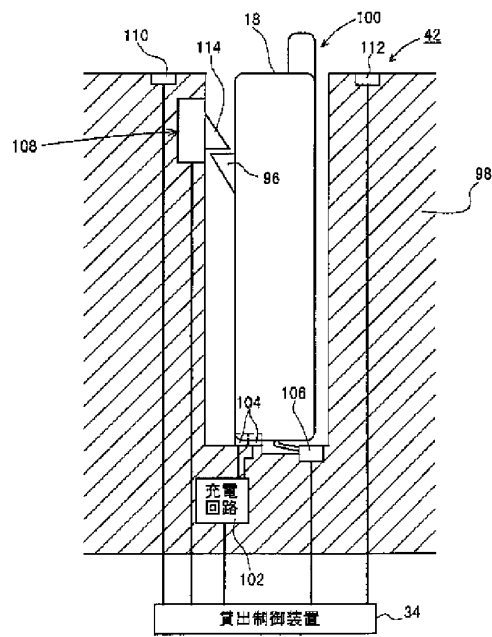


FIG. 4

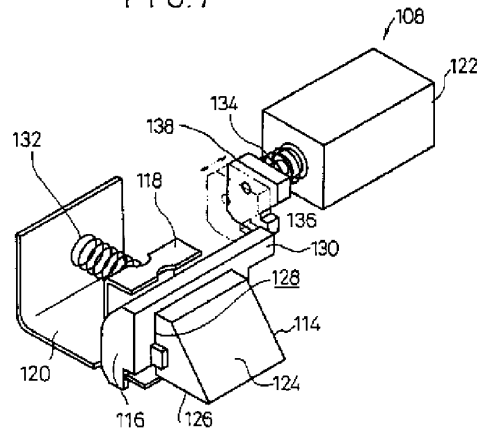
[Drawing 6]

FIG.6

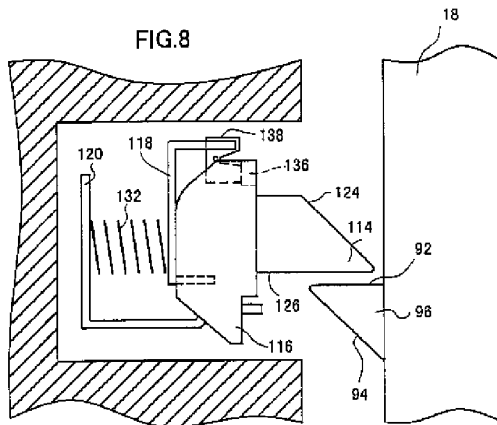


[Drawing 7]

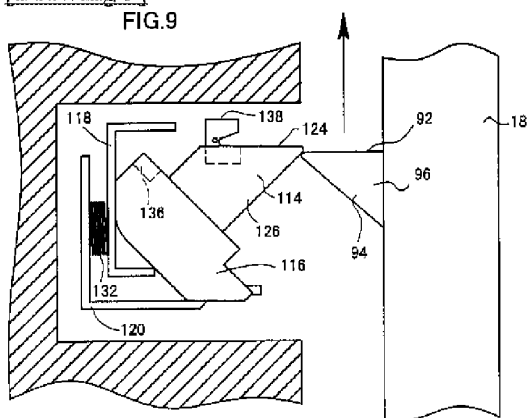
FIG. 7



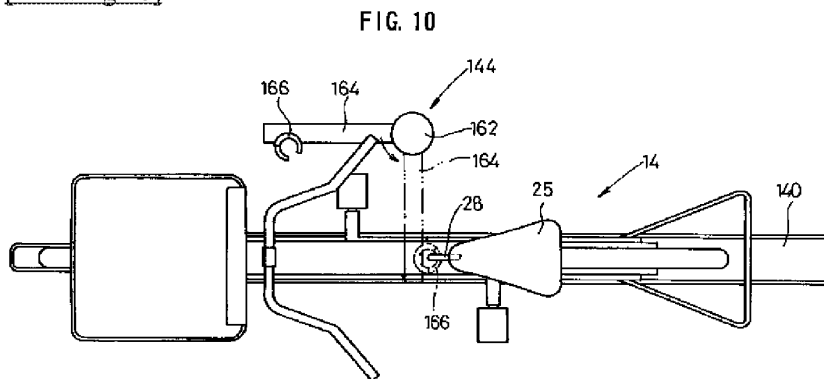
[Drawing 8]



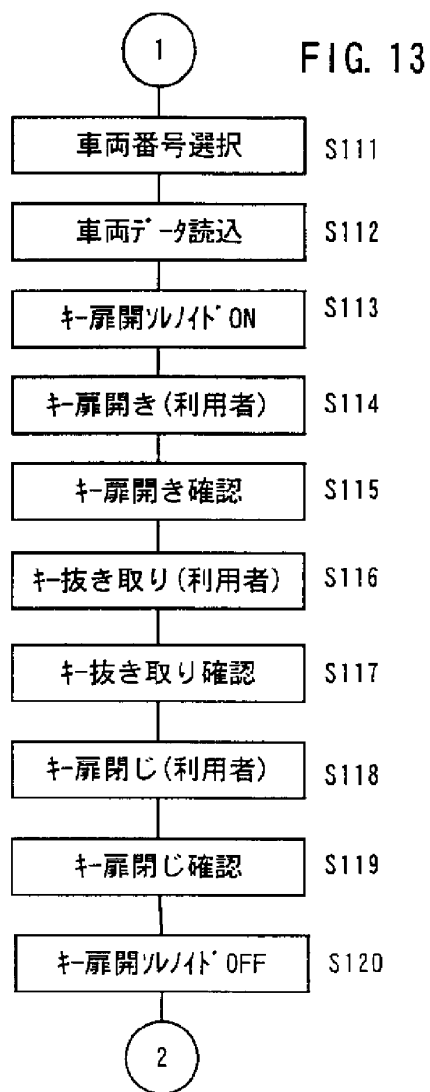
[Drawing 9]



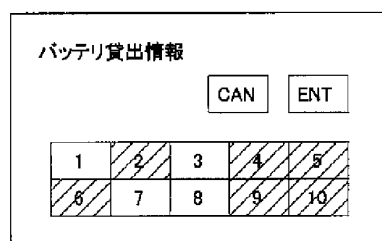
[Drawing 10]



[Drawing 13]

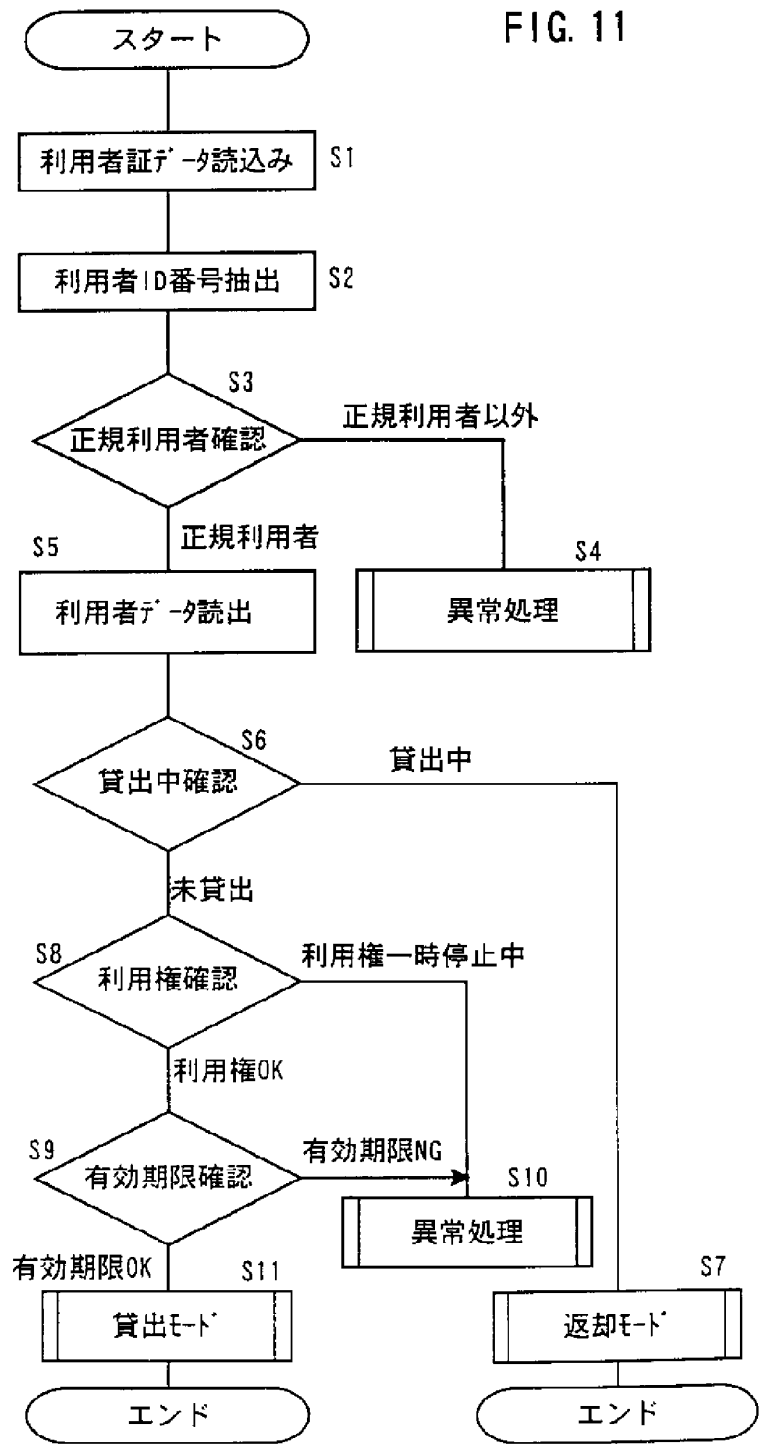


[Drawing 15]
FIG.15



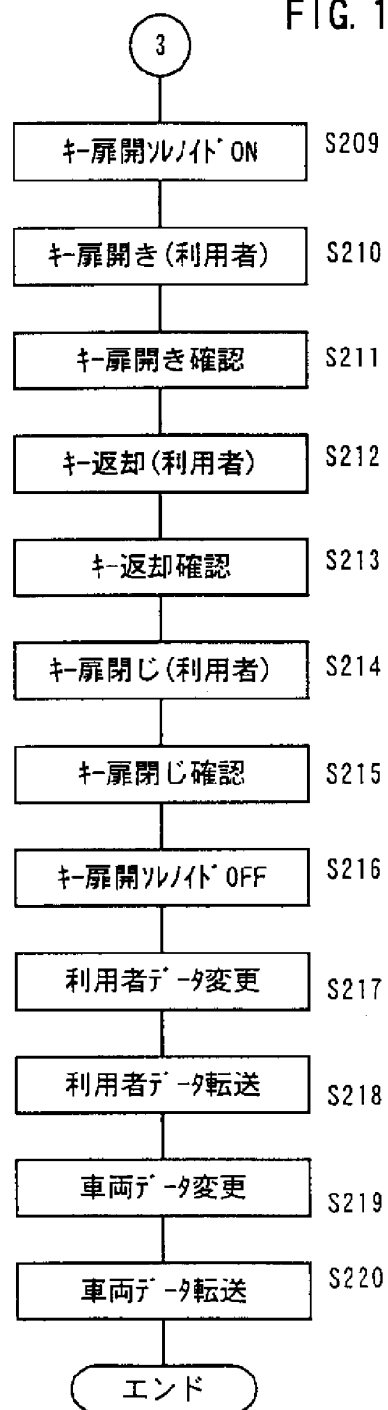
[Drawing 11]

FIG. 11

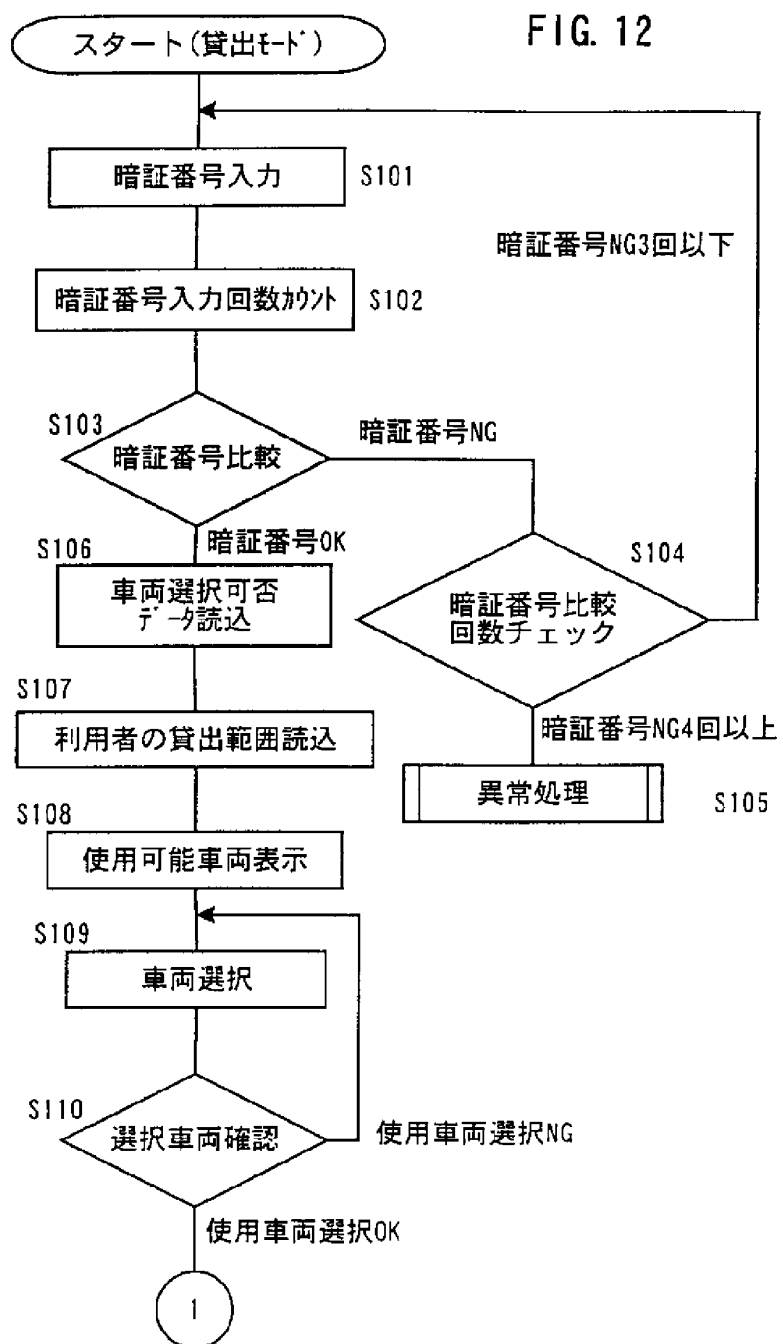


[Drawing 17]

FIG. 17



[Drawing 12]



[Drawing 14]

FIG. 14

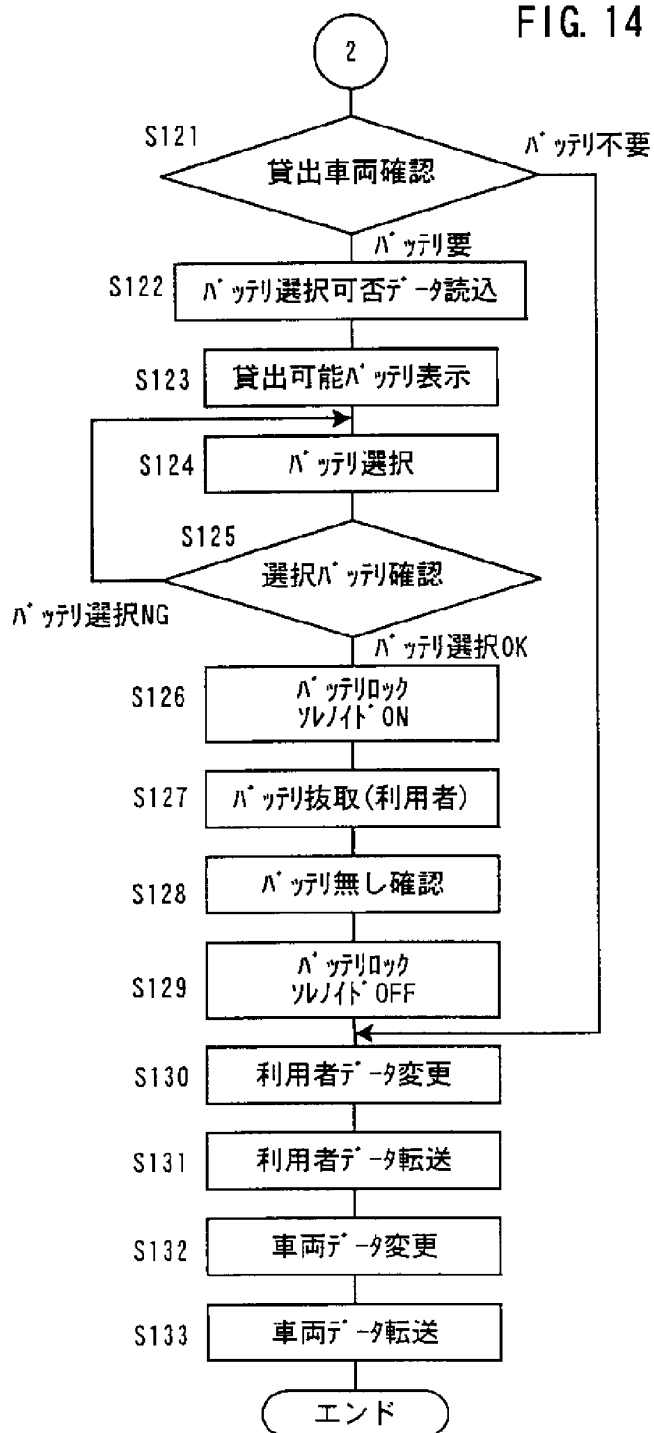
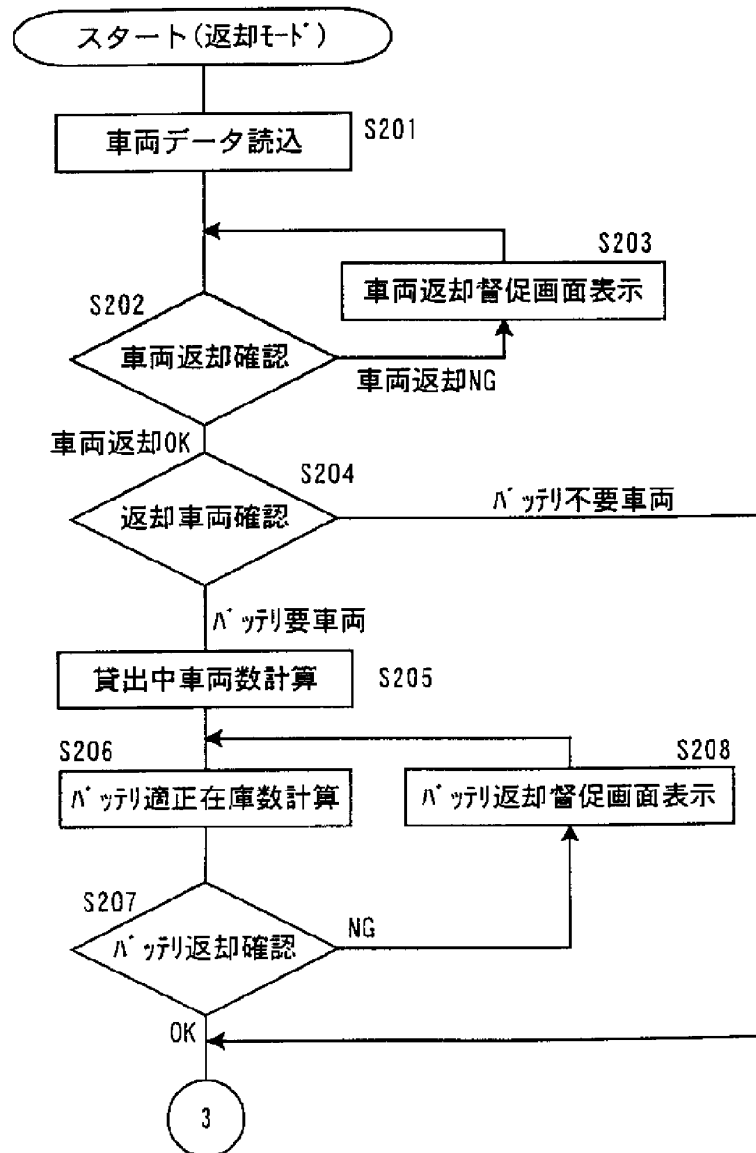


FIG. 16



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7/02		7/02	F
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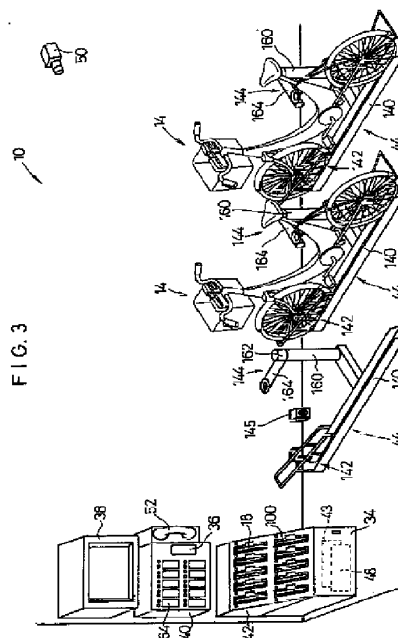
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(54)【発明の名称】 電動車両レンタルシステムにおけるバッテリー供給装置

(57) 【要約】

【課題】電動車両に装填される着脱自在なバッテリーを効率的にレンタルすることのできる電動車両レンタルシステムにおけるバッテリー供給装置を提供することを目的とする。

【解決手段】利用者識別装置36によって識別された利用者は、バッテリー供給装置42から充電済みのバッテリー18を取り出し、電動二輪車14に装填して使用する。この場合、前記バッテリー供給装置42には、レンタル可能な電動二輪車14の台数よりも多い数の装填部100が準備されているため、常に受電完了状態にあるバッテリー18を選択することができる。従って、充電のための待ち時間が生じることがなく、電動二輪車14が効率的にレンタルされることになる。



【特許請求の範囲】

【請求項1】バッテリーが着脱自在である複数台のレンタル可能な電動車両を施錠した状態で駐輪させておき、契約利用者に対して前記電動車両をレンタルする電動車両レンタルシステムであって、レンタル可能な電動車両の台数よりも多い数のバッテリーを保持可能な複数のバッテリー装填部と、前記各バッテリー装填部に設けられ、装填されている前記バッテリーを充電する充電回路と、を備えることを特徴とする電動車両レンタルシステムにおけるバッテリー供給装置。

【請求項2】請求項1記載の装置において、前記バッテリーの充電状態を示す表示手段を備えることを特徴とする電動車両レンタルシステムにおけるバッテリー供給装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、バッテリーが着脱自在である複数台のレンタル可能な電動車両を施錠した状態で駐輪させておき、契約利用者に対して前記電動車両をレンタルする電動車両レンタルシステムにおけるバッテリー供給装置に関する。

【0002】

【従来の技術】自転車や自動車等の車両をレンタルするシステムは、従来より多数存在している。例えば、自動車のレンタルシステムは、利用者がレンタル会社で必要事項を書類に記載してキーを受け取り、所望の自動車を借りて所定時間使用した後、そのレンタル会社に返却するのが一般的である。この場合、レンタル契約やキーの受渡処理、さらには、返却時における精算処理等は、利用者やレンタル会社の作業員にとって相当に煩雑なものとなっている。

【0003】そこで、例えば、特開平6-68095号公報に記載されたシステムでは、加入者が所持する磁気カード等の識別手段を自動車に装備された判断手段で読み取ることで車の使用の可否を判断し、使用可であればドアを解錠してレンタルを可能とする一方、当該自動車の位置を自動車位置識別装置を介して中央制御装置で追跡可能としている。この場合、レンタルの簡便化が図られるとともに、自動車の位置を識別できることから返却の自由度が向上するという利点が得られる。

【0004】また、特開平7-325959号公報に記載されたシステムでは、複数の携帯電話を収納する貸出ステーションにおいて、利用者が有するカードを用いて所望の携帯電話をレンタルし、その利用代金を携帯電話に内蔵された利用度数の積算値に基づいて算出するようにしている。

【0005】しかしながら、これらの従来技術では、利用者が選択できる車両や携帯電話の種類等を簡便に把握できる構成とはなっていない。一方、特開平2-937

96号公報には、利用者が所有するバッテリーを有料で充電可能とした装置が開示されている。しかしながら、この従来技術には、キーの管理やバッテリーの管理について言及されていない。ましてや、着脱自在なバッテリーそのものをレンタルするシステムについて開示された従来技術は見あたらない。

【0006】

【発明が解決しようとする課題】本発明は、前述した事情を考慮してなされたものであり、電動車両に装填される着脱自在なバッテリーを効率的にレンタルすることのできる電動車両レンタルシステムにおけるバッテリー供給装置を提供することを目的とする。

【0007】

【課題を解決するための手段】本発明の電動車両レンタルシステムにおけるバッテリー供給装置は、バッテリーが着脱自在である複数台のレンタル可能な電動車両を施錠した状態で駐輪させておき、契約利用者に対して前記電動車両をレンタルする電動車両レンタルシステムであって、レンタル可能な電動車両の台数よりも多い数のバッテリーを保持可能な複数のバッテリー装填部と、前記各バッテリー装填部に設けられ、装填されている前記バッテリーを充電する充電回路と、を備えることを特徴とする。

【0008】この場合、バッテリー供給装置は、レンタル可能な電動車両の台数よりも多い数のバッテリー装填部を備えており、常時余分なバッテリーを充電回路によって充電状態としている。従って、前記電動車両がレンタルされる際、充電されたバッテリーを即座に貸し出すことができるため、効率的なレンタルが可能となる。なお、前記バッテリーの充電状態は、バッテリー供給装置に備えられた表示手段によって表示されるため、当該バッテリーがレンタル可能であるか否かを容易に判断することができる。

【0009】

【発明の実施の形態】図1は、本発明の一実施形態であるバッテリー供給装置が適用される電動車両のレンタルシステムを示す。

【0010】この電動車両のレンタルシステムは、複数台の電動車両がレンタル可能な状態で駐輪されている駐輪場10と、前記駐輪場10の状況および利用者を管理する中央制御室12とを備える。

【0011】ここで、図2は、このレンタルシステムでレンタルされる電動車両の一例である電動二輪車14を示す。この電動二輪車14は、ペダル15による駆動力を補助する補助駆動部16と、前記補助駆動部16に対して電力を供給するバッテリー18とを備える。バッテリー18は、ハンドル19の前部に装着されたバッテリーケース20に着脱自在に収納される。バッテリーケース20は、収納されたバッテリー18の盗難を防止するため、ロック機構22を備えた蓋24を有する。また、サドル25の下メインフレーム26には、駐輪場10に装備された後述するサークル錠が施錠されるコ字状係合部28

が設けられる。さらに、後輪30には、電動二輪車14の任意の駐輪個所での盗難を防止するためのサークル錠32が設けられる。なお、バッテリー18のロック機構22、駐輪場10に装備された後述するサークル錠および後輪30のサークル錠32は、同一のキーで解錠可能となっている。

【0012】駐輪場10は、図1および図3に示すように、当該駐輪場10における電動二輪車14の貸出処理の全体を制御する貸出制御装置34と、非接触式ICカード等の利用者証により利用者を識別する利用者識別装置36と、選択可能な電動二輪車14に係る選択情報を表示し、且つ、選択するタッチパネル付表示装置38と、駐輪場10に駐輪されている電動二輪車14の複数のキーを保持し、所望の電動二輪車14に係るキーを選択可能なキー供給装置40と、複数のバッテリー18を保持するバッテリー供給装置42と、バッテリー内蔵タイプの電動二輪車に対する充電を制御する充電制御装置43と、複数台の電動二輪車14を施錠状態で駐輪させる駐輪装置44と、ユーザ電話46からの問い合わせに応じ、当該駐輪場10における電動二輪車14の在庫状態の応答を行う在庫応答装置48と、CCDカメラ等からなり、駐輪場10の状況を監視する駐輪場監視装置50と、非常電話52とを備える。

【0013】中央制御室12は、図1に示すように、利用者の登録機能、精算機能および駐輪場10の管理機能を備える利用者管理装置54と、非接触式ICカード等からなる利用者証を発行する利用者証発行装置56と、駐輪場10に設置された非常電話52からの問い合わせに対して応答する非常電話応答装置58とを有する。なお、利用者管理装置54と駐輪場10の貸出制御装置34とは、モデム60を介して情報の授受を行う。

【0014】次に、駐輪場10に配置されたキー供給装置40、バッテリー供給装置42および駐輪装置44の具体的な構成について詳細に説明する。

【0015】キー供給装置40は、図4に示すように、ケーシング62に対して電動二輪車14のキーを保持する複数のキーボックス64を備える。キーボックス64は、キーを収納する本体部66とキー扉68とからなる。本体部66内の側部には、キー扉68の受け部70を吸着して閉状態を維持するマグネット72が配設されるとともに、キー扉68の閉状態を検知するマイクロスイッチ等からなるセンサ74が配設される。本体部66の略中央部には、キーが装着されるキーシリンダ76が配設される。本体部66の上部には、ソレノイド78が配設されており、それによって駆動されるロッド80が本体部66内に進退可能に構成される。一方、本体部66に対してヒンジ81を介して装着されるキー扉68の上部には、当該キー扉68が閉状態にあるときに前記ロッド80に係合する係合部82が配設される。また、キー扉68の側部には、開閉を容易とすべく凹部84が形

成される。このように構成されるキーボックス64の上部には、キーの貸出、返却状態を示すLED等からなる発光素子86および88が配設される。そして、センサ74、キーシリンダ76、ソレノイド78および発光素子86、88は、夫々貸出制御装置34に接続される。

【0016】図5は、電動二輪車14またはバッテリー供給装置42に装填されるバッテリー18を示す。このバッテリー18は、上部に取手90を有した箱形状に構成されており、前記取手90に対向する底部に図示しない電極が配設される。また、側部には、取手90側の一方の面が当該側部に対して直交する平面状の係合面92となり、取手90より離間した他方の面が前記係合面92側に傾斜した傾斜面94となる2つの突出部96が形成されている。

【0017】バッテリー供給装置42には、図6に示すように、本体部98に前記のように構成されるバッテリー18が装填される複数の装填部100が設けられる(図3参照)。この場合、装填部100は、当該駐輪場10において貸し出される電動二輪車14の台数よりも多い数だけ準備されている。前記装填部100には、その底部に充電回路102に接続される電極104が配設されるとともに、バッテリー18が装填されていることを検知するマイクロスイッチ等のセンサ106が配設される。また、装填部100の内側部には、バッテリー18の側部に設けられた突出部96の1つに係合することで当該バッテリー18の抜き取りを阻止するロック機構108が配設される。さらに、装填部100の開口部には、当該バッテリー18のロック状態を示すLED等の発光素子110と、当該バッテリー18の充電状態を示すLED等の表示手段である発光素子112とが配設される。これらの充電回路102、センサ106、ロック機構108、発光素子110、112は、貸出制御装置34に接続される。

【0018】ここで、バッテリー供給装置42に設けられるロック機構108は、図7～図9に示すように構成される。すなわち、ロック機構108は、バッテリー18の側部に設けられた突出部96の1つに係合する爪部材114と、爪部材114を保持するホルダ116と、ホルダ116を支持するブラケット118、120と、ホルダ116の動作を制御するためのソレノイド122とを有する。

【0019】爪部材114は、装填部100に対するバッテリー18の装填時において突出部96の傾斜面94(図5参照)が摺接する傾斜面124と、前記突出部96の係合面92に係合する係合面126とを有し、ホルダ116の開口部128に装着される。ホルダ116は、その側方に突出する係止部130を有し、爪部材114が装着される面と反対の面が円弧状曲面に形成される。この円弧状曲面には、略コ字状となるブラケット118が配置される。また、前記係止部130と略直交す

るホルダ116の側面側の前記開口部128には、略し字状となるブラケット120の一端部が係合する。そして、前記ブラケット120の他端部側の面と前記ブラケット118との間には、爪部材114を図8の状態に維持するためのスプリング132が配設される。一方、ロック機構108を構成するソレノイド122のロッド134には、スプリング136を介してストッパ138が装着される。このストッパ138は、爪部材114を図8の状態に維持すべく、ロッド134が突出した状態においてホルダ116の係止部130に係合する。

【0020】駐輪場10には、複数台の電動二輪車14を駐輪させる複数の駐輪装置44が設けられる。この駐輪装置44は、図3に示すように、電動二輪車14の側方向の位置決めを行うガイドレール140と、前輪の位置決めを行う位置決め機構142と、電動二輪車14を施錠するロック機構144と、当該駐輪装置44に駐輪されたバッテリー内蔵タイプの図示しない電動二輪車を充電するためのコンセント145とを備える。なお、バッテリー内蔵タイプの電動二輪車がコンセント145に接続されているか否かおよびその充電状態は、貸出制御装置34の管理下において、充電制御装置43により制御される。

【0021】ロック機構144は、図3および図10に示すように、ガイドレール140間に立設された支柱160と、支柱160の上端部に配設される旋回軸部162と、旋回軸部162に一端部が固定される旋回アーム164と、旋回アーム164の他端部に装着されるサークル錠166とから構成される。なお、サークル錠166は、図10に示すように、電動二輪車14のメインフレーム26のコ字状係合部28に係合することで、当該電動二輪車14の盗難を防止するとともに、駐輪中における転倒を防止するものである。なお、このサークル錠166は、メインフレーム26が細いパイプ状である場合、直接メインフレーム26に係合させるようにしてもよい。

【0022】本実施形態の電動車両のレンタルシステムは、基本的には以上のように構成されるものであり、次に、このレンタルシステムを利用した電動二輪車14およびバッテリー18の貸出および返却処理について説明する。

【0023】レンタルシステムの利用に先立ち、まず、利用者管理装置54の制御の下、中央制御室12の利用者証発行装置56を用いて、契約利用者の住所、氏名、貸出車両の種類（範囲）、利用料金の精算のための銀行口座番号、カードID番号、利用者ID番号、暗証番号、有効期間等の情報を登録し、非接触型ICカード等の利用者証を発行する。なお、これらの情報は、利用者管理装置54の「利用者リスト」に登録される。

【0024】次に、利用者証を所有する利用者は、例えば、ユーザ電話46によって駐輪場10の在庫応答装置

48を呼び出す。この場合、駐輪場10の駐輪装置44は、図示しない車両センサが検出した電動二輪車14の有無データに係る信号を貸出制御装置34に常時供給しており、前記貸出制御装置34は、この有無データを、例えば、電動二輪車14の種類および在庫台数を示す音声情報に変換し、在庫応答装置48にリアルタイムで提供する。そこで、利用者は、前記在庫応答装置48からの音声応答に従って所望の電動二輪車14の有無を判断することができる。

【0025】在庫が確認されると、次に利用者は、駐輪場10において、所望の電動二輪車14を借り出す。この場合、まず、利用者識別装置36によって利用者の確認が行われる。利用者の確認処理は、図11に示すフローチャートに従って行われる。

【0026】すなわち、利用者は、駐輪場10に備えられた利用者識別装置36に対して非接触型ICカード等の利用者証を近づける。貸出制御装置34は、利用者識別装置36を介してカードID番号、利用者ID番号等の利用者データを読み込み（ステップS1）、これらの利用者データから利用者ID番号を抽出する（ステップS2）。抽出された利用者ID番号は、モデム60を介して利用者管理装置54に転送され、登録されている利用者ID番号と比較照合されることで、当該利用者が正規利用者であるか否かの確認が行われる（ステップS3）。ここで、正規利用者でない場合には、異常処理が実行される（ステップS4）。

【0027】一方、正規利用者であることが確認されると、前記利用者ID番号に係る暗証番号、貸出車両の種類（範囲）、有効期間、貸出状態等の利用者データが利用者管理装置54から読み出され、モデム60を介して貸出制御装置34に転送される（ステップS5）。そして、前記貸出状態のデータに基づき当該利用者が電動二輪車14を貸出中であるか否かが確認される（ステップS6）。この場合、貸出中であれば、当該利用者が電動二輪車14を返却するものと判定し、後述する「返却モード」の処理を実行する（ステップS7）。

【0028】未貸出であることが確認された場合、前記利用者データに基づき、当該利用者が現在利用できる状態にあるか否かを示す利用権の確認を行う（ステップS8）。利用権が確認されると、次に、当該利用者の利用者証が有効期限内であるか否かを確認する（ステップS9）。なお、利用権がなく、あるいは、有効期限を超過している場合には、異常処理を実行する（ステップS10）。また、利用権を有し、且つ、有効期限内である場合には、次の「貸出モード」を実行する（ステップS11）。

【0029】そこで、図12～図14に示すフローチャートに従い、「貸出モード」の処理を説明する。

【0030】まず、利用者は、タッチパネル付表示装置38を用いて、暗証番号を入力する（ステップS10

1)。貸出制御装置34は、暗証番号の入力回数のカウントを開始するとともに(ステップS102)、入力された暗証番号を登録されている利用者データの暗証番号と比較する(ステップS103)。ここで、暗証番号の入力回数が3回以上である場合(ステップS104)、番号に間違いがあるものと見なして異常処理を実行する(ステップS105)。

【0031】一方、暗証番号が一致した場合、駐輪装置44からのデータに基づく車両選択可否データを読み込むとともに(ステップS106)、利用者データの貸出車両の種類(範囲)を読み込む(ステップS107)。すなわち、駐輪装置44は、図示しない車両センサからの信号として電動二輪車14の有無データを貸出制御装置34に供給している。この場合、貸出制御装置34は、前記有無データに基づき、電動二輪車14が使用中であるか、当該利用者の貸出車両の範囲で使用可能であるか、あるいは、故障等により使用不可であることを表す車両選択可否データを作成する。そして、これらのデータに基づいて、タッチパネル付表示装置38に使用可能車両を表示する(ステップS108)。

【0032】タッチパネル付表示装置38には、例えば、駐輪場10にある使用可能な電動二輪車14が、色、サイズ、サドルの高さ等が分かるように絵(写真)等によって表示されるとともに、利用料金、利用時間等の情報が表示される。利用者は、この表示に基づきタッチパネル付表示装置38を操作することで所望の電動二輪車14を選択する(ステップS109)。貸出制御装置34は、利用者が選択した電動二輪車14が使用可能であるか否かを確認する(ステップS110)。

【0033】利用者によって選択された電動二輪車14が使用可能であれば、貸出制御装置34は、その車両番号を選択し(ステップS111)、当該車両番号に対応する車両データを読み込む(ステップS112)。

【0034】次に、貸出制御装置34は、前記車両番号に従い、選択された電動二輪車14のキーを保持するキーボックス64(図4参照)に対して解錠信号を出力する。キーボックス64のソレノイド78は、前記解錠信号に従ってロッド80をキー扉68の係合部82から退出させる(ステップS113)。これによりキーボックス64が解錠される。この時、前記キーボックス64の上部に配設された発光素子88が点滅し、解錠されたことを利用者に知らせる。なお、利用可能なキーを保持するキーボックス64の指示は、発光素子88により行う代わりに、音声によって行うこともできる。

【0035】利用者が発光素子88の点滅するキーボックス64のキー扉68を開けると(ステップS114)、センサ74が作動して発光素子86が点滅し、キー扉68が開放されたことを知らせる(ステップS115)。利用者がキーシリンダ76を「貸出」側に回転させてキーを抜き取ると(ステップS116)、発光素子

86が点灯状態になるとともにキーの抜き取られたことを貸出制御装置34に知らせる(ステップS117)。この場合、貸出制御装置34では、当該キーに対応した車両番号の電動二輪車14の貸出が開始されたことを確認する。

【0036】利用者がキーボックス64のキー扉68を閉じると(ステップS118)、センサ74が作動して発光素子86、88が消灯するとともに、キー扉68の閉じられたことを貸出制御装置34に知らせる(ステップS119)。そこで、貸出制御装置34は、ソレノイド78に対して施錠信号を出力し、この施錠信号によってロッド80が下降して係合部82に係合し、施錠が行われる(ステップS120)。

【0037】次に、貸出制御装置34は、車両番号から貸出をする電動二輪車14の車種を確認する(ステップS121)。この場合、選択された電動二輪車14が着脱自在なバッテリー18を必要とするものか否かが確認され、必要とする場合には、バッテリー選択可否データを読み込む(ステップS122)。なお、バッテリー18が着脱自在でない電動二輪車の場合、図3に示す駐輪場10において、コンセント145から直接充電されており、従って、バッテリー18を選択する必要がない。

【0038】ここで、バッテリー選択可否データとは、例えば、バッテリー供給装置42の各装填部100におけるバッテリー18の有無データ、充電状態に基づく使用可否データによって作成される選択可能なバッテリー18に係るデータを表す。なお、バッテリー18の有無は、図6に示すセンサ106によって確認することができ、充電状態は、充電回路102によって確認することができる。

【0039】タッチパネル付表示装置38は、読み込まれたバッテリー選択可否データに基づき、貸し出し可能なバッテリー18を図15に示すようにして表示する(ステップS123)。すなわち、タッチパネル付表示装置38には、利用者による選択を容易とするため、例えば、充電が完了し貸出が可能であるバッテリー18と、貸出中あるいは充電が完了していないバッテリー18とが色分け等による識別可能な状態で表示される。例えば、未充電状態は赤、半充電状態は黄、4分の3の充電状態は青、完全充電状態は緑として表示することにより、仮に完全充電状態のものがなくても、近距離に使用するときには、完全充電状態以外のものを使用することができる。

【0040】そこで、利用者は、表示されたバッテリー18から利用可能な所望のバッテリー18の番号を選択した後、確定のキーを選択する(ステップS124)。この場合、貸出制御装置34は、選択されたバッテリー18が使用可能な状態まで充電されているか否かを確認し(ステップS125)、使用可能であれば、バッテリー供給装置42の該当する装填部100のロック機構108を解除するとともに(ステップS126)、発光素子110を点灯する。

【0041】ここで、バッテリー供給装置42は、駐輪場10においてレンタル可能な電動二輪車14の台数よりも多数のバッテリー18を充電して保持することのできる装填部100を備えている。従って、利用者は、例えば、全ての電動二輪車14が貸し出された状態から、返却直後の電動二輪車14を借り出そうとする際、未使用の充分に受電されているバッテリー18をバッテリー供給装置42から即座に借り出すことができる。この場合、当該バッテリー18を充電するために利用者が長時間待たされることがなく、極めて効率的に電動二輪車14を借り出すことができる。なお、バッテリー18の数は、例えば、レンタル可能な電動二輪車14の台数の2倍以下に設定するが、使用状態をシミュレートし、最適な数を設定するようにしてもよい。

【0042】装填部100に装填されたバッテリー18は、図6に示すように、その側部に配設された突出部96の係合面92がロック機構108を構成する爪部材114の係合面126に係合することで施錠されている。なお、バッテリー18は、この状態において、底部の図示しない電極が充電回路102の電極104に接触しており、充電処理が継続されている。そして、充電状態は、発光素子112によって外部から検出可能である。

【0043】そこで、貸出制御装置34からロック解除信号が所定の装填部100に供給されると、図7に示すように、ソレノイド122が作動し、ロッド134が退動してホルダ116の係止部130よりストッパ138が外れることになる(ステップS126)。この状態において、作業者がバッテリー18を装填部100より抜き取る際、バッテリー18の突出部96によってロック機構108の爪部材114を介してホルダ116が図9に示すように傾斜する。従って、前記突出部96が爪部材114を乗り越え、バッテリー18が抜き取られることになる(ステップS127)。

【0044】バッテリー18が抜き取られると、装填部100の底部に配設されたセンサ106がバッテリー18の無いことを検知し、その検知信号を貸出制御装置34に転送する(ステップS128)。次いで、ロック機構108のソレノイド122が作動し、ロッド134を介してストッパ138がホルダ116の係止部130に係合し、当該ロック機構108が再び施錠状態となり、且つ、発光素子110が消灯される(ステップS129)。

【0045】一方、以上の処理が終了すると、貸出制御装置34は、レジスタに保持されている利用者データに対して、貸し出した電動二輪車14の車両番号、貸出時刻、貸出中であることを示すフラグ等を書き込み(ステップS130)、モデム60を介して利用者管理装置54に転送する(ステップS131)。また、レジスタに保持されている車両データに対して、当該電動二輪車14を使用する利用者の利用者ID番号、貸出開始時刻等

を書き込み(ステップS132)、モデム60を介して利用者管理装置54に転送する(ステップS133)。

【0046】以上のようにして貸し出し処理が完了した後、利用者は、キー供給装置40より取り出したキーを用いて、駐輪装置44の該当する電動二輪車14を解錠する。この場合、電動二輪車14は、図3および図10に示すように、電動二輪車14間に配置されたロック機構144を構成する旋回アーム164の先端部に設けられたサークル錠166により駐輪装置44に施錠されている。そこで、前記サークル錠166をキーを用いて解錠し、メインフレーム26のコ字状係合部28から取り外す。この場合、図3に示すように、ガイドレール140が斜めに設置されているため、隣接する電動二輪車14に対するロック機構144が解錠の邪魔となることがない。サークル錠166が解錠された旋回アーム164は、支柱160を中心として旋回させ、図10の実線で示す位置まで退避させる。前記のようにして解錠した後、当該電動二輪車14を駐輪装置44から取り出す。

【0047】利用者は、次に、取り出した電動二輪車14のバッテリーケース20に対して、バッテリー供給装置42から取り出したバッテリー18を装填し、蓋24を閉めた後、ロック機構22を前記サークル錠166を解錠したキーによって施錠する。利用者は、このようにしてバッテリー18が装填された電動二輪車14に乗り、所望の場所まで移動することになる。

【0048】次に、使用した電動二輪車14を返却する場合の処理について説明する。利用者は、駐輪場10において、電動二輪車14を借り出す場合と同様に、まず、利用者識別装置36に利用者証を近づける。貸出制御装置34は、利用者識別装置36を介して利用者データを読み込み、この利用者データから抽出された利用者ID番号を登録されている利用者ID番号と比較照合することで、当該利用者が正規利用者であるか否かが確認される。正規利用者であることが確認されると、前記利用者ID番号に係る暗証番号、貸出車両の種類(範囲)、有効期間、貸出状態等の利用者データが利用者管理装置54から読み出され、前記貸出状態のデータに基づき当該利用者が電動二輪車14を貸出中であるか否かが確認される。この場合、貸出中であるため、当該利用者が電動二輪車14を返却するものと判定し、「返却モード」の処理を実行する。

【0049】次に、この「返却モード」の処理について、図16および図17に示すフローチャートに従い説明する。

【0050】まず、貸出制御装置34は、車両番号、利用者ID番号、貸出開始時刻、貸出終了時刻等を含む車両データを読み込み(ステップS201)、前記車両番号に係る電動二輪車14が返却されたか否かの確認を行う(ステップS202)。タッチパネル付表示装置38は、当該電動二輪車14が返却されていない場合、車両

返却督促画面を表示し、返却を促す(ステップS203)。

【0051】そこで、利用者は、駐輪装置44の所定の位置に電動二輪車14を返却する。すなわち、ガイドレール140に対して前後の車輪に係合させ、次いで、位置決め機構142により前輪の位置決めを行った後、旋回アーム162を旋回させ、メインフレーム26のコ字状係合部28にロック機構144を構成するサークル錠166を施錠する。

【0052】前記のようにして電動二輪車14が所定の駐輪装置44に返却されると、その位置決め機構142に設けられた図示しない車両センサが返却状態を検知し、返却検知信号を貸出制御装置34に送信する。従って、貸出制御装置34は、所定の電動二輪車14が返却されたものと判断し(ステップS202)、車両データに基づき返却車両の種類の確認を行う(ステップS204)。

【0053】ここで、返却車両が着脱自在なバッテリー18を有する電動二輪車14である場合、貸出中の車両数を計数する一方(ステップS205)、バッテリー供給装置42のセンサ106によって検出された貸出中のバッテリー数と前記車両数とに基づいてバッテリー18の適正な在庫数を計算し(ステップS206)、バッテリー18が返却されたか否かを確認する(ステップS207)。タッチパネル付表示装置38は、バッテリー18が返却されていない場合、バッテリー返却督促画面を表示し、返却を促す(ステップS208)。

【0054】電動二輪車14およびバッテリー18の返却が完了した後、利用者は、キーを返却する。この場合、貸出制御装置34は、返却された電動二輪車14の車両番号に従い、該当するキーボックス64(図4参照)に対して解錠信号を出力する。キーボックス64のソレノイド78は、前記解錠信号に従ってロッド80をキー扉68の係合部82から退出させる(ステップS209)。これによりキーボックス64が解錠される。この時、前記キーボックス64の上部に配設された発光素子88が点滅し、解錠されたことを利用者に知らせる。

【0055】利用者が発光素子88の点滅するキーボックス64のキー扉68を開けると(ステップS210)、センサ74が作動して発光素子86が点滅し、キー扉68が開放されたことを知らせる(ステップS211)。利用者がキーシリンダ76にキーを差し込み、「返却」側に回転させると(ステップS212)、発光素子86が点灯状態になるとともにキーが返却されたことを貸出制御装置34に知らせる(ステップS213)。

【0056】利用者がキーボックス64のキー扉68を閉じると(ステップS214)、センサ74が作動して発光素子86、88が消灯するとともに、キー扉68の閉じられたことを貸出制御装置34に知らせる(ステッ

プS215)。そこで、貸出制御装置34は、ソレノイド78に対して施錠信号を供給し、この施錠信号によってロッド80が下降して係合部82に係合し、施錠が行われる(ステップS216)。

【0057】一方、貸出制御装置34は、レジスタに保持されている利用者データに対して、返却された電動二輪車14の車両番号、貸出中であることを示すフラグのクリア処理を行うとともに、貸出終了時刻を書き込み(ステップS217)、モデム60を介して利用者管理装置54に転送する(ステップS218)。また、レジスタに保持されている車両データに対して、利用者の利用者ID番号、貸出中であることを示すフラグのクリア処理を行うとともに、貸出終了時刻を書き込み(ステップS219)、モデム60を介して利用者管理装置54に転送する(ステップS220)。

【0058】以上のようにして、電動二輪車14の返却処理が完了する。なお、電動二輪車14の貸出を行った利用者の利用状況は、前記利用者データに基づいて利用者管理装置54で管理されており、例えば、単位期間毎に契約利用者の利用状況を集計し、タッチパネル付表示装置38を介して課金情報が表示されるとともに、利用明細の発行、課金等の処理が行われる。

【0059】なお、上述した実施形態において、バッテリー18は同一形態となっているため、バッテリー供給装置42に設けられた複数の装填部100の中、空いている任意の装填部100に対して返却することができるが、このバッテリー18に複数の種類がある場合、その種類に応じて返却すべき装填部100を指示するように構成することも可能である。

【0060】

【発明の効果】以上説明したように、本発明に係る電動車両レンタルシステムにおけるバッテリー供給装置は、レンタル可能な電動車両の台数よりも多い数のバッテリー装填部を備えており、常時余分なバッテリーを充電回路によって充電状態としている。従って、前記電動車両がレンタルされる際、充電されたバッテリーを即座に貸し出すことができるため、電動車両およびそれに装填されるバッテリーを効率的にレンタルすることが可能となる。なお、前記バッテリーの充電状態は、バッテリー供給装置に備えられた表示手段によって表示されるため、当該バッテリーがレンタル可能であるか否かを容易に判断することができる。

【図面の簡単な説明】

【図1】電動車両のレンタルシステムの構成ブロック図である。

【図2】電動二輪車の説明図である。

【図3】駐輪場の構成図である。

【図4】キー供給装置の構成図である。

【図5】バッテリーの構成図である。

【図6】バッテリー供給装置の断面構成図である。

【図7】バッテリー供給装置におけるロック機構の構成図である。

【図8】バッテリー供給装置におけるロック機構の施錠状態を示す断面説明図である。

【図9】バッテリー供給装置におけるロック機構の解錠状態を示す断面説明図である。

【図10】ロック機構と電動二輪車との関係説明図である。

【図11】利用者の確認処理を行うフローチャートである。

【図12】貸出モードのフローチャートである。

【図13】貸出モードのフローチャートである。

【図14】貸出モードのフローチャートである。

【図15】タッチパネル付表示装置に表示されたバッテリー貸出情報の説明図である。

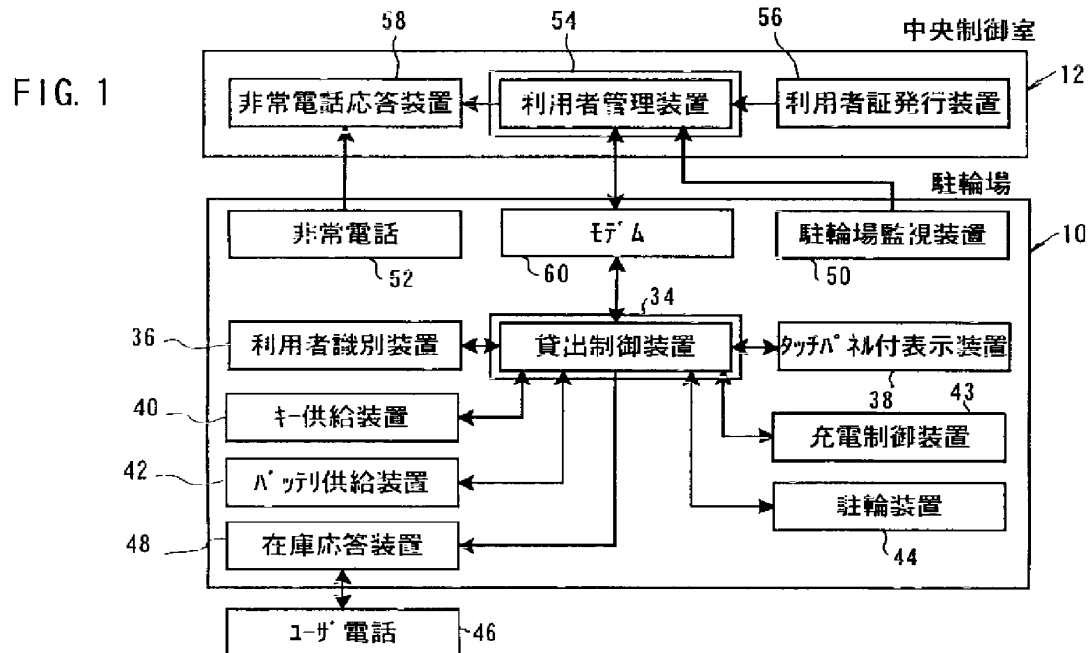
【図16】返却モードのフローチャートである。

【図17】返却モードのフローチャートである。

【符号の説明】

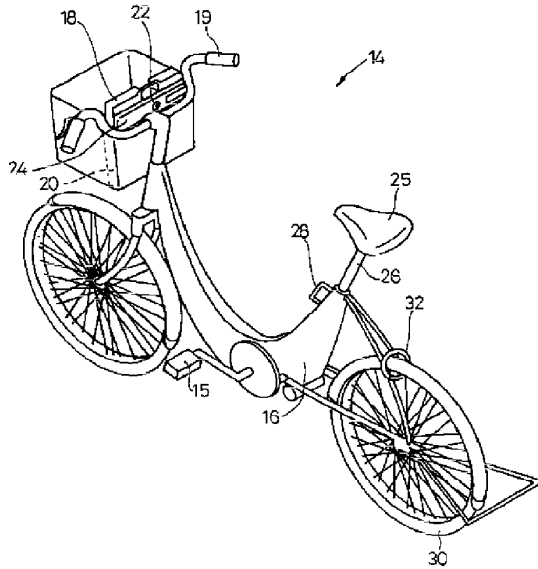
10…駐輪場	12…中央制御室
14…電動二輪車	18…バッテリー
38…タッチパネル付表示装置	40…キー供給装置
42…バッテリー供給装置	44…駐輪装置
48…在庫応答装置	50…駐輪場監視装置
54…利用者管理装置	56…利用者証発行装置
58…非常電話応答装置	60…モデム
64…キーボックス	108、144…ロック機構
142…位置決め機構	

【図1】



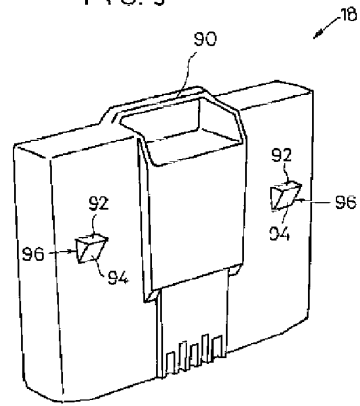
【図2】

FIG. 2



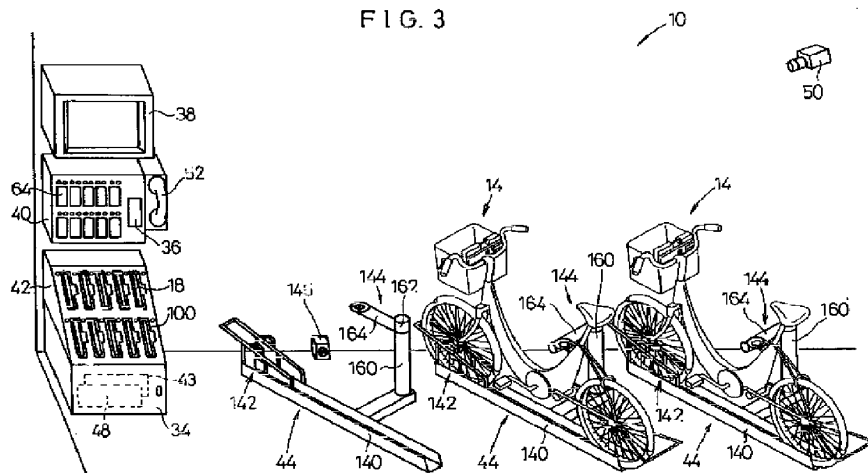
【図5】

FIG. 5

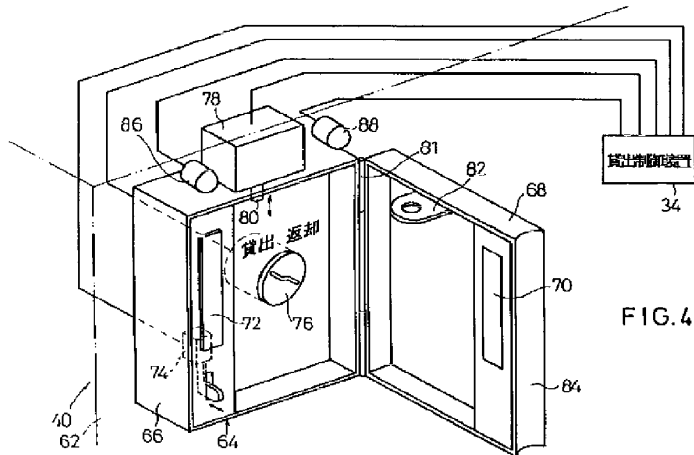


【図3】

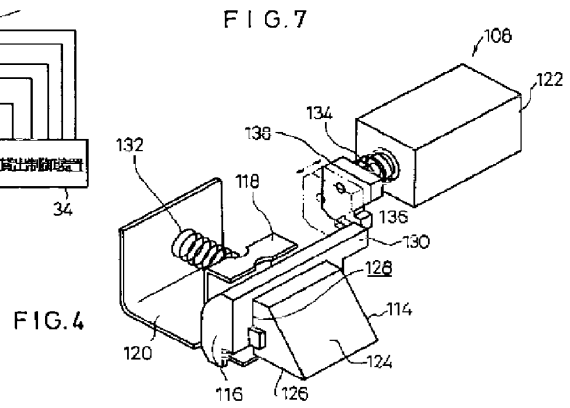
FIG. 3



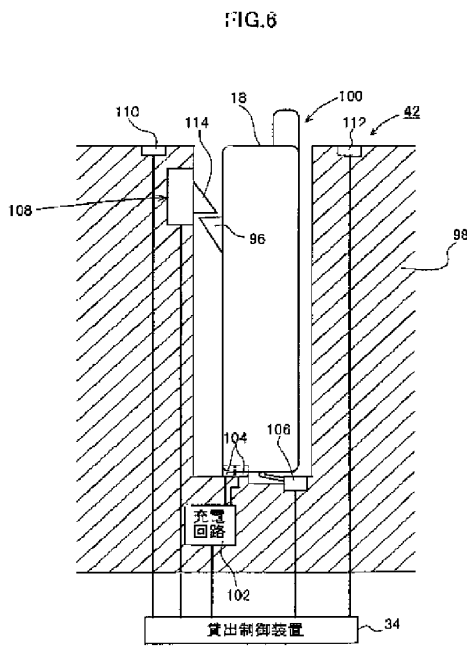
【図4】



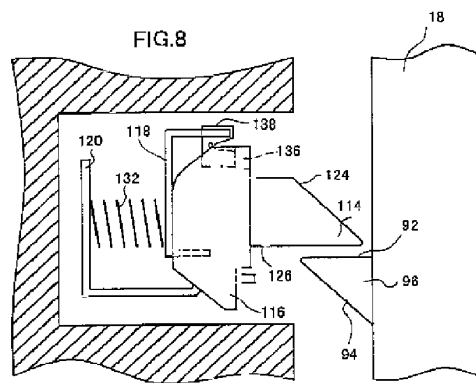
【図7】



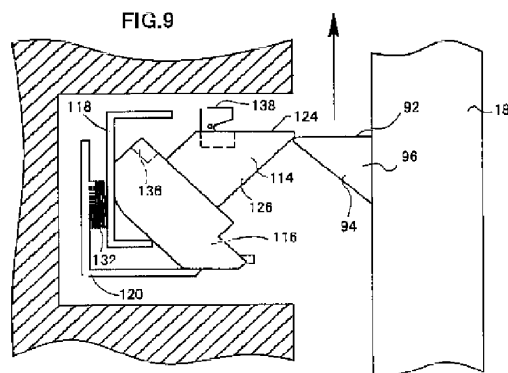
【図6】



【図8】

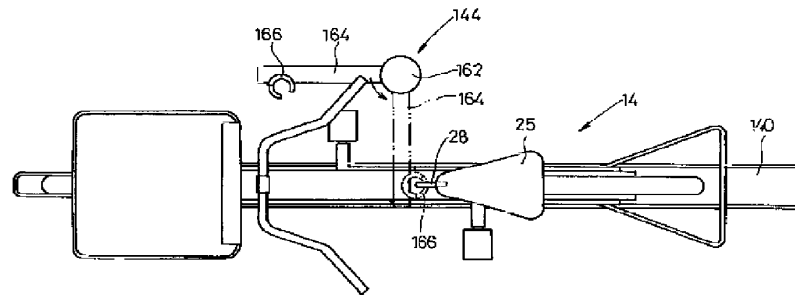


【図9】



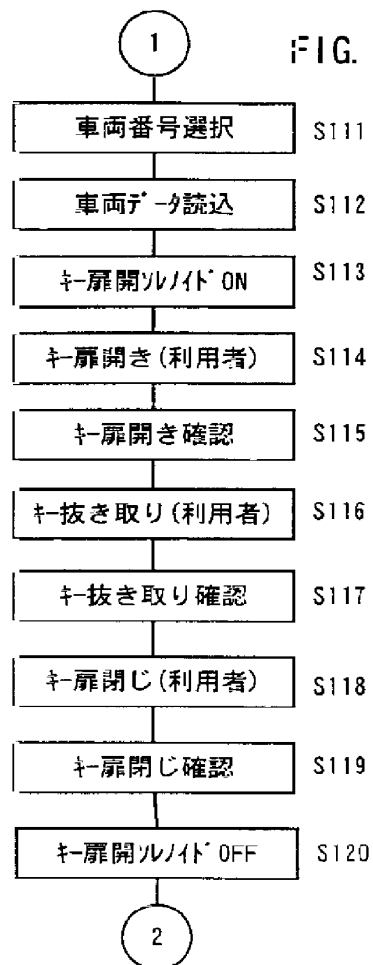
【図10】

FIG. 10



【図13】

FIG. 13



【図15】

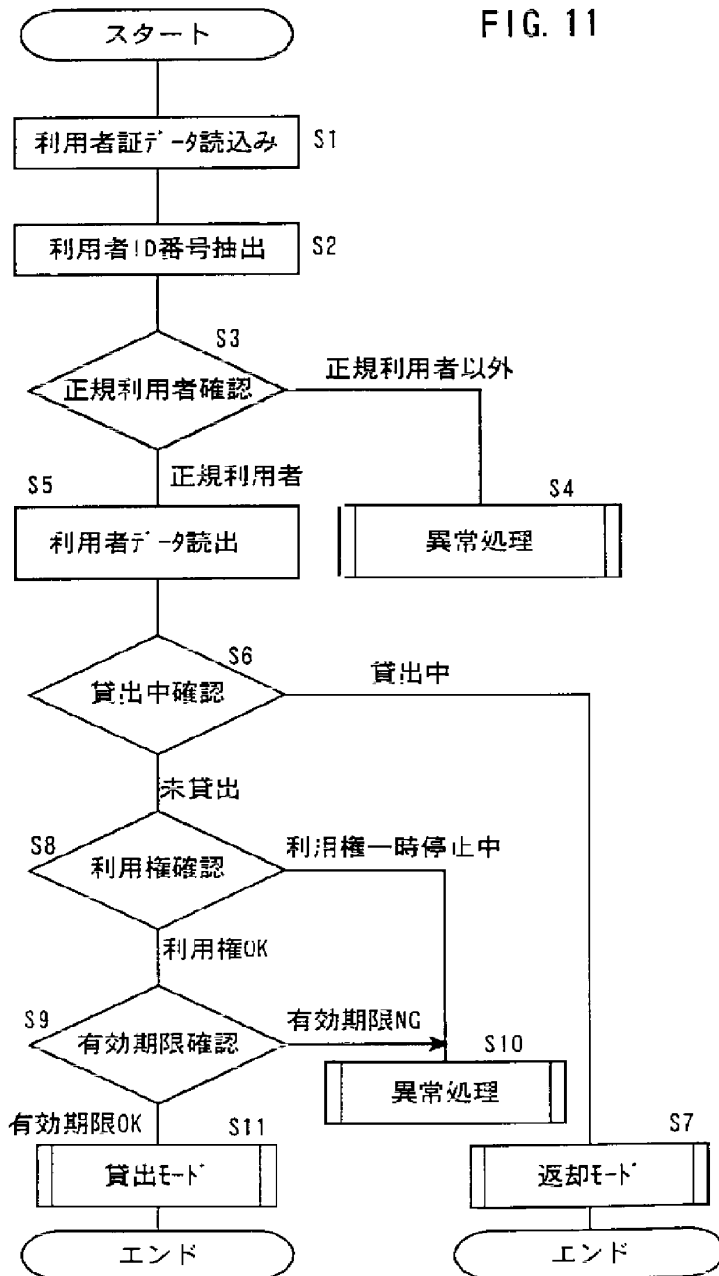
FIG. 15

バッテリー貸出情報

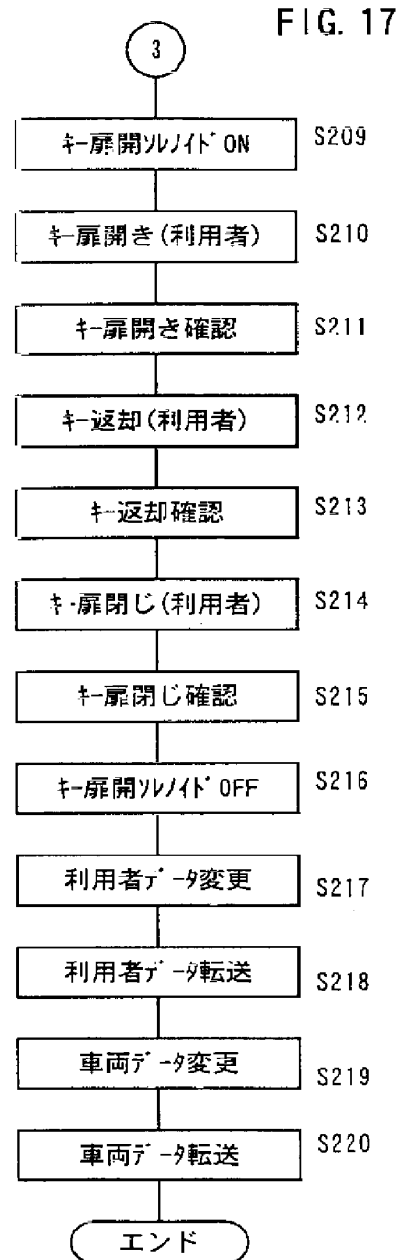
CAN ENT

1	2	3	4	5
6	7	8	9	10

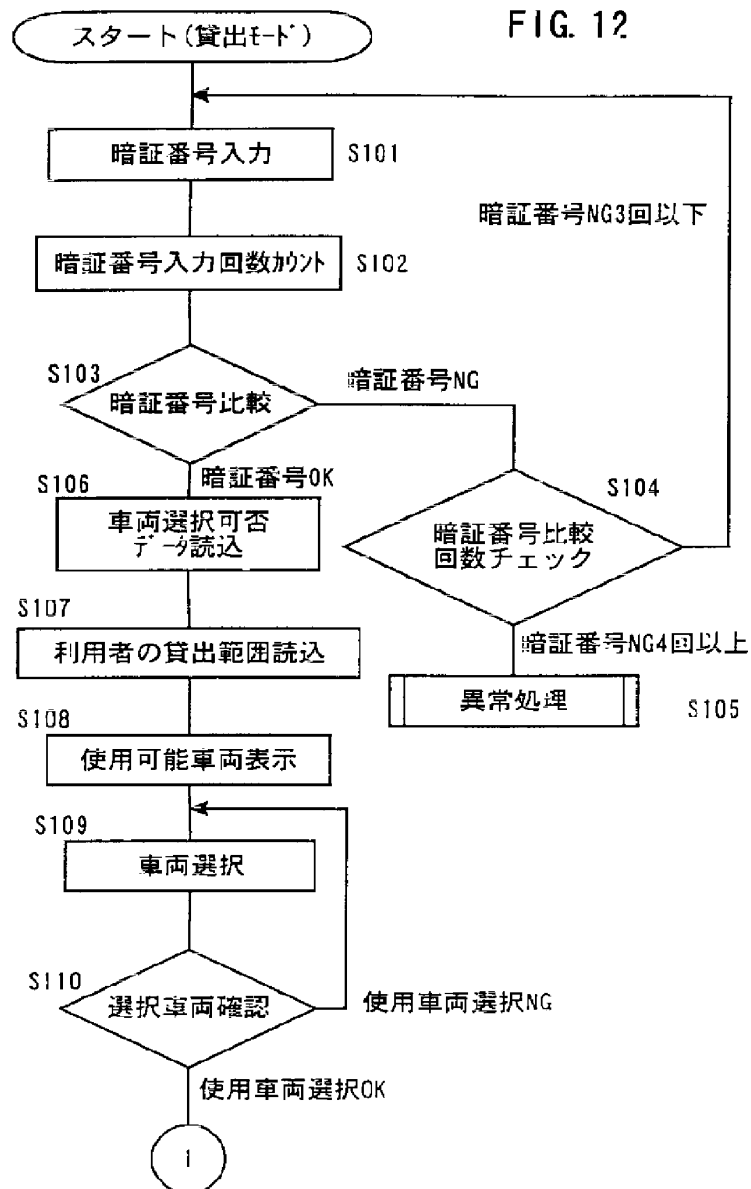
【図11】



【図17】

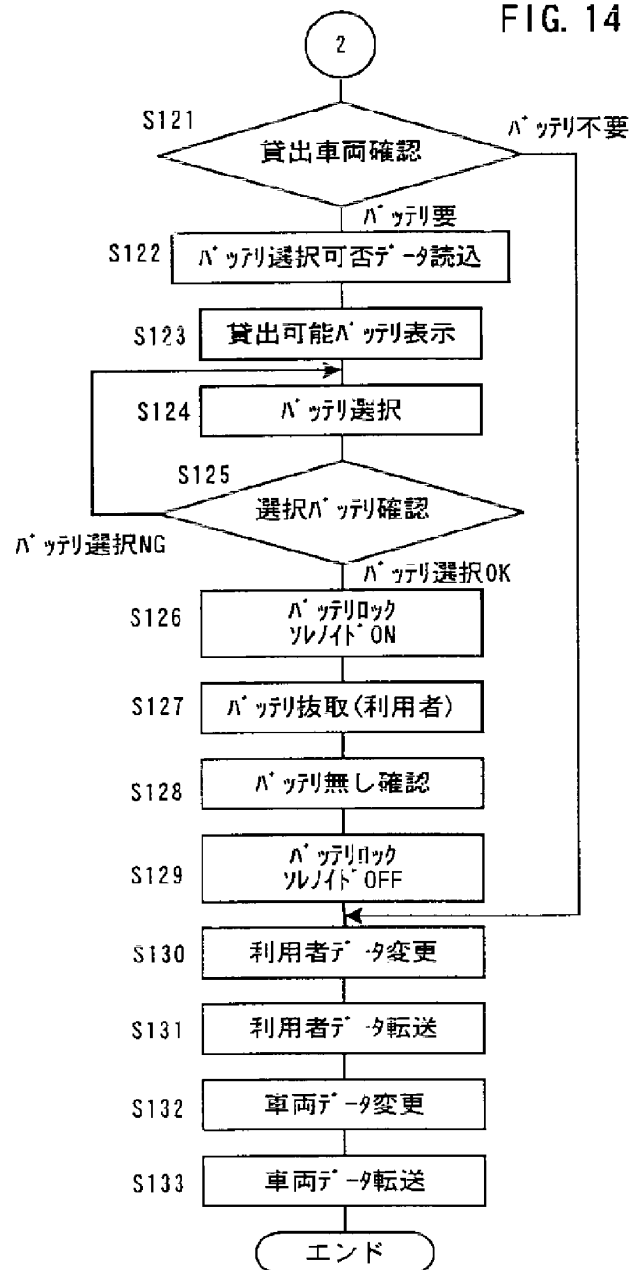


【図12】



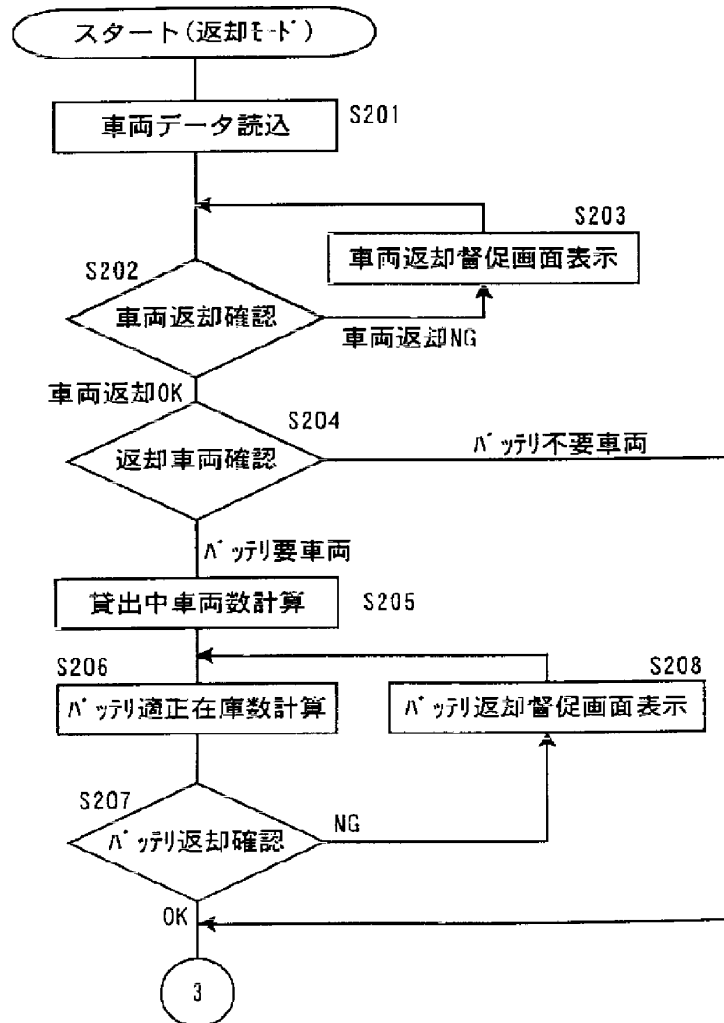
【図14】

FIG. 14



【図16】

FIG. 16



PATENT ABSTRACTS OF JAPAN

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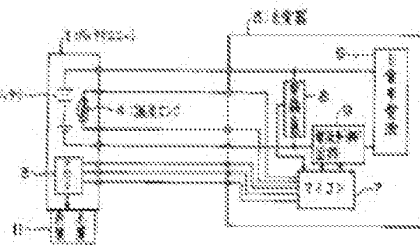
(72)Inventor : OTA KATSUTOSHI

(54) BICYCLE WITH AUXILIARY DRIVING MOTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent the disturbance of the operation of a bicycle due to battery charging and to always comprehend the residue of a battery by having the computing means of a discharge quantity and a means for transmitting a computation value signal to a battery charge hysteresis memory.

SOLUTION: At the time of the charging of a battery 2, a microcomputer 7 computes so as to renew the presumed condensed quantity of the battery 2 according to a charge quantity. Namely, the microcomputer 7 carries out computation as a current controlled by a current control circuit 9 after the beginning of charging and a voltage detected by a voltage detector are taken in, and its value is sent to a charging hysteresis memory 3 and written in as a presumed charging quantity. The number of times of charging is also stored in the charging hysteresis 3 of a battery unit 1, and the number of times of charging is displayed in a display device 1. This display can be used as a guideline for judging the life of the battery 2.



【特許請求の範囲】

【請求項 1】 交換可能なバッテリーを電源とする補助駆動モータ付き自転車において、
該バッテリー側に付設され充電情報を記憶する充電履歴メモリと、
自転車とは別置きであって充電時には該バッテリーと結合され、充電電流又は充電電圧を制御する制御手段及び該制御手段の充電量信号を該充電履歴メモリに伝達する手段を備えた充電器と、
該バッテリーから供給される電流を自転車の速度と踏力トルク信号に適応した出力に変換してモータを駆動制御するインバータを内蔵し、該インバータへの出力電流及び電圧を検出して放電量を演算する演算手段と、該演算手段から演算値信号を該バッテリーの該充電履歴メモリに伝達する手段とを有する自転車に設置のコントローラとにより構成されていることを特徴とする、補助駆動モータ付き自転車。

【請求項 2】 該バッテリー側に付設された表示装置を備え、該表示装置により該充電履歴メモリに記憶されたバッテリーの推定蓄電量を表示することを特徴とする、請求項 1 記載の補助駆動モータ付き自転車。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、自転車の補助駆動装置として電動モータを備えた、補助駆動モータ付き自転車に関し、特に、電動モータの電源となるバッテリーの充電及び放電状態を記憶する充電履歴メモリを備えた、補助駆動モータ付き自転車に関する。

【0002】

【従来の技術】従来より、補助駆動モータ付き自転車に用いられるバッテリーにおいて、バッテリー個々の終止電圧におけるばらつきを最小限に抑えてバッテリーのダメージを防止するためにバッテリーの充電状態を監視する充電状態監視手段が開発されている。その設置例が特開平 7-212905 号に開示されており、図 5 はかかる従来のバッテリーの充電状態監視手段を示すブロック図である。

【0003】図 5 に示すように、コントローラ 05 には、バッテリー V1、V2 の個々の電圧を監視するバッテリー監視手段 06 が設けられ、このバッテリー監視手段 06 は、各バッテリー V1、V2 間の電位差 Vg がバッテリー間電位差制御停止電圧 Vh よりも大きくなったら、バッテリー V1、V2 の放電を打ち切るように構成されている。バッテリー V1、V2 が蓄積した電力を放電し終えたら、コントローラ 05 は、自転車から切り離して設置された充電器 08 に接続して充電するようになっている。この充電器 08 はバッテリー V1、V2 に対して個別に充電できるように構成されている。さらにコントローラ 05 には放電を打ち切った際の各バッテリー V1、V2 の電圧状態の情報を読取り、この情報を充電器 05 に対して転送するバッテリー情報伝達手段 010 が設けられている。

【0004】

【発明が解決しようとする課題】ところで、上述のような従来の補助駆動モータ付き自転車におけるバッテリーの充電状態監視手段では、各バッテリー個別（バッテリーセル毎）の監視手段と各バッテリー個別の充電器とが必要であり、構成が複雑である。また、バッテリーの電圧状態の情報は、コントローラが保持しており、充電時にはバッテリー+コントローラ+充電器の構成が必要であり、構成が複雑である。

【0005】自転車にバッテリーを搭載したままでこのバッテリーを充電しようとする時には、当然ながら自転車の運転はできない。そこで自転車に搭載された放電したバッテリーを予め充電された交換用のバッテリーと取り替えることで、充電中に自転車を運転できない不具合を回避することが考えられるが、この場合、交換したバッテリーの残量が不明のためにバッテリー管理上心配が生じるおそれがある。

【0006】本発明は、上述の課題に鑑み創案されたもので、バッテリーの充電状態を監視するうえで、バッテリー充電により自転車の運転が妨げられることがなく、かつバッテリーの残量が常に把握できるようにした、補助駆動モータ付き自転車を提供することを目的とする。

【0007】

【課題を解決するための手段】このため、請求項 1 記載の本発明の補助駆動モータ付き自転車は、交換可能なバッテリーを電源とし、該バッテリー側に付設され充電情報を記憶する充電履歴メモリと、自転車とは別置きであって充電時には該バッテリーと結合され、充電電流又は充電電圧を制御する制御手段及び該制御手段の充電量信号を該充電履歴メモリに伝達する手段を備えた充電器と、該バッテリーから供給される電流を自転車の速度と踏力トルク信号に適応した出力に変換してモータを駆動制御するインバータを内蔵し、該インバータへの出力電流及び電圧を検出して放電量を演算する演算手段と、該演算手段から演算値信号を該バッテリーの該充電履歴メモリに伝達する手段とを有する自転車に設置のコントローラとにより構成されていることを特徴としている。

【0008】請求項 2 記載の本発明の補助駆動モータ付き自転車は、請求項 1 記載の自転車において、該バッテリー側に付設された表示装置を備え、該表示装置により該充電履歴メモリに記憶されたバッテリーの推定蓄電量を表示することを特徴としている。

【0009】

【発明の実施の形態】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 4 は本発明の一実施形態としての補助駆動モータ付き自転車について示すものであり、このうち、図 1 及び図 2 はその充電装置の回路ブロック図であり、図 1 は充電時の回路ブロック図を、図 2 は放電時の回路ブロック図を示す。

【0010】図 1、図 2 において、1 はバッテリーユニッ

トであり、このバッテリーユニット1にはバッテリー（蓄電池）2と、充電履歴メモリ3と、バッテリー2の温度を検出する温度センサ4とが内蔵されている。図1において5は充電器であり、この充電器5は自転車とは別置きであり、充電時にはバッテリーユニット1と図示しないプラグ、ソケット等により配線結合される。充電器5は、外部の一般的なAC電源に繋がれ、AC電源を充電用DC電源に変換する充電用電源装置6と、この充電用DC電源の電圧を検出する電圧検出器8と、バッテリー2の充電特性に合わせた充電プログラムに従って充電電流を制御するマイコン（演算手段）7と、マイコン7の指示に従って充電電流を制御する電流制御回路9とを内蔵し、バッテリー2の充電履歴メモリ3に配線結合するためのプラグ、ソケット等の図示しない結合手段を備えている。

【0011】図2において15は自転車（図示略）に備え付けられているコントローラであり、このコントローラ15は、補助モータ18の駆動時には、プラグ、ソケット等の図示しない結合手段により、自転車に取り付けられたバッテリーユニット1と配線結合される。コントローラ15には、マイコン（演算手段）16とインバータ17とが内蔵される。マイコン16は、自転車の駆動部（図示略）に設けられた速度センサ23と足踏トルクセンサ22との信号を取込み、これらの信号に対応してインバータ17に指示を行なう。インバータ17は、バッテリー2から供給された直流電流をマイコン16の指示に従い電流変換して補助モータ18へ出力する。コントローラ15は、さらに、バッテリー2からインバータ17へ送られる電流を検出しマイコン16へ信号をおくる電流検出器21と、インバータ17からの同出力電圧を検出しマイコン16へ信号をおくる電圧検出器19とを内蔵し、バッテリー2の充電履歴メモリ3に配線結合するためのプラグ、ソケット等の図示しない結合手段とを備えている。

【0012】また、図1、図2に示す11は、充電履歴メモリ3の記憶内容を表示する表示装置であり、この表示装置11はバッテリーユニット1に取り付けられ、バッテリーユニット1が充電器5又はコントローラ15に接続されたときだけ表示がなされるようになっている。そして、充電時には、図1に示すように、バッテリーユニット1を充電器5に配線結合して充電を行なうが、この場合、まず、充電履歴メモリ3に記憶されたバッテリー2の充電前初期蓄電量 Q_{li} を、マイコン7に読み出して、その後の推定蓄電量の演算のベースとする。バッテリー2への充電時には、マイコン7では、充電量に応じてバッテリー2の推定蓄電量を更新するように演算を行なう。すなわち、マイコン7では、充電開始時から電流制御回路9により制御された電流と電圧検出器8で検出された電圧とを取り込みながら、単位時間 Δt 毎に、充電量 Δq_1 （電流制御回路9で制御された電流と電圧検出器8で検出された電圧との積）と単位時間 Δt の積（単位時間当

たりの充電量）を計算して、さらに充電前初期蓄電量 Q_{li} と充電量 Q_1 （ $=\sum (\Delta q_1 \times \Delta t)$ ）との和を演算して、この値（ $Q_{li}+Q_1$ ）が充電履歴メモリ3に送られ、推定蓄電量として更新して書き込まれるようになっている。

【0013】なお、バッテリー2の温度が充電電流の大きさに大きく影響するので、マイコン7は、温度センサ4により検出されマイコン7へ送信されたバッテリー2の温度信号より、図4に示すような充電特性に沿ったプログラムを用いて、適正な充電電流値を決定して電流制御回路に指示するようになっている。さらに、マイコン7により、充電前初期蓄電量 Q_{li} と充電量 Q_1 との合計〔即ち、推定蓄電量（ $Q_{li}+Q_1$ ）〕と、バッテリー2の最大蓄電量 Q_{max} とが比較され、充電前初期蓄電量 Q_{li} と充電量 Q_1 の合計がバッテリー2の最大蓄電量 Q_{max} に達するまでは、充電処理を続け、充電前初期蓄電量 Q_{li} と充電量 Q_1 の合計〔推定蓄電量（ $Q_{li}+Q_1$ ）〕が最大蓄電量 Q_{max} に達したら、マイコン7を通じて、充電を停止するようになっている。

【0014】ところで、図4について説明すると、図4はバッテリー2の充電の際の電流（電圧）／時間特性図であり、充電は電流値 I_{ch} によってコントロールされるようになっている。バッテリー2の温度が低い初期段階においては電流値 I_{ch} を⑦を付すように低い値（例えば約0.10mA）に設定するようになっている。温度が一定温度以上に上がった段階で、電流値 I_{ch} を⑤を付すように高い値〔例えば0.50mA以上（最大充電電流は個々のバッテリーにより規定）〕に設定し、④を付すように急速充電に移行（例えば電圧0.8～1.0V／セル）するようになっている。そして、③に示すように急速充電経過中に V_B が下がる点（バッテリー2の内部抵抗が増加する点）において、所定の電圧降下（例えば、セルあたり15～20mVの降下電圧）を検出したら（ただし、①に示す充電の最初の5分間の降下電圧は検出しない）トリクル充電に切り換える。また、これ以前（所定の電圧降下前）でも、②に示すような所定電圧値（例えば、1セルあたり $1.9 \pm 0.025V$ の電圧）を検出した場合には、トリクル充電に切り換える。このトリクル充電時には、充電電流値 I_{ch} を⑥を付す低い値に設定し一定時間保持（例えば、0.050mAで15時間）するようになっている。

【0015】なお、⑧に示す範囲は急速充電のトータルタイマーであり、タイマーカウントアップの段階で、公称容量の150%充電量に相当する時間になっており、急速充電温度範囲は10～40℃になっている。充電前初期蓄電量 Q_{li} と充電量 Q_1 の合計（推定蓄電量）が最大蓄電量 Q_{max} となった時点で、全充電を終了するようになっている。

【0016】一方、バッテリーの放電時、即ちバッテリー使用時には、バッテリーユニット1を自転車に取付け補助駆

動モータ 18 を回すが、この場合、バッテリーユニット 1 をコントローラ 15 に配線結合し放電を開始すると、まず、充電履歴メモリ 3 に記憶されたバッテリー 2 の放電前初期蓄電量 Q_{2i} が、マイコン 16 に読み出されるようになっている。そして、バッテリー 2 への放電処理が行なわれる際には、マイコン 16 では放電量に応じてバッテリーの蓄電量を更新するように演算を行なう。すなわち、マイコン 16 では、放電開始時から単位時間 Δt 毎に放電量 Δq_2 （電流検出器 21 で検出された電流と電圧検出器 19 で検出された電圧との積）と単位時間 Δt との積（単位時間当たりの放電量）を計算して、さらに、放電前初期蓄電量 Q_{2i} と放電量 Q_2 （ $= \sum (\Delta q_2 \times \Delta t)$ ）との差を演算して、この値が充電履歴メモリ 3 に送られ、更新して書き込まれるようになっている。

【0017】さらに、マイコン 16 では、モータ 18 が停止する場合は放電を一時停止するなどモータ 18 の作動に応じて放電を制御しながら、放電前初期蓄電量 Q_{2i} と放電量 Q_2 との差（即ち推定蓄電量）が残存していれば、戻り放電処理を続けるが、推定蓄電量（ $Q_{2i} - Q_2$ ）が零まで減少したら、放電停止として、充電履歴メモリ 3 には残量（蓄電量）が零と更新して書き込まれるようになっている。

【0018】さらに、バッテリーユニット 1 の充電履歴メモリ 3 には充電回数も記憶され、この充電回数を表示装置 11 に表示しうようになり、この表示をバッテリー 2 の寿命を判定する指針とすることができる。また、充電器 5 のマイコン 7 において、充電時の電流に対する電圧よりバッテリー 2 の内部抵抗値を計算し、これよりバッテリー 2 の寿命を判定することもできる。

【0019】本発明の一実施形態としての補助駆動モータ付き自転車は、上述のように構成されているので、バッテリーの充、放電時には、例えば図 3 に示すような処理が行なわれる。すなわち、充電時には、図 3 の左側に『充電』と付して示すように、バッテリーユニット 1 を充電器 5 に配線結合し充電を開始し、ステップ c 1 で、充電履歴メモリ 3 に記憶されたバッテリー 2 の充電前初期蓄電量 Q_{1i} が、マイコン 7 に読み出される。次いで、ステップ c 2 では、バッテリーへの充電処理が行なわれ、これと同時に、充電開始時から単位時間 Δt 当たりの充電量 Δq_1 （電流制御回路 9 で制御された電流と電圧検出器 8 で検出された電圧との積）と単位時間 Δt の積（単位時間当たりの充電量）が時間 Δt 毎にマイコン 7 において計算され、充電前初期蓄電量 Q_{1i} と充電量 Q_1 （ $= \sum (\Delta q_1 \times \Delta t)$ ）との和〔推定蓄電量（ $Q_{1i} + Q_1$ ）〕が充電履歴メモリ 3 に送られ、更新して書き込まれる。この充電時には、バッテリー 2 の温度が充電電流の大きさに大きく影響するので、マイコン 7 は、温度センサ 4 により検出されマイコン 7 へ送信されたバッテリー 2 の温度信号より、図 4 に示した充電特性に沿ったプログラムを用いて適正な充電電流値を決定して電流制御回路

に指示する。

【0020】続くステップ c 3 では、マイコン 7 により、充電前初期蓄電量 Q_{1i} と充電量 Q_1 との合計（推定蓄電量）と、バッテリー 2 の最大蓄電量 Q_{max} が比較され、充電前初期蓄電量 Q_{1i} と充電量 Q_1 との合計（推定蓄電量）がバッテリー 2 の最大蓄電量 Q_{max} に達しないときは、ステップ c 2 に戻り充電処理を続けられるが、充電前初期蓄電量 Q_{1i} と充電量 Q_1 との合計（推定蓄電量）が最大蓄電量 Q_{max} に達したときには、マイコン 7 の指示により、次のステップ c 4 に進み充電停止とする。

【0021】一方、放電時、即ち、バッテリーユニット 1 を自転車に取付け補助駆動モータ 18 を作動させる場合には、図 3 の右側に『放電』と付して示すように、バッテリーユニット 1 をコントローラ 15 に配線結合し放電を開始し、ステップ r 1 で、充電履歴メモリ 3 に記憶されたバッテリー 2 の放電前初期蓄電量 Q_{2i} が、マイコン 16 に読み出される。次いで、ステップ r 2 では、バッテリーへの放電処理が行なわれ、これと同時に、放電開始時から単位時間 Δt 当たりの放電量 Δq_2 （電流検出器 21 で検出された電流と電圧検出器 19 で検出された電圧との積）と単位時間 Δt の積（単位時間当たりの放電量）が時間 Δt 毎にマイコン 16 において計算され、放電前初期蓄電量 Q_{2i} と放電量 Q_2 （ $= \sum (\Delta q_2 \times \Delta t)$ ）の差〔推定放電量（ $Q_{2i} - Q_2$ ）〕が充電履歴メモリ 3 に送られ、更新して書き込まれる。

【0022】ステップ r 3 では、モータ 18 の放電を継続させるか否か（即ち、モータ 18 を一時停止させるかどうか）の判断が行なわれ、モータ 18 を停止させる場合はステップ r 4 で放電を一時停止し、次回放電を待つ（ステップ r 5）。一方、ステップ r 3 においてはそのまま放電を継続すると判断されると、ステップ r 6 に進む。ステップ r 6 では、マイコン 16 により、放電前初期蓄電量 Q_{2i} と放電量 Q_2 との差〔推定放電量（ $Q_{2i} - Q_2$ ）〕が零まで減少したか否かが判断され、推定放電量（ $Q_{2i} - Q_2$ ）が零まで減少していないときには、ステップ r 2 に戻り放電処理が続けられるが、推定放電量（ $Q_{2i} - Q_2$ ）が零まで減少したときには、マイコン 16 の指示により、ステップ r 7 の放電停止として、充電履歴メモリ 3 には残量が零と更新して書き込まれる。

【0023】このように、本補助駆動モータ付き自転車によれば、バッテリー 2 の使用状態の情報をバッテリー 2 と一体の充電履歴メモリ 3 に記憶保存できるので、従来例のように充電器 5 とコントローラ 15 との常時組み合わせを要することなく、バッテリー 2 の充電状態や放電状態（蓄電状態）を監視することができる。従って、充電器 5 は、バッテリーユニット 1 と配線結合することにより、充電履歴メモリ 3 より放電状態（蓄電状態）を把握し、高速で安全な充電方法を選択することができる。また、コントローラ 15 は、バッテリーユニット 1 と配線結合す

ることにより、充電履歴メモリ3より充電状態（蓄電状態）を把握し、過放電によるバッテリー2のダメージを防止することができる。

【0024】また、バッテリー2の充、放電量（蓄電量）等の充電履歴はメモリ3に記憶されているので、常にバッテリー2の状態を把握することができる。従って、交換用のバッテリーユニット1を常に充電済み状態にしておけば、バッテリーユニット1を交換することにより直ぐに補助モータ18が利用でき、充電により自転車が充電器5に拘束されることはなく、自転車の運転が可能となる。

【0025】また、充電履歴メモリ3に記憶されたバッテリー2の推定蓄電量の残量をリアルタイムに表示装置11に表示することにより、運転者はバッテリー2の充電時期が容易に把握でき、過放電によるバッテリー2のダメージを防止することができる。さらに、バッテリーユニット1の充電履歴メモリ3に記憶された充電回数も表示装置11に表示されるので、バッテリー2の寿命を判定する指針とすることができ、また、充電器5のマイコン7において、充電時の電流に対する電圧よりバッテリー2の内部抵抗値を計算し、これよりバッテリー2の寿命を判定することもできる。

【0026】

【発明の効果】以上詳述したように、請求項1記載の本発明の補助駆動モータ付き自転車によれば、バッテリーの使用状態の情報をバッテリー側の充電履歴メモリに記憶保存できるので、充電器とコントローラの常時組み合わせを要することなくバッテリーの充電状態を監視することができ、高速で安全な充電方法を選択できる。

【0027】また、バッテリーの充、放電量（蓄電量）等の充電履歴がバッテリー側のメモリに記憶されているので、常にバッテリーの状態を把握することができ、従って、バッテリーを充電済みのものと交換して直ぐに補助モータを作動させることができるようになり、自転車が充電器に拘束されて自転車の運転が妨げられることは無い。更に、この充電時の装置構成が簡単であり、低コストで構成できるという利点もある。

【0028】請求項2記載の本発明の補助駆動モータ付

き自転車によれば、充電履歴メモリに記憶されたバッテリーの情報が表示されるため、バッテリー情報を把握することができ、安心して自転車を運転することができ、また充電時期が運転者に容易に把握できるため、過放電を防止することができる利点もある。

【図面の簡単な説明】

【図1】本発明の一実施形態としての補助駆動モータ付き自転車を示す充電時の回路ブロック図である。

【図2】本発明の一実施形態としての補助駆動モータ付き自転車を示す放電時の回路ブロック図である。

【図3】本発明の一実施形態としての補助駆動モータ付き自転車における充、放電時の動作の一例を示すフローチャートである。

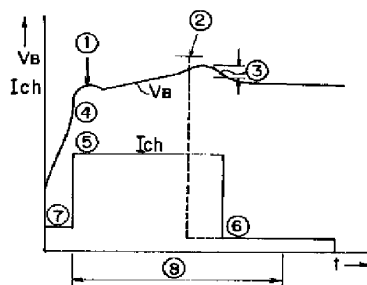
【図4】本発明の一実施形態としての補助駆動モータ付き自転車の充電特性を示すバッテリー充電の電流（電圧）／時間特性図である。

【図5】従来の補助駆動モータ付き自転車におけるバッテリーの充電状態監視手段を示すブロック図である。

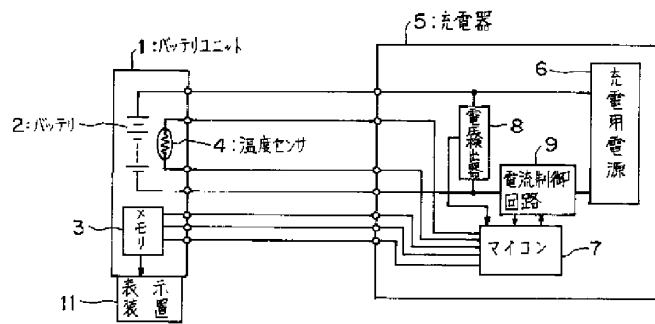
【符号の説明】

- 1 バッテリーユニット
- 2 バッテリー
- 3 充電履歴メモリ
- 4 温度センサ
- 5 充電器
- 6 充電用電源
- 7 マイコン
- 8 電圧検出器
- 9 電流制御回路
- 11 表示装置
- 15 コントローラ
- 16 マイコン
- 17 インバータ
- 18 補助駆動モータ
- 19 電圧検出器
- 21 電流検出器
- 22 足踏トルクセンサ
- 23 速度センサ

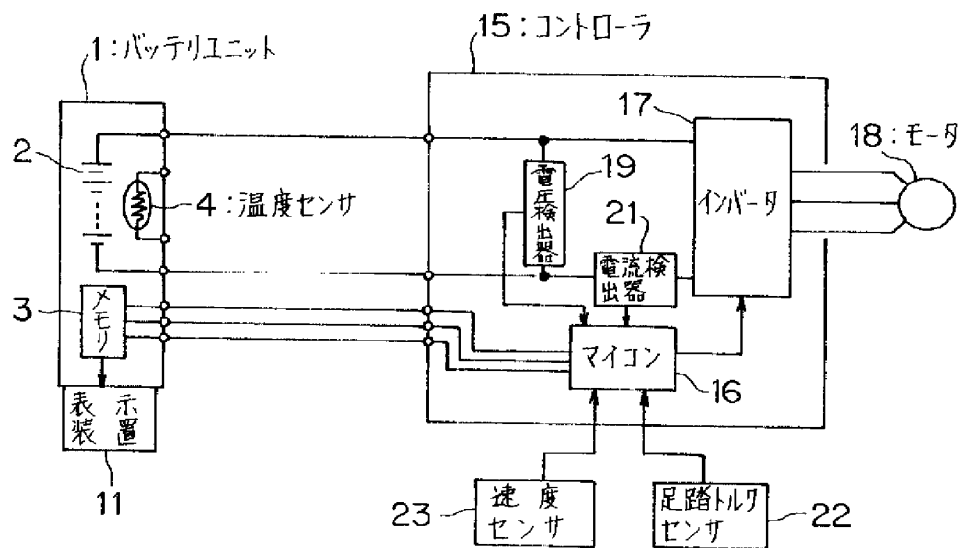
【図4】



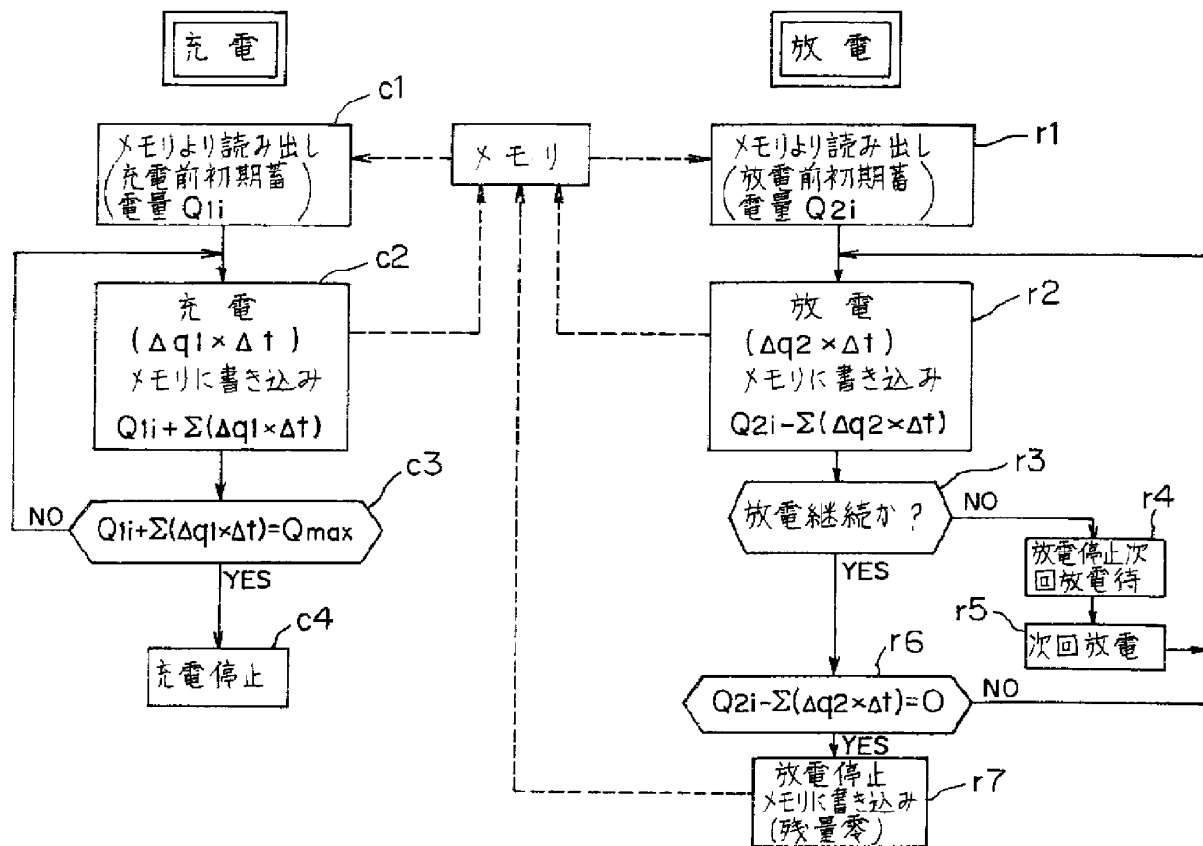
【図1】



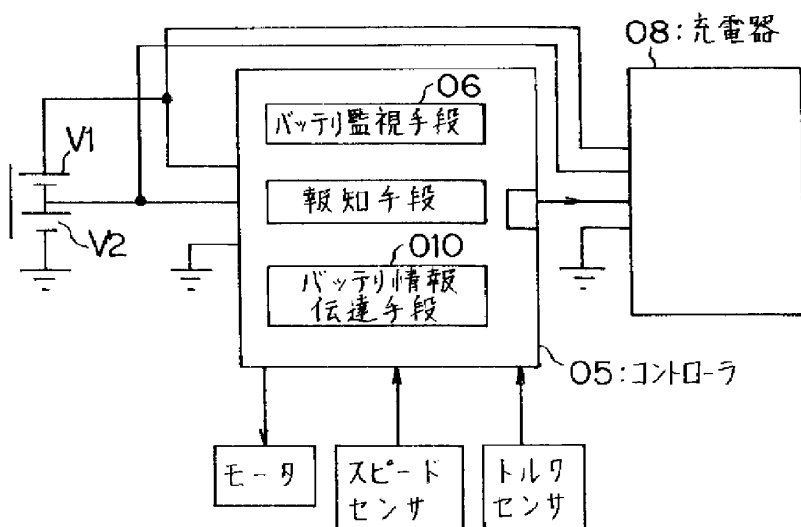
【図2】



【図3】



【図5】



No documents available for this priority number.



Espacenet

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CAR NAVIGATION SYSTEM AND RECORDING MEDIUM

Inventor(s): WATANABE KAZUYUKI ± (WATANABE KAZUYUKI)

Applicant(s): AISIN AW CO ± (AISIN AW CO LTD)

Classification: - **international:** **G01C21/00; G06F12/06; G06F19/00; G08G1/0969; G09B29/10;** (IPC1-7): G01C21/00; G06F12/06; G06F19/00; G08G1/0969; G09B29/10

- **cooperative:**

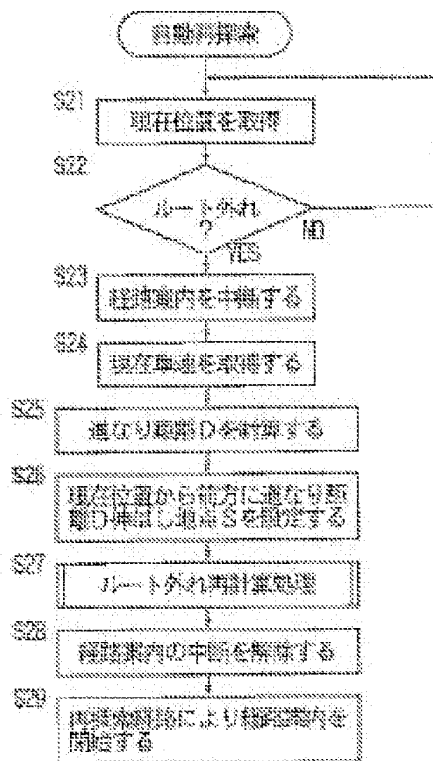
Application number: JP19970214780 19970808

Priority number (s): JP19970214780 19970808

Abstract of JP11051681 (A)

PROBLEM TO BE SOLVED: To start route guidance smoothly through researching after deviation from a route by determining a guide starting point from the distance required for starting guidance and the road information in the traveling direction depending on the vehicle speed when a vehicle has deviated from a route and then searching a route.
SOLUTION: When display output and voice output processing of route guidance is being executed before arriving at a goal, current position of vehicle is acquired through automatic researching (S21), and a decision is made whether a vehicle has deviated from a route (S22) by matching the current position with a route to be guided. When a decision is made whether a vehicle has deviated from a route, route guidance is interrupted (S23) and the distance D along the road (the distance required before starting route guidance according to a researched route) is calculated based on the current traveling speed. A guidance starting point determining means sets a guidance starting point (S26) at point S separated forward from current position by the distance D along the road and then a route researching means researches the route (S27).

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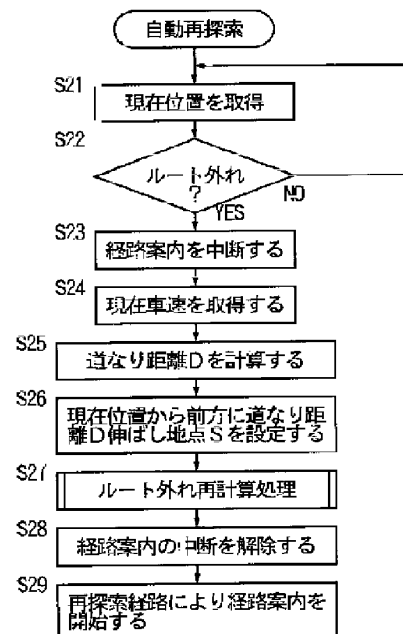
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(54) 【発明の名称】 車両用ナビゲーション装置及び記録媒体

(57) 【要約】

【課題】 ルート外れ時の再探索による経路案内の開始を円滑に行えるようにする。

【解決手段】 出発地又は現在位置から目的地までの経路を探索し、その経路にそって経路案内を行うとともに、車両が探索された経路上を走行しているか判定し、その判定結果に基づいて、車両が経路を外れた場合に、車両の速度を検出し、車両の速度に応じて案内開始までに必要な距離を決定し、現在走行中の道路から車両の進行方向にある道路の道路情報を取得し、前記決定された距離と前記取得された道路情報から案内開始地点を決定して経路を探索する。



【特許請求の範囲】

【請求項1】 出発地又は現在位置から目的地までの経路を探索し、その経路にそって経路案内を行うとともに、車両が探索された経路上を走行しているか判定し、その判定結果に基づいて、車両が経路を外れた場合に、車両の速度を検出し、車両の速度に応じて案内開始までに必要な距離を決定し、現在走行中の道路から車両の進行方向にある道路の道路情報を取得し、前記決定された距離と前記取得された道路情報から案内開始地点を決定して経路を探索することを特徴とする車両用ナビゲーション装置。

【請求項2】 出発地又は現在位置から目的地までの経路を探索するとともに、その探索された経路にそって経路案内を行う車両用ナビゲーション装置において、各道路の属性、接続状態などの道路情報を記憶する情報記憶手段と、車両の位置及び移動速度を検出する現在位置検出手段と、前記現在位置検出手段の検出結果に基づいて、車両が探索された経路上を走行しているか否かを判定する経路外れ判定手段と、前記経路外れ判定手段の判定結果より車両が探索された経路を外れていると判定されたとき、前記現在位置検出手段で検出された現在位置から経路を算出する経路再探索手段と、前記経路外れ判定手段の判定結果より車両が探索された経路を外れていると判定されたとき、前記現在位置検出手段で検出された移動速度に基づいて、案内開始に必要な走行距離を算出する走行距離算出手段と、前記走行距離算出手段により算出された走行距離と、前記情報記憶手段に記憶された道路情報とに基づいて、案内開始地点を決定する案内開始地点決定手段とを有し、前記経路再探索手段は、前記案内開始地点決定手段によって決定された案内開始地点を通る経路を算出することを特徴とする車両用ナビゲーション装置。

【請求項3】 前記案内開始地点決定手段は、前記取得された道路情報から案内不要道路にそって前記決定された距離伸ばした地点を前記案内開始地点に決定することを特徴とする請求項2記載の車両用ナビゲーション装置。

【請求項4】 前記案内開始地点決定手段は、前記決定された距離の範囲内で前記取得された道路情報に案内不要道路を有しない交差点があるか否かを判断し、案内不要道路を有しない交差点がある場合には、当該交差点を前記案内開始地点に決定することを特徴とする請求項2記載の車両用ナビゲーション装置。

【請求項5】 前記案内開始地点決定手段は、前記決定された距離の範囲内で前記取得された道路情報に案内不要道路を有しない交差点があるか否かを判断し、案内不要道路を有しない交差点がある場合には、経路を外れたときの案内方向に近い方向の道路に伸ばした地点を前記案内開始地点に決定することを特徴とする請求項2記載の車両用ナビゲーション装置。

【請求項6】 出発地又は現在位置から目的地までの経路を探索し、その経路にそって経路案内を行うとともに、車両が探索された経路上を走行しているか判定し、その判定結果に基づいて、車両が経路を外れた場合に、車両の速度を検出し、車両の速度に応じて案内開始までに必要な距離を決定し、現在走行中の道路から車両の進行方向にある道路の道路情報を取得し、前記決定された距離と前記取得された道路情報から案内開始地点を決定して経路を探索するプログラムを記録したコンピュータ読み取り可能な記録媒体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、出発地又は現在位置から目的地までの経路探索を行い、該探索した経路にしたがって経路案内を行い、経路外れが検出されると再探索を行う車両用ナビゲーション装置及び記録媒体に関する。

【0002】

【従来の技術】車両用ナビゲーション装置では、出発地又は現在位置から設定された目的地までの経路探索を行い、その探索された経路にしたがって案内を行っている。経路案内では、現在位置を追跡しながら案内経路とのマッチング処理を行って、案内地点その他の地点や指示に応じて、経路と現在位置マークを上書き地図、交差点案内図、市街地図、特徴物案内図等の画面切り換えを行って表示情報を出力し、これらに関連する音声情報を出力して、表示出力、音声出力による経路の案内を行っている。このような車両用ナビゲーション装置において、現在位置が案内経路から外れると適切な案内を行うことができなくなるので、ルート外れの検出機能と再探索機能を備え、ルート外れを検出すると、その周辺での経路、又は目的地までの全経路の再探索を行うようにしている。

【0003】

【発明が解決しようとする課題】しかしながら、従来の車両用ナビゲーション装置における再探索機能は、ルート外れを検出して再探索を開始するが、車両は再探索を実行した地点からさらに前進しているので、再探索が終了して経路案内がでたときは、次の案内地点を通過してしまっており、適切に案内が受けられないという問題がある。

【0004】さらに、案内を行う地点を再探索開始地点から所定距離進めておくことが考えられるが、直進道路が必ずしも十分な距離存在するとは限らないので、常に所定距離進めて案内を開始させることはできないという問題がある。

【0005】また、上記所定距離を車両の移動速度に応じて変更することも考えられるが、その間に交差点のない十分な長さの道路が存在するエリアでしか、効力を発揮できない。

【0006】

【課題を解決するための手段】本発明は、上記課題を解決するものであって、ルート外れ時の再探索による経路案内の開始を円滑に行えるようにするものである。

【0007】そのために本発明は、出発地又は現在位置から目的地までの経路を探索し、その経路にそって経路案内を行うとともに、車両が探索された経路上を走行しているか判定し、その判定結果に基づいて、車両が経路を外れた場合に、車両の速度を検出し、車両の速度に応じて案内開始までに必要な距離を決定し、現在走行中の道路から車両の進行方向にある道路の道路情報を取得し、前記決定された距離と前記取得された道路情報から案内開始地点を決定して経路を探索することを特徴とするものである。

【0008】また、前記案内開始地点は、前記取得された道路情報から案内不要道路にそって前記決定された距離伸ばした地点に決定し、前記決定された距離の範囲内で前記取得された道路情報に案内不要道路を有しない交差点があるか否かを判断し、案内不要道路を有しない交差点がある場合には、当該交差点又は経路を外れたときの案内方向に近い方向の道路に伸ばした地点に決定することを特徴とするものである。

【0009】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照しつつ説明する。図1は本発明に係る車両用ナビゲーション装置の実施の形態を示す図、図2は案内道路データ等の構成例を示す図、図3は道路属性データ等の構成例を示す図、図4は交差点データの構成例を示す図、図5は案内フレーズデータの構成例を示す図である。本発明に係るナビゲーション装置は、経路案内に関する情報や各種機能の選択、実行のための情報を入出力する入出力装置1、自車両の現在位置に関する情報を検出する現在位置検出装置（現在位置検出手段）2、経路の算出に必要なナビゲーション用データや経路案内に必要な表示／音声の案内データとプログラム（OS及び／又はアプリケーション）等が記憶されている情報記憶装置（情報記憶手段）3、経路探索処理や経路案内に必要な表示／音声案内処理を行うと共に、システム全体の制御を行う中央処理装置4から構成されている。まず、それぞれの構成について説明する。

【0010】入出力装置1は、目的地を入力したり、運転者が必要な時に案内情報を音声及び／又は画面のうち少なくとも一つから出力できるように、運転者の意志によりナビゲーション処理を中央処理装置4に指示すると共に、処理後のデータなどをプリント出力する機能を備えている。その機能を実現するための手段として、入力部には、目的地を電話番号や地図上の座標などにて入力したり、経路案内をリクエストしたりするタッチスイッチ11や操作スイッチを有する。勿論、入力手段としては、タッチスイッチ11や操作スイッチ等に代えて、リ

モートコントローラ等の入力手段を使用してもよいし、これらを併用してもよい。さらに、車両前方の風景画像を撮影するためのビデオカメラ15を備えている。また、出力部には、入力データを画面表示したり、運転者のリクエストに応じ自動的に経路案内を画面で表示するディスプレイ（表示出力手段）12、中央処理装置4で処理したデータや情報記憶装置3に格納されたデータをプリント出力するプリンタ13および経路案内を音声で出力するスピーカ（音声出力手段）16などを備えている。

【0011】ここで、音声入力を可能にするための音声認識装置やICカードや磁気カードに記録されたデータを読み取るための記録カード読取装置を付加することもできる。また、予め地図データや目的地データなどの運転者固有のデータが記憶されているパソコンなどの情報源との間でデータのやりとりを行うためのデータ通信装置を付加することもできる。

【0012】ディスプレイ12は、カラーCRTやカラー液晶表示器により構成されており、中央処理装置4が処理する地図データや案内データに基づく経路設定画面、区間図画面、交差点図画面などナビゲーションに必要なすべての画面をカラー表示出力すると共に、本画面に経路案内の設定および経路案内中の案内画面の切替え操作、各種機能の選択呼び出し操作を行うためのボタンが表示される。特に、通過交差点名などの通過交差点情報は、随時、区間図画面にポップアップでカラー表示される。

【0013】このディスプレイ12は、運転席近傍のインストルメントパネル内に設けられており、運転者は表示された地図を見ることにより自車の現在地を確認し、またこれからの経路についての情報を得ることができる。また、ディスプレイ12には機能ボタンの表示に対応してタッチスイッチ11が設けられており、ボタンをタッチすることにより入力される信号に基づいて上記の操作が実行されるように構成されている。このボタンとタッチスイッチなどから構成される入力信号発生手段は入力部を構成するものであるが、ここではその詳細な説明を省略する。

【0014】現在位置検出装置2は、車両の現在位置に関する情報を検出、或いは受信する装置であり、地磁気センサ等で構成される絶対方位センサ24、ステアリングセンサ、ジャイロ等で構成される相対方位センサ25、車輪の回転数から車速（又は走行距離）を検出する速度センサ26、衛星航法システム（GPS）を利用したGPS受信装置21及び通信装置を備えている。前記通信装置は、交通情報取得手段であるVICS受信装置22及びデータ送受信装置23から構成され、VICS（道路交通情報システム；Vehicle Information & Communication System）は、道路交通情報をリアルタイムでFM多重（文字放送）、電波ビーコン、光ビーコンによ

って車両に伝送するもので、FM多重は広いエリアにわたり粗い情報を伝送し、電波ビーコン及び光ビーコンの情報は、ビーコンを中心として半径10km程度以内の狭いエリアの詳細な情報であって、車両がビーコンを通過すると受信できるようになっている。VICS送信データは、各道路毎に付けられたリンク番号に対して、渋滞度（例えば、通行不可、渋滞、混雑、交通量多い、平常等の混雑の度合い）、渋滞先頭位置、渋滞長、通行規制（工事情報、通行止め等）、旅行時間（所定速度での所要時間）から構成されている。また、データ送受信装置23は、例えば携帯電話やパソコンであり、運転者の要求により交通情報センター（例えばATIS）との間でナビゲーションに必要な情報のやりとりを行うものである。

【0015】情報記憶装置3は、ナビゲーションプログラム及びデータをCD-ROM（以下、単にCDという）、DVD（デジタル・ビデオディスク）、光CD、ICカード等の外部記憶媒体に記憶したものである。プログラムは、地図描画部、経路探索部、経路案内部、現在位置計算部、目的地設定操作制御部等からなり、ナビゲーションの信号処理を行うアプリケーション部及びOS部等で構成され、ここに、経路探索などの処理を行うためのプログラムや経路の表示案内に必要な表示出力制御、音声案内に必要な音声出力制御を行うためのプログラム及びそれに必要なデータ、さらには、経路案内及び地図表示に必要な表示情報データが格納されている。また、データは、地図データ、交差点データ、道路データ、各種案内データ等、ナビゲーションに必要なすべてのデータが格納されている。

【0016】具体的には、現在位置検出装置2からの位置情報、入力装置11からの入力信号に基づき目的地や通過点を設定し、探索道路データを用いて経路探索を実行するプログラム（経路探索手段）、通信装置から取得された交通情報に基づき探索道路データを変換して再度経路探索を実行させるためのプログラム、探索された経路を立体的に描画するために変換するプログラム（経路情報変換手段）、或いは地図描画やマップマッチング、経路に沿って音声出力タイミングや音声フレーズの内容を決定するためのプログラム、さらには画像撮影手段であるビデオカメラ15から取り込まれた画像から特徴物を認識したり、認識された特徴物の画像上の相対移動方向を判定したり、その移動方向から進出路を決定するプログラム等が格納され、これら情報記憶装置3に格納されたプログラムを起動することにより、本発明におけるナビゲーションの各機能が実行される。つまり、本実施の形態においては、本発明の機能が実現されるためのプログラムが外部記憶媒体である情報記憶装置3に格納されている。

【0017】また、本発明の機能が実現されるためのプログラムの全部又は一部、データの全部又は一部を情報

センタや他の車両からデータ送受信装置23を介して受信し、ナビゲーション装置内の記録媒体であるフラッシュメモリ41やRAM42に記憶させるようにしてもよい。

【0018】中央処理装置4は、種々の演算処理を実行するCPU40、情報記憶装置3のCDからプログラムを読み込んで格納するフラッシュメモリ41を備えている。このフラッシュメモリ41は、CDのプログラムの変更があっても既存のプログラムを消去して書き換え可能にするものである。また、フラッシュメモリ41のプログラムチェック、更新処理を行うプログラム（プログラム読み込み手段）を格納した第1ROM43a、設定された目的地の地点座標、道路コードNo.等の探索された経路案内情報や演算処理中のデータを一時的に格納するRAM42、経路案内及び地図表示に必要な表示情報データが格納された第2ROM43bを備えている。なお、前記した更新処理を行うプログラムを外部記憶装置に格納しておいてもよい。

【0019】さらに、ディスプレイへの画面表示に使用する画像データが記憶された画像メモリ44、CPU40からの表示制御信号に基づいて画像メモリから画像データを取り出し、画像処理を施してディスプレイ12に出力する画像プロセッサ45、CPU40からの音声出力制御信号に基づいてRAM42から読み出した音声、フレーズ、1つにまとまった文章、音等を合成してアナログ信号に変換してスピーカ16に出力する音声プロセッサ46、通信装置による入出力データのやり取りを行う通信インタフェース47および現在位置検出装置2のセンサ信号を取り込むためのセンサ入力インタフェース48、内部ダイアグ情報に日付や時間を記入するための時計49などを備えている。

【0020】また、撮影された画像は、CPU40によりアナログ信号からデジタル信号に変換され、RAM42に記憶される。この画像データから交差点や分岐点の特徴物が認識され画像認識処理が実行される。この画像認識処理においては、情報記憶装置3に記憶された画像データファイルの色、形状情報を参照することにより特徴物の認識が行われる。

【0021】この中央処理装置4において、現在位置検出装置2の各センサにより取得されたデータをセンサ入力インターフェース48より取り込むと、そのデータに基づきCPU40は、一定時間毎に現在位置座標を算出し、一時的にRAM42に書き込む。この現在位置座標は、各種データの検出誤差を考慮してマップマッチング処理を行ったものである。また、各種センサによる出力値は、常に補正が行われる。ここで、経路案内は画面表示と音声出力で行い、音声出力の有無は運転者が選択できるように構成されている。

【0022】ナビゲーションに必要なプログラムは、中央処理装置4のROM43aに予め格納するように構成

してもよいし、情報記憶装置（記憶媒体）3に格納するように構成してもよい。なお、情報記憶装置3にプログラムを格納した場合には、例えば情報記憶装置3からプログラムを読み出してフラッシュメモリ41に記憶させるようにすると、情報記憶装置3を交換することにより、新たなプログラムを更新、実行することが可能となる。また、情報記憶装置3から読み出したプログラムを一時的にRAM42に記憶させてナビゲーション機能进行处理するようにすることもできる。

【0023】図2～図5は情報記憶装置に格納された主要なデータファイルの構成例を示し、案内道路データファイルは、図2（A）に示すように、道路数nのそれぞれに対して、道路番号、長さ、道路属性データ、形状データのアドレス、サイズおよび案内データのアドレス、サイズの各データからなり、経路探索部により経路を算出し経路案内を行うために必要なデータとして格納される。

【0024】道路番号は、分岐点間の道路毎に方向（往路、復路）別に設定されている。道路属性データは、道路案内補助情報データであり、図3（A）に示すように、その道路が高架か、高架の横か、地下道か、地下道の横かなどからなる高架・地下道の情報、車線数の情報、市街、郊外の情報を示すデータである。形状データは、図2（B）に示すように、各道路の複数のノード（節）で分割したとき、ノード数mのそれぞれに対して東経、北緯からなる座標データを有している。案内データは、図2（C）に示すように、交差点（または分岐点）名称、信号機データ、ランドマークデータ、注意点データ、道路名称データ、道路名称音声データ、行き先データのアドレス、サイズの各データからなる。

【0025】案内データのうち、注意点データは、図3（C）に示すように、踏切か、トンネル入口か、トンネル出口か、幅員減少点か、なしか等の情報を示すデータであり、分岐点以外の踏切、トンネル等において運転者に注意を促すためのデータである。道路名称データは、図3（B）に示すように、高速道路、都市高速道路、有料道路、一般道（国道、県道、その他）の道路種別の情報と高速道路、都市高速道路、有料道路について本線か取付道かを示す情報のデータであり、道路種別データとさらに各道路種別毎での個別番号データである種別内番号から構成される。行き先データは、図2（D）に示すように、行き先道路番号、行き先名称、行き先名称音声データのアドレス、サイズおよび行き先方向データ、走行案内データからなる。

【0026】行き先データのうち、行き先方向データは、図2（E）に示すように、無効（行き先方向データを使用しない）、不要（案内しない）、直進、右方向、斜め右方向、右に戻る方向、左方向、斜め左方向、左に戻る方向の情報を示すデータである。走行案内データは、図3（D）に示すように、車線が複数ある場合にど

の車線を走行すべきかを案内するためのデータを格納したもので、右寄りか、左寄りか、中央寄りか、なしかの情報を示すデータである。

【0027】なお、図2及び図3に示すデータ構造では、道路データに交差点に関する情報を格納しているが、図4に示すような交差点データを道路データとは別個に持たせて、信号機の有無や接続する道路の情報等を格納させるようにしてもよい。ただし、道路データに接続情報を持たせた方が、ある道路からある道路は進入不可である等のデータを持たせることが容易であり、データ量を少なく済ませることができる。また、経路案内における案内文の編集をしやすくした案内フレーズデータの例を示したのが図5である。このように案内文を距離フレーズ、方向フレーズ、特徴物フレーズ等のフレーズ毎に分割して案内フレーズデータを持たせることにより、案内音声データを出力する場合に、例えば「およそ300mで右折です」というように各フレーズを組み合わせさせて案内地点の状況に応じた案内文を設定して出力することができる。

【0028】図6は本発明に係る車両用ナビゲーション装置のシステム全体の処理の流れを説明するための図、図7は図6の経路探索により設定された経路を説明するための図である。中央処理装置4のCPU40により、まずイニシャライズ処理でCD-ROMからナビゲーションプログラムを読み出され、フラッシュメモリ41に格納されて起動されると、図6に示すように現在位置検出装置2により現在位置を検出する処理を行い、現在位置を中心としてその周辺地図を表示すると共に、現在位置の名称等を表示する（ステップS11）。次に、電話番号や住所、施設名称、登録地点等を用いて目的地を設定する処理を行い（ステップS12）、現在位置から目的地までの経路探索処理を行う（ステップS13）。この経路探索の結果、目的地に到着するまでの経路は、例えば図7に示すように案内する道路番号を並べた案内道路番号データとして設定される。経路が決まると、現在位置検出装置2による現在位置追跡を行いながら、目的地に到着するまで経路案内の表示出力・音声出力の処理を行う（ステップS14）。

【0029】本発明は、上記ステップS14の案内・表示において、例えば曲がるべき案内交差点を通過してしまい、ルート外れが生じた場合の自動再探索に関するものである。図8は自動再探索の例を説明するための図、図9は自動再探索における再探索開始点を説明するための図、図10は道なり距離の範囲内に案内交差点が存在する場合の例を説明するための図、図11は再探索処理の場合の表示例を示す図である。

【0030】目的地に到着するまで経路案内の表示出力・音声出力の処理を実行している間において、自動再探索では、図8に示すように車両の現在位置を取得して（ステップS21）、現在位置を案内経路とマッチング

処理することにより、ルート外れか否かを判断する（ステップS22）。そして、ルート外れと判断した場合には、まず、経路案内を中断して（ステップS23）、走行距離算出手段により現在の走行速度（車速）を取得し（ステップS24）、取得した走行速度に基づき道なり距離Dを算出する（ステップS25）。この道なり距離Dは、再探索した新たな経路により経路案内ができるようになるまでの走行距離に相当する。したがって、車速に所要時間乗じた距離となり、車速が速ければ道なり距離Dは長くなる。具体的には、案内開始とほぼ同時に曲がるべき案内交差点に入るようになると、先に述べたように再びルート外れを起こしてしまうので、車速に掛ける所要時間は、再探索に要する時間に、少なくとも音声案内を出力する時間を加えた時間となる。つまり、曲がるべき案内交差点に対する音声案内が出力できる十分な距離を残した地点から再探索後の案内開始ができるようになるものである。なお、さらには快適に現状の車速から停止できる時間を加えてもよい。したがって、この道なり距離Dが算出されると、案内開始地点決定手段により、現在位置から道なり距離Dだけ前方の地点Sを案内開始地点として設定し（ステップS26）、経路再探索手段によりルート外れの再探索処理を実行する（ステップS27）。再探索処理により新たな経路が探索されると、経路案内の中断を解除して（ステップS28）、再探索された経路に基づき経路案内の表示出力・音声出力の処理を開始する（ステップS29）。

【0031】例えば図9に示すように案内経路では、交差点①で右折すべきところ、直進して通過してしまったとする。この場合、交差点①の通過直後にルート外れが検出されてその地点から直ちに再探索を実行しても、交差点②が間近に迫っていると、新たな経路が再探索できないうちに交差点に到達してしまうことになる。また、交差点に入る前に再探索が終了しても、その交差点の案内を出力する時間がなかったり、案内が出力されても、運転者側に充分に対応できるだけの余裕を持ってないこともある。そこで、道なり距離Dは、車両が現在案内されている経路から外れたことが検出され、再探索を開始するにあたり、車両の移動速度、案内音声の出力時間、及び経路の探索時間などを考慮して、運転者が再探索終了後に経路案内を聞いて適切に経路の指示を実行できるように計算した距離である。また、再探索開始地点から道なり距離D進んだ地点を案内開始地点Sとする。したがって、本発明の場合には、図9に示すような交差点①と②との間でルート外れが検出されると、道なり距離Dだけ前方の地点を再探索の出発地点Sとして再探索を実行し、出発地点Sから交差点③へ向かって経路案内を行うことになる。

【0032】また、道なり距離Dを算出し、現在走行中の道路情報及び現在位置検出手段である方位センサ24、25又はGPS受信装置21から検出された車両の

進行方向に接続された他の道路の道路情報から、車両の進行方向に道路を先送りした結果、道なり距離D以上に直進道路がない場合、例えば図10に示すように、T字路が存在する場合、このT字路に進入する道路に対して案内不要道路があるか否かを判断する。もし、案内不要道路があるなら、進入道路から案内不要道路の方へ道なり距離Dを進める。図10を参照してさらに詳細に説明すると、この図では、車両が案内地点①で最初の経路を外れてしまっており、車速に基づいて計算された道なり距離DまでにT字路②が存在している図である。さらに、ここでは、道路情報が交差点③において、車両の進入路に対し、右折方向が案内不要道路である場合を示しており、このとき、再探索手段は右折方向に道なり距離Dを伸ばしていく。そして、 $D_1 + D_2 - D$ となった地点を案内開始地点Sとして、再探索案内開始地点②から案内開始地点Sを通過するように、再探索手段は、もとの経路に戻る新しい経路を探索する。

【0033】なお、上記説明では、道路情報に案内不要情報がある場合の説明をしたが、案内不要情報がない場合でも、例えば図10において、右折方向の道路に右折禁止情報があるような場合には、進入路に対して1本しか道路が存在しないので、当然、左折方向に道なり距離を伸ばしていくことになる。また、案内不要情報も進入禁止情報もない道路では、再探索手段は、経路を外れたときの案内方向（前回の退出路方向）を現在の経路情報から取得して、その方向に近い方向を持つ退出路方向に道のり距離を伸ばすこともできる。

【0034】再探索に要する時間は、特に周辺探索であればごく短時間であるので、その場合には、ルート外れ、再探索の実行を運転者に報知しなくても、混乱なく再探索による経路案内を開始することができる。しかし、ルート外れの場合、運転者が戸惑いを感じることは否めないため、ルート外れを検出してから経路案内を開始するまでの間に、例えば図11に示すように再探索中であるとの情報や、案内開始する地点の情報、現在位置の情報等を報知させるようにしてもよい。勿論、図11に示す表示の態様だけでなく、他の表示の態様や必要に応じて音声による報知を行うようにしてもよいことは勿論である。

【0035】図12は案内不要道路の有無により地点設定を調整する他の実施の形態を示す図、図13は案内不要道路の有無による地点設定の調整例を示す図である。図12に示す例では、ルート外れの場合にまず、車両の走行速度を取得して道なり距離Dを算出し（ステップS31）、車両の現在位置から進行方向に向かって算出した距離Dまでの道路を検索して（ステップS32）、案内不要道路のない交差点があるか否かを調べる（ステップS33）。図12（A）に示すように案内不要道路のない交差点がない場合には、つまり各交差点①、②は案内不要道路があり案内不要道路に沿って現在位置から進

行方向に向かって距離Dの走行が可能であるので、図12(C)に示すように車両の現在地から進行方向に向かって案内不要道路を道なり距離D伸ばして地点Sを設定する(ステップS34)。また、図12(B)に示すように案内不要道路のない交差点③がある場合には、進行方向が決められないので、図12(D)に示すように案内不要道路のない交差点を地点Sとして設定する(ステップS35)。このようにして設定された地点Sまでは案内を必要としない経路を作る条件で再探索を開始する(ステップS36)。

【0036】図14はルート外れ処理の例を説明するための図、図15及び図16はルート再計算処理の例を説明するための図である。ルート外れ処理では、図14に示すようにまず、ルート外れを検出すると、オートリルートモードがオンか否かを調べる(ステップS51)。これは、自動再探索モードのスイッチ及び再探索スイッチを有し、運転者がこの自動再探索モードによりオートリルートモードを選択できるようにしている例であり、その状態の判定を行っている。自動再探索モードのスイッチがオンであれば、自動的に再探索処理を行い(ステップS52)、再探索されたルートの表示を行う(ステップS53)。

【0037】オートリルートモードでなければ、再探索処理を行って(ステップS54)、再探索スイッチがオンか否かを調べ(ステップS55)、オンでなければステップS54に戻り、オンであればさらに最新の経路上にいまするか否かを判定し(ステップS56)、最新の経路上にいないければステップS54に戻り、最新の経路上にいる場合には、再探索されたルートの表示を行う(ステップS57)。このようにオートリルートモードでない場合には、再探索スイッチがオンされる以前に再探索処理を行うようにし、再探索スイッチがオンと同時に最新の経路を出力可能にしている。ステップS55の判定結果、再探索スイッチがオンでなければステップS54に戻ることなくオンになるまで待つようにしてもよい。

【0038】ステップS52及びS54の再探索処理は、例えば図15に示すようにまず、車両の現在位置周辺の探索データを読み込み(ステップS58)、前回の案内ルート列を取得する(ステップS59)。そして、前回の案内ルートへ戻る方向に各交差点での進行方向及び探索コストを計算する(ステップS60)。経路探索において、通常、探索コストは、その道路(番号)に対して通過所要時間や、距離、走りやすさ(道路幅、国道等の道路種別、信号機の数等)、料金等で設定されており、探索コストが例えば距離で設定されていれば、道路幅の違い、道路種別等による走りやすさを距離に換算する。したがって、物理的に同じ長さであっても、例えば幹線道路に対して高速道路は換算距離が短くなるが、支線道路は換算距離が長くなるように設定されている。これらの換算距離に対し、前回の案内ルートに戻る方向の

道路には、さらに一定の値、或いは倍率で距離を短縮し、探索コストを低くしてその道路の最適経路の候補に選びやすくする。次に、車両現在地の道路及び方向を取得し(ステップS61)、進行方向で現在地道路につながる交差点を選択し、各交差点までの進行方向及び探索コストに基づき前回のルートに戻るルートを決める(ステップS62)。これらの処理結果として案内ルートの道路列を再作成する(ステップS63)。

【0039】また、上記再探索処理では、周辺探索データのみで探索を行うため、通行止めなどにより経路が探索できない場合がある。そこで、このような不都合が生じないように目的地までの全ルートの再探索を行う例を示したのが図16である。この処理では、車両の現在地道路、及び方向を取得し(ステップS64)、目的地道路を取得して(ステップS65)、現在位置と目的地間で探索道路データを読み込む(ステップS66)。そして、進行方向で現在地道路がつながる交差点を選択し、各交差点までの進行方向及びペナルティ(探索コストと同義)に基づき目的地に至る全ルートを決定し(ステップS67)、案内ルートの道路列を再作成する(ステップS68)。

【0040】なお、本発明は、上記実施の形態に限定されるものではなく、種々の変形が可能である。例えば上記実施の形態では、現在地から道なり距離Dだけ前方の地点を再探索の出発地として設定したが、その先の交差点や特徴物等の案内出力の開始地点を出発地として再探索を行うようにしてもよい。

【0041】

【発明の効果】以上の説明から明らかなように、本発明によれば、案内交差点等を行き過ぎたりしてルート外れを起こした時、再探索時間や案内出力時間に相当する時間以上の余裕時間を折り込んだ道なり距離を算出し、その前方位置から再探索を実行するので、再探索経路により案内を開始する時に、いきなり案内交差点に差しかったり、再探索経路からもルート外れを起こしていたりするということを防ぐことができる。しかも、車速に応じて道なり距離を算出するので、車速に関係なく常に余裕を持って、経路案内を出力することができる。

【図面の簡単な説明】

【図1】 本発明に係る車両用ナビゲーション装置の実施の形態を示す図である。

【図2】 案内道路データ等の構成例を示す図である。

【図3】 道路属性データ等の構成例を示す図である。

【図4】 交差点データの構成例を示す図である。

【図5】 案内フレーズデータの構成例を示す図である。

【図6】 本発明に係る車両用ナビゲーション装置のシステム全体の処理の流れを説明するための図である。

【図7】 図6の経路探索により設定された経路を説明するための図である。

【図8】 自動再探索の例を説明するための図である。

【図9】 自動再探索における再探索開始点を説明するための図である。

【図10】 道なり距離の範囲内に案内交差点が存在する場合の例を説明するための図である。

【図11】 再探索処理の場合の表示例を示す図である。

【図12】 案内不要道路の有無により地点設定を調整する他の実施の形態を示す図である。

【図13】 案内不要道路の有無による地点設定の調整例を示す図である。

【図14】 ルート外れ処理の例を説明するための図である。

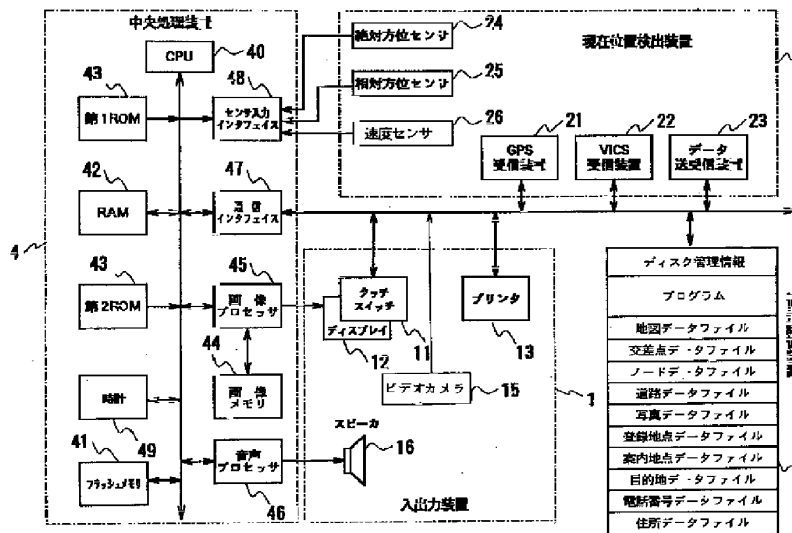
【図15】 ルート再計算処理の例を説明するための図である。

【図16】 ルート再計算処理の例を説明するための図である。

【符号の説明】

1…入出力装置、2…現在位置検出装置、3…情報記憶装置、4…中央処理装置、11…タッチスイッチ、12…ディスプレイ、13…プリンタ、15…ビデオカメラ、16…スピーカ、21…GPS受信装置、22…VICS情報受信装置、23…データ送受信装置、24…絶対方位センサ、25…相対方位センサ、25は距離センサ、40…CPU、41…フラッシュメモリ、42…RAM、43a…第1ROM、43b…第2ROM、44…画像メモリ、45…画像プロセッサ、46…音声プロセッサ、47…通信インターフェース、48…入力インターフェース

【図1】



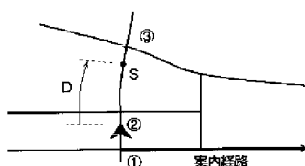
【図4】

交差点データ	
交差点数 (k)	
1	交差点番号
	交差点名称
	番号欄データ
	横断歩道データ
	分岐点待機物データ
	進入道路データ
	退出道路データ
	ランドマークデータ
	...
k	

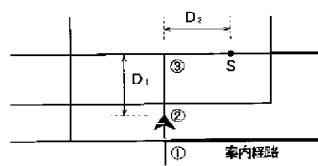
【図5】

フレーズ種別	フレーズ内容
A 距離フレーズ	1 およそ700mで
	2 およそ800mで
	3 まもなく
	4 その先
	5 この先
B 方向フレーズ	1 直進です
	2 右折です
	3 左折です
C 待機物フレーズ	1 信号機の無い交差点です
	2 次の信号を
	3 2つの信号を
	4 信号の手前の交差点を
	5 信号の次の交差点を
	6 次のノンリンスランドを
:	:
:	:

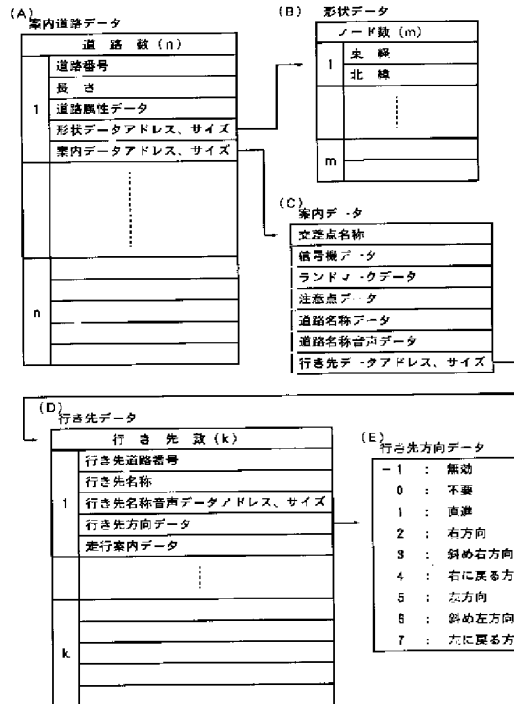
【図9】



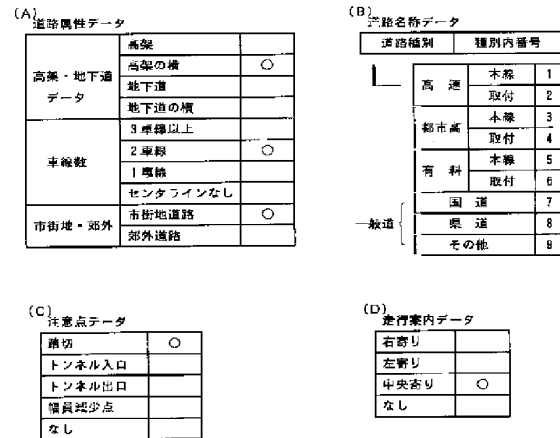
【図10】



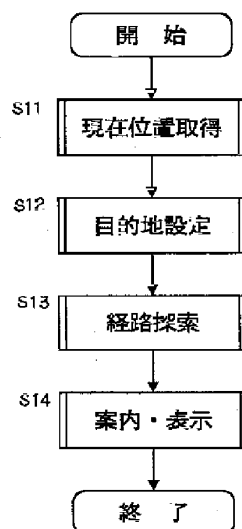
【図2】



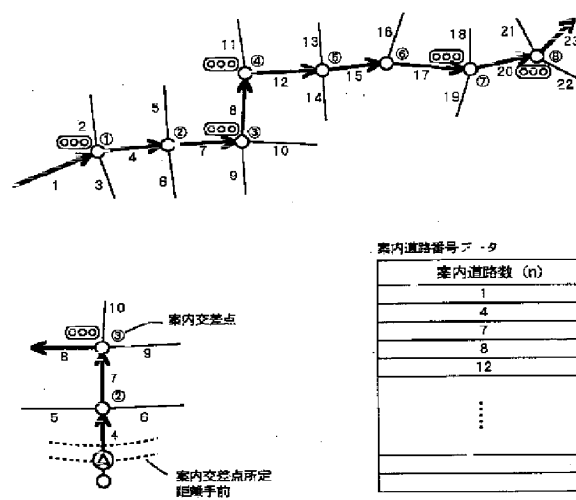
【図3】



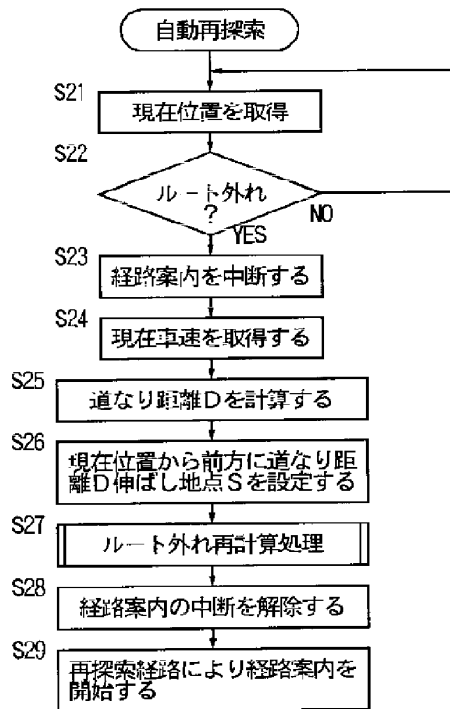
【例6】



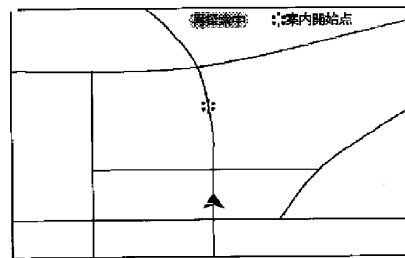
【例7】



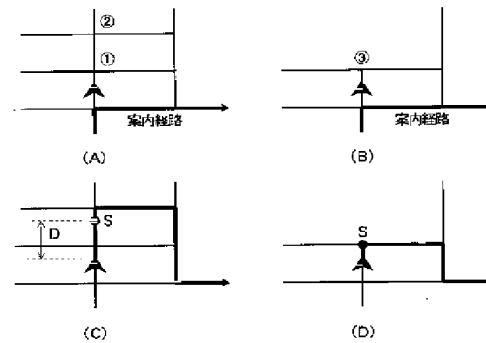
【図8】



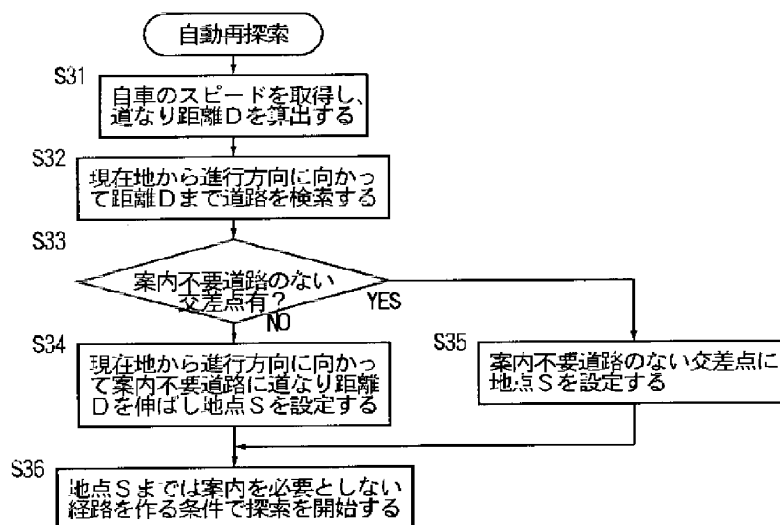
【図11】



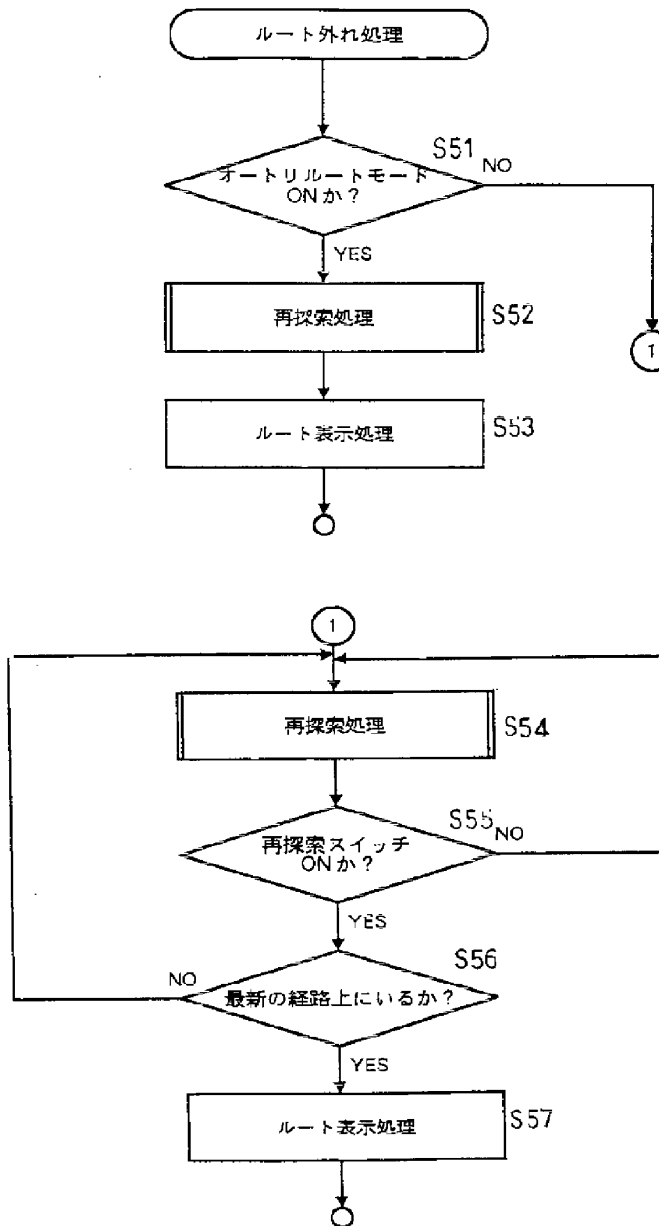
【図13】



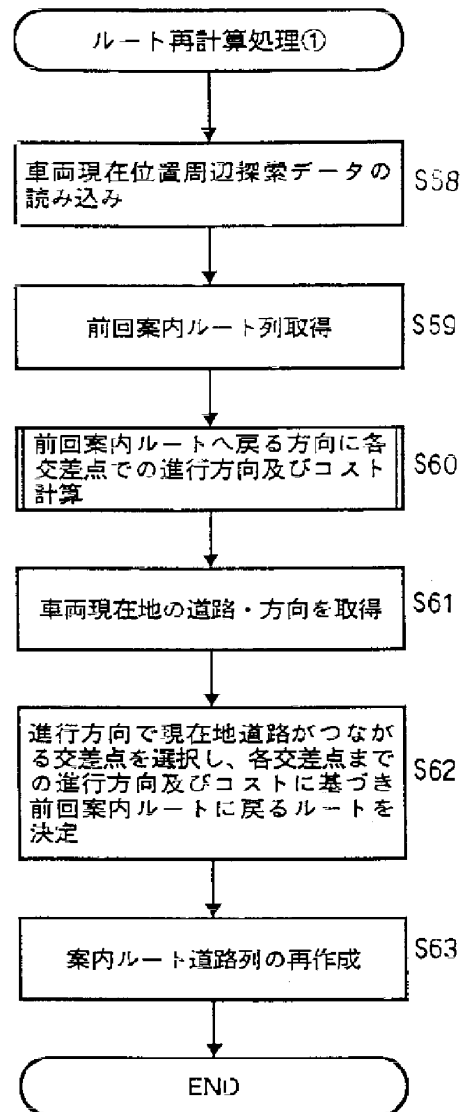
【図12】



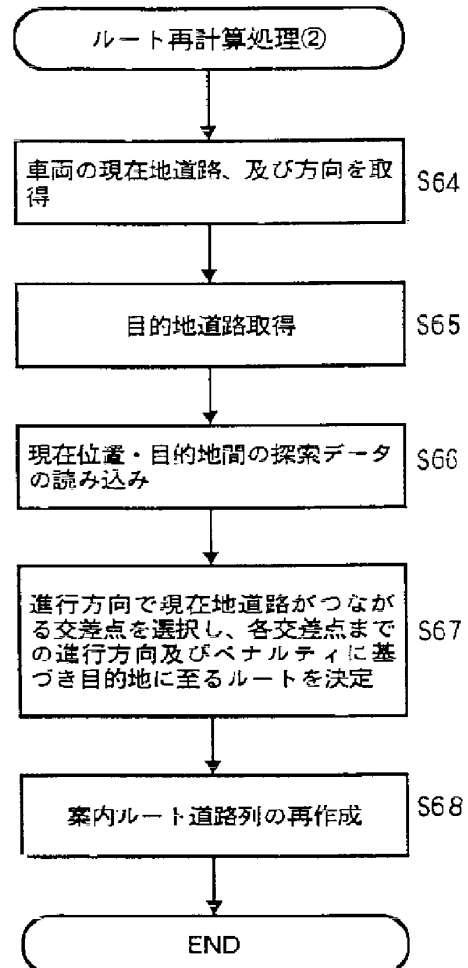
【図14】



【図15】



【図 1 6】



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Record 22/25 JP11176487A ELECTRIC VEHICLE BATTERY TEMPERATURE-ADJUSTING DEVICE AND ADJUSTING METHOD

Publication Number: JP11176487A

Publication Date: 1999-07-02

Title: ELECTRIC VEHICLE BATTERY TEMPERATURE-ADJUSTING DEVICE AND ADJUSTING METHOD

Application Number: JP1997340375A

Application Date: 1997-12-10

Abstract (English):

PROBLEM TO BE SOLVED: To improve the battery performance and prolong battery service life by adjusting the temperature of a battery which is mounted on a vehicle.

SOLUTION: Plural battery cells 3 are contained in a battery, containing space 9 in a battery case 5 installed on a lower surface of a car body floor of an electric vehicle. A Peltier element for exhibiting heat generation or heat absorbing action by supplied current directions is provided between the battery containing spaces 9 as it is tightly applied to an outer surface of the battery containing space 9. The temperature of the battery cell 3 is detected by a temperature sensor, and the current directions through the Peltier element are changed, depending on the temperature, thereby the battery cell 3 is heated or cooled.

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Abstract - DWPI:

Abstract - DWPI Novelty: NOVELTY - A temperature detector (39) detects temperature of battery (3), based on which a Peltier element (17) is controlled with a temperature controller. The Peltier element, changes temperature of battery (3) by transferring heat by supplying electricity. The temperature controller changes the flow of electricity to the Peltier element. **DETAILED DESCRIPTION** - The flow of electricity to the Peltier element (17) is controlled by temperature controller based on the detection result of detector (39). Temperature controller includes transistors (25,31) and two comparators (29,35).

Abstract - DWPI Use: USE

For batteries used in electric vehicles.

Abstract - DWPI Advantage: ADVANTAGE

Battery property and battery life span is increased. **DESCRIPTION OF DRAWING(S)** - The figure shows the electric circuit of battery temperature regulator. (3) Battery; (17) Peltier element; (25,31) Transistors; (29,35) Comparators; (39) Temperature detector.



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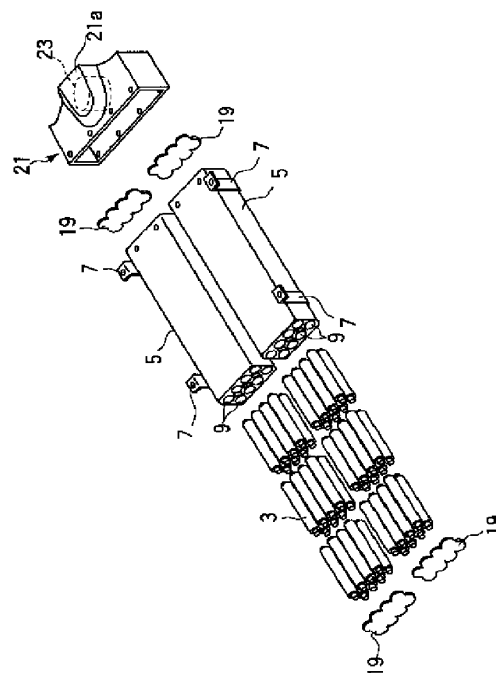
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(54) 【発明の名称】 電気自動車のバッテリー温度調整装置および調整方法

(57) 【要約】

【課題】 車両に搭載されるバッテリーの温度を調整可能として、バッテリー性能の向上およびバッテリー寿命の向上を図る。

【解決手段】 電気自動車の車体フロア下面に装着されるバッテリーケース5のバッテリー収容空間9には、複数のバッテリーセル3が収容される。バッテリー収容空間9相互間には、供給される電流の向きによって発熱または吸熱作用が発揮されるペルチェ素子17が、バッテリー収容空間9の外表面に密着した状態で設けられている。バッテリーセル3の温度を温度センサによって検出し、その温度に応じてペルチェ素子17に流れる電流の向きを変え、バッテリーセル3を加熱または冷却する。



【特許請求の範囲】

【請求項 1】 車両に搭載される走行駆動源となるバッテリーの温度を検出する温度検出手段と、電流が供給されることによって温度変化し前記バッテリーの温度を熱伝達により変化させる熱交換素子と、前記温度検出手段が検出する前記バッテリーの温度に応じて前記熱交換素子を温度変化させるよう動作する温度制御手段とを有することを特徴とする電気自動車のバッテリー温度調整装置。

【請求項 2】 バッテリーは、車体に装着されるバッテリーケース内に設けられたバッテリー収容空間の内面に密着した状態で收容され、熱交換素子は、前記バッテリー収容空間の外側面に装着されている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ー温度調整装置。

【請求項 3】 バッテリーは複数設けられ、この複数のバッテリーそれぞれに、温度検出手段および熱交換素子を設け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ー温度調整装置。

【請求項 4】 熱交換素子は、供給される電流の向きによって発熱または吸熱するペルチェ素子である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ー温度調整装置。

【請求項 5】 車体に搭載される走行駆動源となるバッテリーの温度に応じて、熱交換素子に電流を供給して発熱または吸熱させ、この発熱または吸熱によって前記バッテリーを加熱または冷却することを特徴とする電気自動車のバッテリー温度調整方法。

【請求項 6】 バッテリーを加熱する際の熱交換素子の発熱は、前記バッテリーを充電する際に使用する外部電源からの電流によってなされることを特徴とする請求項 5 記載の電気自動車のバッテリー温度調整方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、バッテリーを走行駆動源とする電気自動車のバッテリー温度調整装置および調整方法に関する。

【0002】

【発明が解決しようとする課題】この発明は、車両に搭載されるバッテリーの温度を調整可能として、バッテリー性能の向上およびバッテリー寿命の向上を図ることを目的としている。

【0003】

【課題を解決するための手段】前記目的を達成するために、請求項 1 の発明は、車両に搭載される走行駆動源となるバッテリーの温度を検出する温度検出手段と、電流が供給されることによって温度変化し前記バッテリーの温度を熱伝達により変化させる熱交換素子と、前記温度検出手段が検出する前記バッテリーの温度に応じて前記熱交換素子を温度変化させるよう動作する温度制御手段とを有する構成としてある。

【0004】このような構成の電気自動車のバッテリー温

度調整装置によれば、温度検出手段が検出したバッテリーの温度が、例えば電力消費によってある温度以上となって高温化している場合には、温度制御手段は、熱交換素子に対し電流を供給して温度を低下させるよう動作し、温度低下した熱交換素子はバッテリーを冷却する。

【0005】請求項 2 の発明は、請求項 1 の発明の構成において、バッテリーは、車体に装着されるバッテリーケース内に設けられたバッテリー収容空間の内面に密着した状態で收容され、熱交換素子は、前記バッテリー収容空間の外側面に装着されている。

【0006】上記構成によれば、熱交換素子の熱は、バッテリー収容空間を形成する壁面を介してバッテリーに効率よく伝達される。

【0007】請求項 3 の発明は、請求項 1 の発明の構成において、バッテリーは複数設けられ、この複数のバッテリーそれぞれに、温度検出手段および熱交換素子を設けている。

【0008】上記構成によれば、複数のバッテリーの温度均一化が図れる。

【0009】請求項 4 の発明は、請求項 1 の発明の構成において、熱交換素子は、供給される電流の向きによって発熱または吸熱するペルチェ素子である。

【0010】上記構成によれば、ペルチェ素子は、一方の端子が正極側となるように電流が供給されることで発熱するとすれば、前記一方の端子が負極側となるように電流が供給されることで吸熱する。

【0011】請求項 5 の発明は、車体に搭載される走行駆動源となるバッテリーの温度に応じて、熱交換素子に電流を供給して発熱または吸熱させ、この発熱または吸熱によって前記バッテリーを加熱または冷却する。

【0012】上記バッテリー温度調整方法によれば、バッテリー温度が高い場合には熱交換素子を吸熱させてバッテリーを冷却する一方、バッテリー温度が低い場合には熱交換素子を発熱させてバッテリーを加熱する。

【0013】請求項 6 の発明は、請求項 5 の発明のバッテリー温度調整方法において、バッテリーを加熱する際の熱交換素子の発熱は、前記バッテリーを充電する際に使用する外部電源からの電流によってなされる。

【0014】上記バッテリー温度調整方法によれば、バッテリーの電力を消費することなく、バッテリーの加熱動作が行える。

【0015】

【発明の効果】請求項 1 の発明によれば、熱交換素子によってバッテリーの温度を調整可能であるので、バッテリーの適温での使用が可能となり、バッテリー性能の向上およびバッテリー寿命の向上を図ることができる。

【0016】請求項 2 の発明によれば、熱交換素子の熱は、バッテリー収容空間を形成する壁面を介してバッテリーに効率よく伝達することができる。

【0017】請求項 3 の発明によれば、複数のバッテリー

の温度均一化が図れ、組電池としての性能および寿命を向上させることができる。

【0018】請求項4の発明によれば、電力消費によるバッテリーの高温化を抑制できるほか、寒冷地など周囲温度が低い条件下でのバッテリーの低温状態での使用を回避することができる。

【0019】請求項5の発明によれば、バッテリー温度が高い場合には熱交換素子を吸熱させてバッテリーを冷却する一方、バッテリー温度が低い場合には熱交換素子を発熱させてバッテリーを加熱するので、電力消費によるバッテリーの高温化を抑制できるとともに、寒冷地など周囲温度が低い条件下でのバッテリーの低温状態での使用を回避することができる。

【0020】請求項6の発明によれば、バッテリーの加熱動作を行う際に、バッテリーの電力が消費されないの、1回の充電による車両の走行航続距離が短縮化することなく、バッテリー性能の向上及びバッテリー寿命の向上を達成することができる。

【0021】

【発明の実施の形態】以下、この発明の実施の形態を図面に基づき説明する。

【0022】図1は、この発明の実施の一形態を示す電気自動車のバッテリー温度調整装置を備えたバッテリー保持構造の分解斜視図で、図2は、この保持構造によってバッテリーが車体1に装着された状態を示す電気自動車の側面図である。バッテリーを構成する円筒状のバッテリーセル3を収容するバッテリーケース5は、車体前後方向に延長されたものが車幅方向に2個並列に配置された状態で、車体1のフロア下面1aに、ブラケット7を介して装着されている。車体1のモータールームR内には、上記バッテリーセル3によって作動する走行駆動用のモータ4が設置されている。

【0023】バッテリーケース5は、アルミニウム製の押し出し材で構成され、図2において車体前方側から見た正面図である図3に示すように、バッテリーセル3が収容されるバッテリー収容空間9が上下2段に4個ずつ全部で8個形成されている。これら各バッテリー収容空間9は、車体前後方向に貫通している。

【0024】これらの各バッテリー収容空間9には、バッテリーセル3が3個直列に接続された状態で収容される。このため、8個のバッテリー収容空間9を備えた1個のバッテリーケース5には、24個のバッテリーセル3が収容されることになり、ここではバッテリーケース5を2個を使用しているので、車両全体では48個のバッテリーセル3を使用することになる。上記したバッテリーセル3は、バッテリー収容空間9の内面にほぼ密着した状態で収容される。

【0025】図3に示すように、バッテリーケース5におけるバッテリー収容空間9の上部側および同下部側には、車体前後方向に貫通する冷却風導入空間11および13

がそれぞれ形成されている。この冷却風導入空間11、13に外気が導入されることで、バッテリーセル3が冷却される。

【0026】また、互いに隣接する4個のバッテリー収容空間9相互間および、図3中で左右両端のバッテリー収容空間9とバッテリーケース5の側壁との間にも、車体前後方向に貫通する貫通孔15が形成されている。そして、この貫通孔15には、熱変換素子としてのペルチェ素子17が、バッテリー収容空間9の外表面に密着した状態で設けられている。このペルチェ素子17は、電圧印加により供給される電流の向きによって発熱または吸熱して温度変化し、バッテリーセル3を加熱または冷却して温度変化させるもので、すべてのバッテリーセル3を温度変化させられるよう各バッテリーセル3毎に設置されているものとする。図4は、このペルチェ素子17の配置位置を示した平面図で、図5は同側面図である。

【0027】バッテリーケース5の車体前後方向両端には、上下の冷却風導入空間11、13を除き、バッテリー収容空間9および貫通孔15を密閉状に閉塞する端子カバー19が、ボルトなどによって固定装着されている。この端子カバー19の内面には、バッテリーセル3の端子に押し付けられた状態で接触する図示しない端子板が設けられている。この端子板は、1個のバッテリーケース5内に設けられた24個のバッテリーセル3相互を電氣的に直列に接続するような形状に形成され、直列接続された両最端部のものからは、図示していないが、リード線などによって外部に引き出される。

【0028】また、2個のバッテリーケース5の車体後方側の端部には、端子カバー19が装着された状態で排気ダクト21が装着される。排気ダクト21の車体後部側の上面には、上方に突出する膨出部21aが形成され、この膨出部21aの内面の凹部には、前記冷却風導入空間11、13に導入された外気を外部に排出するための排気用ファン23が設けられている。

【0029】図6は、ペルチェ素子17を備えたバッテリー温度調整装置の電気回路図である。ペルチェ素子17は、図中で下部側の一方の端部が第1のトランジスタ25のエミッタに接続され、第1のトランジスタ25のコレクタはバッテリーセル3の正極側に接続され、ベースは抵抗27を介して第1のコンパレータ29の出力端子に接続されている。

【0030】ペルチェ素子17の図中で上部側の他方の端部は、第2のトランジスタ31のエミッタに接続され、コレクタはバッテリーセル3の正極側に接続され、ベースは抵抗33を介して第2のコンパレータ35の出力端子に接続されている。また、バッテリーセル3の正極側の端子は、抵抗37を介して第1、第2の各コンパレータ29、35の電源端子に接続されている。

【0031】第1、第2の各コンパレータ29、35の正入力端子は、熱電対式バッテリー温度センサ39に接続

されている。このバッテリー温度センサ39は、バッテリーセル3の温度を検出する温度検出手段を構成するもので、図1ないし図5では図示していないが、バッテリーセル3毎に設けられているものとする。第1、第2の各コンパレータ29、35の負入力端子には基準電圧が供給され、この基準電圧を安定化させるために、ツェナーダイオード41が設けられている。

【0032】上記第1のコンパレータ29は、バッテリー温度センサ39が検出したバッテリーセル3の温度が、第1の所定値以上と高い場合に、信号出力して第1のトランジスタ25を導通させる。このときバッテリーセル3から供給される電流は、実線矢印で示すように、第1のトランジスタ25を経てペルチェ素子17に向かう方向に流れる。このときのペルチェ素子17は、吸熱作用を発揮するものとする。

【0033】一方、第2のコンパレータ35は、バッテリー温度センサ39が検出したバッテリーセル3の温度が、前記第1の所定値より低い第2の所定値以下と低い場合に、信号出力して第2のトランジスタ31を導通させる。このときバッテリーセル3から供給される電流は、破線矢印で示すように、第2のトランジスタ31を経てペルチェ素子17に向かう方向に流れる。このときのペルチェ素子17は、発熱作用を発揮するものとする。

【0034】ペルチェ素子17の発熱または吸熱により、バッテリーセル3はバッテリー収容空間9の壁面を介して加熱または冷却されることになるので、上記第1、第2の各コンパレータ29、35および第1、第2の各トランジスタ25、31は、バッテリー温度センサ39が検出するバッテリーセル3の温度に応じてペルチェ素子17を温度変化させるよう動作する温度制御手段を構成することになる。

【0035】上記のように構成された電気自動車のバッテリー温度調整装置において、バッテリーセル3が、電力消費によって温度上昇し、温度上昇したバッテリーセル3は、冷却風導入空間11、13に外気が導入されることで冷却されるが、それでもまだバッテリー温度が高く第1の所定値以上の場合には、バッテリー温度センサ39がこれを検出して第1のコンパレータ29が第1のトランジスタ25を導通させ、これにより電流は実線矢印のように流れてペルチェ素子17は吸熱作用を発揮し、バッテリーセル3を冷却する。

【0036】一方、特に寒冷地など周囲温度が低い場合に、バッテリーセル3は、温度低下し、この温度低下をバ

ッテリー温度センサ39が検出して第2の所定値以下と低くなった場合には、バッテリー温度センサ39がこれを検出して第2のコンパレータ35が第2のトランジスタ31を導通させ、これにより電流は破線矢印のように流れてペルチェ素子17は発熱作用を発揮し、バッテリーセル3を加熱する。

【0037】このように、バッテリーセル3は、冷却あるいは加熱されることで適温での使用が可能となり、性能および寿命が向上するものとなる。なお、寒冷地等でバッテリーを充電する場合にバッテリーセル3を加熱する際には、二重線の矢印で示すように、バッテリーセル3を充電する際の充電電流を利用することで、バッテリーセル3の電力を消費させずに済むので、車両の走行航続距離を低下させることなく、バッテリーセル3の性能および寿命の向上が達成される。

【0038】また、複数のバッテリーセル3それぞれにペルチェ素子17を設けてあるので、各バッテリーセル3について温度の均一化が図れ、組電池としての性能および寿命が向上するものとなる。

【図面の簡単な説明】

【図1】この発明の実施の一形態を示す電気自動車のバッテリー温度調整装置を備えたバッテリー保持構造の分解斜視図である。

【図2】図1の保持構造によってバッテリーが車体に装着された状態を示す電気自動車の側面図である。

【図3】図2で使用されるバッテリーケースの車体前方側から見た正面図である。

【図4】バッテリーケースに装着されるペルチェ素子の配置位置を示した平面図である。

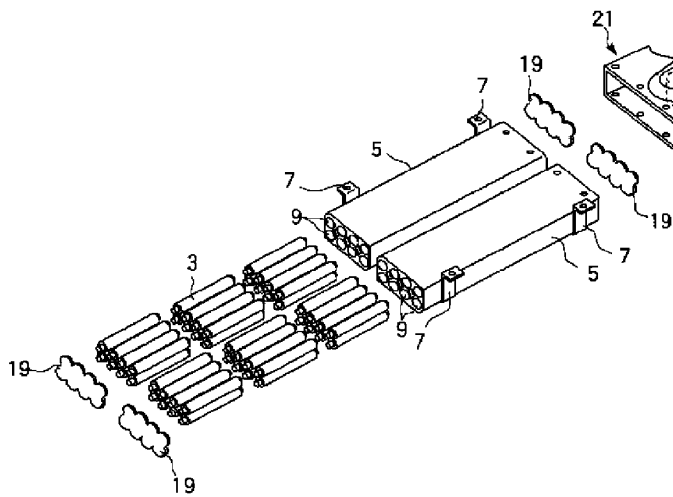
【図5】バッテリーケースに装着されるペルチェ素子の配置位置を示した側面図である。

【図6】ペルチェ素子を備えたバッテリー温度調整装置の電気回路図である。

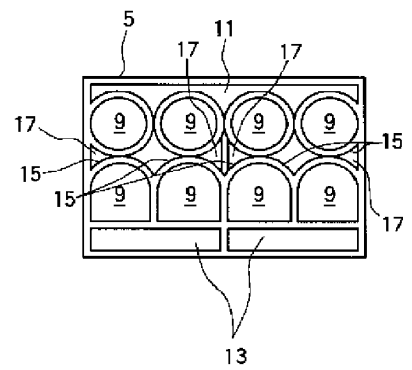
【符号の説明】

- 3 バッテリーセル（バッテリー）
- 5 バッテリーケース
- 9 バッテリー収容空間
- 17 ペルチェ素子（熱交換素子）
- 25 第1のトランジスタ（温度制御手段）
- 29 第1のコンパレータ（温度制御手段）
- 31 第2のトランジスタ（温度制御手段）
- 35 第2のコンパレータ（温度制御手段）
- 39 バッテリー温度センサ（温度検出手段）

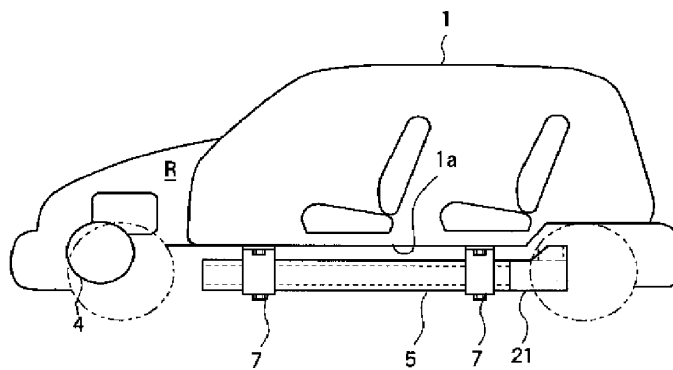
【図 1】



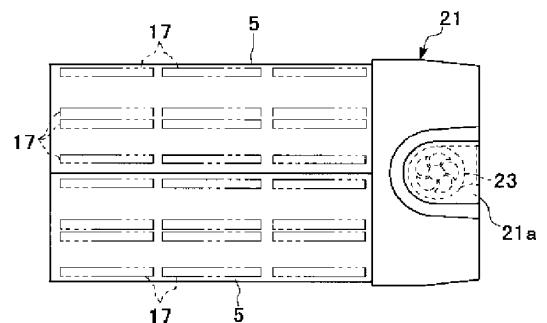
【図 3】



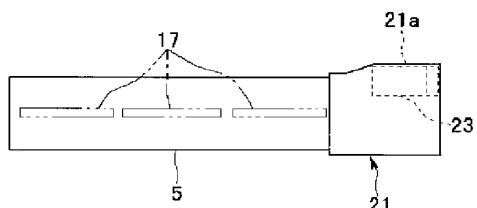
【図 2】



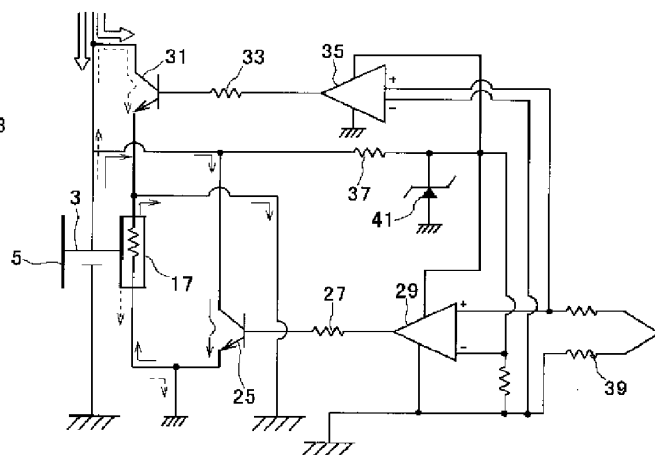
【図 4】



【図 5】



【図 6】





Espacenet

Bibliographic data: JPH11205914 (A) — 1999-07-30

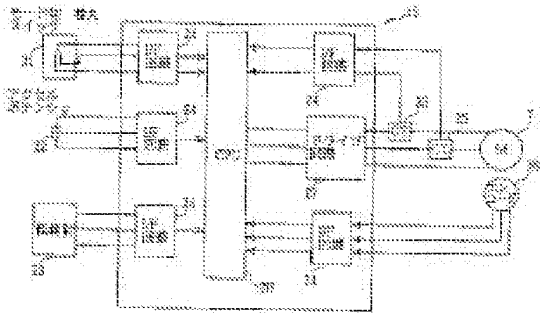
ELECTRIC VEHICLE OUTPUT CONTROLLER

No documents available for this priority number.

Inventor(s): TAKECHI HIROAKI; SHIOZAWA SOICHI; SAITO MIKIO ± (TAKECHI HIROAKI, ; SHIOZAWA SOICHI, ; SAITO MIKIO)**Applicant(s):** YAMAHA MOTOR CO LTD ± (YAMAHA MOTOR CO LTD)**Classification:** - **international:** **B60L11/18**; **B60L15/20**; (IPC1-7): B60L11/18;
B60L15/20
- **cooperative:** B60W2550/142; Y02T10/7005; Y02T10/7275**Application number:** JP19980004101 19980112**Priority number (s):** JP19980004101 19980112**Abstract of JPH11205914 (A)**

PROBLEM TO BE SOLVED: To provide an electric vehicle output controller by which an electric vehicle that has the small maximum output such as a motor scooter may not have difficulty in climbing on an up slope. SOLUTION: A controller is provided with a mode switch means 21 for selecting either a power mode which is a driving method that focuses on the driving performance or an economy mode which is a driving means that focuses on the economy, an up slope detecting means 23 which detects that a vehicle is running on an up slope, a maximum allowable current value limiting means for limiting the maximum allowable current value at the economy mode to an economy maximum allowable current value smaller than the maximum allowable current value at the power mode, and a CPU 20 which functions as a limited current value correcting means which corrects the economy maximum allowable current value to a larger one when it is detected that the vehicle is running on an up slope at the economy mode.

Last updated: 13.03.2013 Worldwide Database 5.8.11.1; 92p



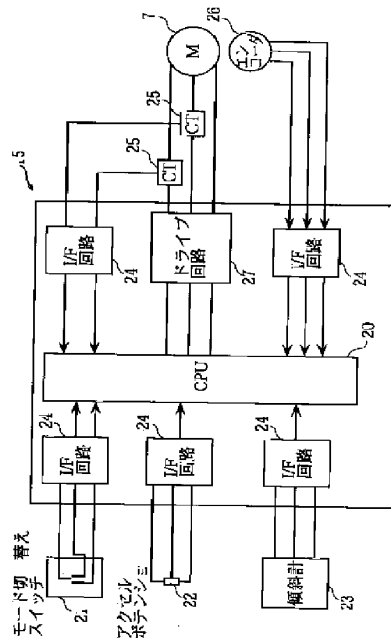
(11)特許出願公開番号

(43)公開日 平成11年(1999)7月30日

FI

J
A

(74)代理人 弁理士 下市 努



【特許請求の範囲】

【請求項1】 運転性能を重視した駆動方法であるパワーモードと経済性を重視した駆動方法であるエコノミーモードとの何れかを選択するモード切替え手段と、登坂中であることを検出する登坂検出手段と、上記エコノミーモードの選択時の最大許容電流値をパワーモードの選択時の最大許容電流値より小さいエコノミー最大許容電流値に制限する最大許容電流値制限手段と、上記エコノミーモードが選択されている時に登坂中であることが検出された場合には、上記エコノミー最大許容電流値を大側に補正する制限電流値補正手段とを備えたことを特徴とする電動車両の出力制御装置。

【請求項2】 請求項1において、上記登坂検出手段が、路面の傾斜角度を検出する傾斜計により構成されていることを特徴とする電動車両の出力制御装置。

【請求項3】 請求項2において、上記登坂検出手段が、電動モータに流れているモータ電流値と車速とに基づいて登坂中であることを検出するよう構成されていることを特徴とする電動車両の出力制御装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、電動スクータ等の電動車両における出力制御装置に関し、特に運転モードを切り替え可能とした場合の登坂走行性能の改善に関する。

【0002】

【従来の技術】近年、低公害、低騒音を図る観点から、バッテリーを電源とする電動モータにより車輪を駆動するようにした電動スクータ等の電動車両が注目されている。この種の電動車両では、容量に限りのあるバッテリーを使用しながら走行可能距離をできるだけ延ばすことができ、しかも必要な走行性能を確保できることが要請される。

【0003】このような要請に応えることのできるものとして、従来例えば、特開平6-121405号公報に記載されているように、運転性能を重視したパワーモードと経済性を重視したエコノミーモードとの何れかを運転者の意図に応じて手動又は自動で切り替えることができるようにした電気自動車がある。上記運転モードの自動切替えは、アクセル踏み込み量、ブレーキ踏み込み量等を検出することにより行われる。

【0004】

【発明が解決しようとする課題】上記公報が対象とする電気自動車の場合、通常走行においては1/2以下のアクセル開度で運転され、アクセル全開走行といったことはあまりないので、上記アクセル踏み込み量等によるモード自動切替えが可能である。しかし電動スクータのように最大出力が小さく、アクセル全開走行が頻繁に行われるような場合には、エコノミーモードが選択されている状態で登坂走行になると、出力が不足し登坂走行に支

障が生じるといった問題が懸念される。

【0005】本発明は、上記従来装置の問題点に鑑みてなされたもので、電動スクータのように最大出力が小さい電動車両であっても登坂走行に支障を来すことのない電動車両の出力制御装置を提供することを課題としている。

【0006】

【課題を解決するための手段】請求項1の発明は、運転性能を重視した駆動方法であるパワーモードと経済性を重視した駆動方法であるエコノミーモードとの何れかを選択するモード切替え手段と、登坂中であることを検出する登坂検出手段と、上記エコノミーモードの選択時の最大許容電流値をパワーモードの選択時の最大許容電流値より小さいエコノミー最大許容電流値に制限する最大許容電流値制限手段と、上記エコノミーモードが選択されている時に登坂中であることが検出された場合には、上記エコノミー最大許容電流値を大側に補正する制限電流値補正手段とを備えたことを特徴としている。

【0007】ここで本発明において、上記エコノミー最大許容電流値を大側に補正するとは、最大許容電流値をパワーモード選択時の最大許容電流値に補正する場合、及びこれより大きい値又は小さい値に補正する場合を含む。

【0008】請求項2の発明は、請求項1において、上記登坂検出手段が、路面の傾斜角度を検出する傾斜計により構成されていることを特徴とし、請求項3の発明は、上記登坂検出手段が、電動モータに流れているモータ電流値と車速とに基づいて登坂中であることを検出するよう構成されていることを特徴としている。

【0009】

【発明の作用効果】請求項1の発明によれば、エコノミーモードが選択された場合には最大許容電流値がパワーモード選択時より小側に制限されるので、経済性を重視した走行が行われ、走行可能距離を延長できる。一方、エコノミーモード選択時であっても登坂中であることが検出された場合には、上記エコノミー最大許容電流値が例えばパワーモード選択時の最大許容電流値に補正されるので、登坂時には最大出力の発生が可能となり、登坂走行に支障が生じることはない。

【0010】また請求項2の発明によれば、路面の傾斜角度を検出し、該傾斜角度に基づいて登坂中か否かの判断が行われるので、登坂中の検出が確実であり、登坂走行での支障をより確実に防止できる。

【0011】請求項3の発明によれば、モータ電流値と車速とに基づいて登坂中か否かの判断を行うようにしたので、傾斜計が不要であり、コスト上昇を抑制できる。

【0012】

【発明の実施の形態】以下、本発明の実施の形態を添付図面に基いて説明する。図1～図4は本発明の第1実施形態による電動スクータの出力制御装置を説明するた

めの図であり、図1は該電動スクータの側面図、図2は上記出力制御装置のブロック構成図、図3、図4は動作を説明するためのフローチャートである。

【0013】図1において、1は本実施形態出力制御装置を備えた電動スクータであり、該スクータ1の車体フレーム2は、ヘッドパイプ2aに接続された1本のメインパイプ2bの下端に左、右一対のサイドパイプ2c、2cを接続し、該左、右一対のサイドパイプ2c、2cを左右に拡開させるとともにその下端部を後方に屈曲させ低床の足載部2dを形成するように後方に延長し、さらに後方斜め上方に延長した構造となっている。

【0014】また上記車体フレーム2のヘッドパイプ2aにより左右に操向自在に支持されたフロントフォーク3の下端には前輪4が軸支され、上端には操向ハンドル5が固定されている。また上記車体フレーム2の後方延長部2eには懸架ブラケット2gを介してパワーユニット6が上下揺動可能に支持されている。このパワーユニット6は、車幅方向に延びるように配置された電動モータ7と、該電動モータ7の左端部から後方に延び、モータ回転を後輪8に伝達する伝動機構を内蔵する伝動ケース9とを一体的に結合してなるユニットスイング式のものである。

【0015】そして上記車体フレーム2の足載部2dには支持ブラケット2fが吊設されており、該支持ブラケット2fの横辺部上にバッテリー10が搭載されている。このバッテリー10は多数の単電池11を直列接続するとともにバッテリーケース12内に収容配置してなるものである。

【0016】また上記バッテリーケース12の後側には冷却用ファン13が配設されており、該冷却用ファン13の上側には充電器14が配設され、さらに該充電器14の上側には、上記電動モータ7の出力制御を行うモータコントローラ15が配設されている。なお上記充電器14は、該充電器14による充電の開始、中断、終了及び充電電流値の制御、さらにリフレッシュ放電の実行を制御するバッテリーマネジメントコントローラを内蔵している。

【0017】図2に示すように、上記モータコントローラ15のCPU20には、運転者の意志により、走行性能重視のパワーモードと経済性重視のエコノミーモードとの何れを選択するモード切替えスイッチ21、アクセル操作量（アクセル開度）を検出するアクセルポテンシヨ22、路面の傾斜角度を検出する傾斜計23、電動モータ7に供給されるモータ電流値を検出する電流計25、及び電動モータ7の回転数を検出するエンコーダ26のそれぞれの検出信号がインターフェース回路24を介して入力される。

【0018】そして上記CPU20は、上記アクセルポテンシヨ22の検出したアクセル開度に応じたモータ電流指令値を求めるとともに、該モータ電流指令値と上記

電流計25で検出されたモータ電流値と比較し、例えばその差分に比例するように制御値を求めるPID制御により出力値を決定し、該出力値に応じたパルス幅をドライブ回路27に出力する。

【0019】上記ドライブ回路27は、入力されたパルス幅に応じて電動モータ7に通電するためのFET等のパワースイッチング素子を駆動し、これにより電動モータ7が回転し、駆動力を発生する。なお、上記CPU20はエンコーダ26で検出された駆動モータ7の回転数と固定情報として記憶している減速比等から車速を求める。

【0020】ここで上記CPU20は、上記モード切替えスイッチ21によりパワーモードが選択されている場合には、所定の最大許容電流値の範囲内で、上記アクセルポテンシヨ22で検出されたアクセル開度をそのまま上記モータ電流指令値として採用する一方、エコノミーモードが選択されている場合には、モータ電流指令値を、上記パワーモード選択時の最大許容電流値より小さいエコノミー最大許容電流値以下に制限する最大許容電流値制限手段として機能する。

【0021】また上記CPU20は、上記傾斜計23により検出された路面の傾斜角度が所定値以上の場合には登坂中であると判断する登坂検出手段として機能し、また登坂中と判断した場合には上記エコノミー最大許容電流値を大側に補正する制限電流値補正手段としても機能する。具体的には上記モータ電流指令値の制限を解除し、上記パワーモードと同じ最大許容電流値の範囲内でモータ電流指令値を制御する。そしてこのエコノミーモードにおいて路面の傾斜角度が上記所定値未満となった場合には、再び最大許容電流値を上記エコノミー最大許容電流値に制限する。

【0022】次に出力制御動作を図3、図4のフローチャートに沿って説明する。走行制御が開始されると、アクセルポテンシヨ22の検出値が読み込まれ（ステップS1）、該ポテンシヨ値に所定の比例係数を乗算してモータ電流指令値が求められる（ステップS2）。この場合に、上記モード切替えスイッチ21により通常モード（パワーモード）が選択されている場合には、上記求められたモータ電流指令値と電流計25で検出されたモータ電流値とに基づいて電流フィードバック制御により、デューティ比が計算され（ステップS3～5）、この計算結果に基づいて上記電動モータ7に供給される電流値が制御される。

【0023】上記ステップS3において、エコノミーモードが選択されている場合には、上記モータ電流指令値に後述するエコノミーモード処理が施され（ステップS6）、該処理後のモータ電流指令値に基づいて上記フィードバック制御が行われる。

【0024】上記エコノミーモード処理では、図4に示すように、まず登坂中であるか否か、つまり傾斜計23

により検出された路面の傾斜角度が所定値より大きいかな否かが判断され（ステップS11）、検出傾斜角度が所定値より小さい場合、つまり登坂中以外の場合には、モータ電流指令値と、パワーモード時の最大許容電流値より小さい値に予め設定された最大設定値（エコノミ最大許容電流値）とが比較され（ステップS12）、モータ電流指令値が最大設定値以下である場合にはモータ電流指令値をそのまま用いて上記ステップS4のフィードバック制御が行われる。一方、上記モータ電流指令値が最大設定値より大きい場合には、該モータ電流指令値は最大設定値に制限され（ステップS13）、ステップS4に移行する。

【0025】そして上記ステップS11において登坂中である場合には、上記モータ電流指令値に何ら処理を施すことなく、つまり上記パワーモードの場合と同様に上記演算されたままのモータ電流指令値でステップS4のフィードバック制御が行われる。

【0026】このように、本実施形態装置では、モータ電流指令値を最大設定値（エコノミ最大許容電流値）に制限する経済性重視のエコノミーモードと、この制限を行わない走行性能重視のパワーモードとを選択可能としたので、走行可能距離を延ばすかあるいは加速性等の走行性能を重視するか等のユーザの希望するモードの走行が可能である。

【0027】そしてエコノミーモードを選択している場合であっても、登坂走行においては、上記モータ電流指令値を制限することなくフィードバック制御を行うようにしたので、登坂走行についてはパワーモードと同様となり、登坂走行に支障が生じることはない。

【0028】図5〜図7は本発明の第2実施形態を示す。上記第1実施形態では、傾斜計により検出した路面の傾斜角度に基づいて登坂中か否かの判断を行うようにしたが、本第2実施形態は傾斜計を用いることなく登坂中か否かの判断を行うようにした例である。

【0029】登坂中か否かの判断フローを示す図5において、上記アクセルポテンショ22で検出されたスロットル開度からモータ駆動力（モータ電流値）が、また上記エンコーダ26で検出されたモータ回転数から車速がそれぞれ求められ（ステップS21）、該求められたモータ駆動力と車速とから、図6の車速－駆動力特性曲線上における現在の走行状態を示すポイントAが求められ、該ポイントAの位置と走行抵抗との関係から登坂中か否かが判断される（ステップS22、23）。

【0030】図6、図7において、駆動力曲線C100はアクセル開度が全開、つまり最大電流が電動モータ7に供給されている場合の車速－駆動力特性を示し、駆動力曲線C70、C50、C30はそれぞれアクセル開度、つまりモータ電流値が70、50、30％の場合の車速－駆動力特性を示す。また傾斜度曲線D0は平坦路における車

速－走行抵抗特性を示し、傾斜度曲線D3、D5、D10、D15はそれぞれ路面の傾斜角度が3、5、10、15度の場合の車速－走行抵抗特性を示し、これらの特性は予め実験等で求められたものであり、上記コントローラ15に内蔵されている。

【0031】アクセル開度を全開とした場合、車速は例えば平坦路では v_{max} となり、傾斜角度が15°の登坂路では v_{min} となる。またアクセル開度を例えば30％とした場合において車速がV30である場合には、C30ラインとV30ラインとの交点Aの座標から現在走行中の路面の傾斜角度は3°であることが判る。CPU20は求められた路面の傾斜角度が所定値（例えば5°）以上の場合には登坂中であると判断する。

【0032】上記スロットル開度と車速との関係から登坂走行中であると判断された場合には、上記第1実施形態と同様に、エコノミーモードを選択している場合であっても、上記モータ電流指令値を制限することなくスロットル開度に応じた電流指令値をそのまま使用してフィードバック制御が行われる。

【0033】また、上記CPU20は現在の走行状態を示すポイントAが、図7に斜線で示した領域、つまり平坦路の車速－走行抵抗特性線D0より下側に位置している場合には降坂中であると判断する。この判断により回生制動力の値を変化させることも可能である。

【0034】このように本第2実施形態においても上記第1実施形態と同様に、エコノミーモードを選択している場合であっても登坂走行に支障が生じることはない。さらに本第2実施形態では、スロットル開度（モータ電流値）と車速とから登坂中か否かの検出が可能であり、傾斜計を不要にでき、コストを低減できる。

【図面の簡単な説明】

【図1】本発明の第1実施形態による出力制御装置を備えた電動スクータの側面図である。

【図2】上記実施形態装置のブロック構成図である。

【図3】上記実施形態装置のフローチャート図である。

【図4】上記実施形態装置のフローチャート図である。

【図5】本発明の第2実施形態装置のフローチャート図である。

【図6】上記第2実施形態装置の車速－駆動力特性図である。

【図7】上記第2実施形態装置の車速－駆動力特性図である。

【符号の説明】

1 電動スクータ（電動車両）

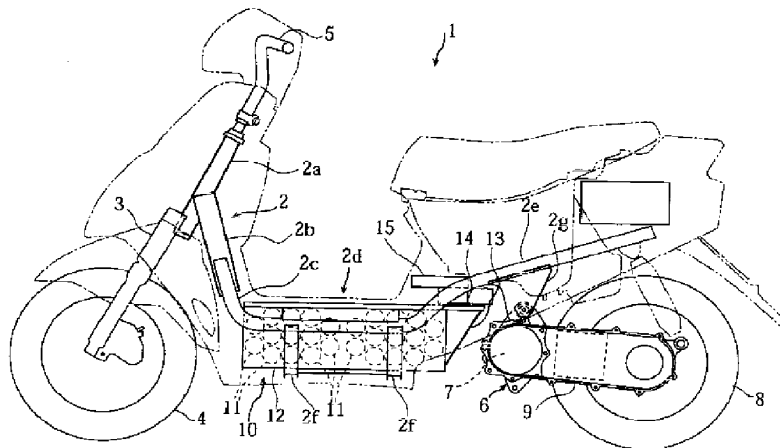
7 電動モータ

20 CPU（登坂検出手段、最大許容電流値制限手段、制限電流値補正手段）

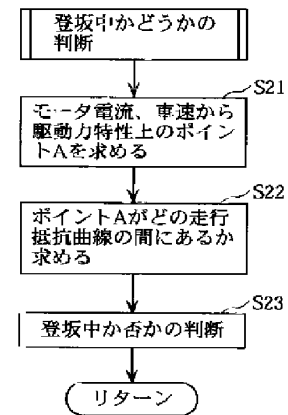
21 切替えスイッチ（切替え手段）

23 傾斜計（登坂検出手段）

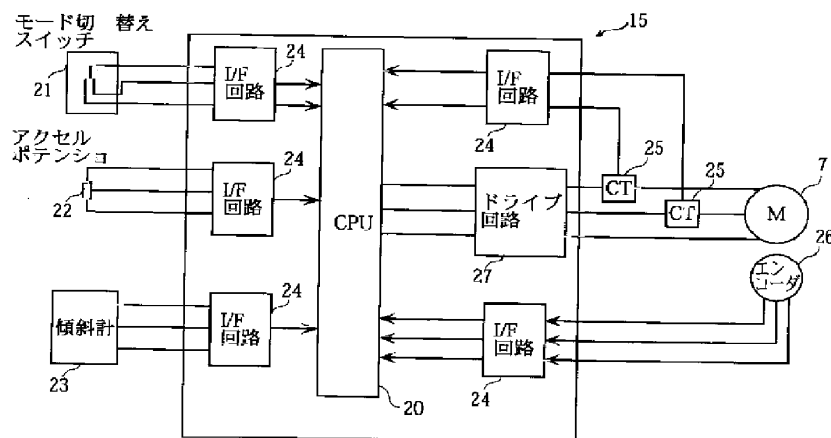
【図1】



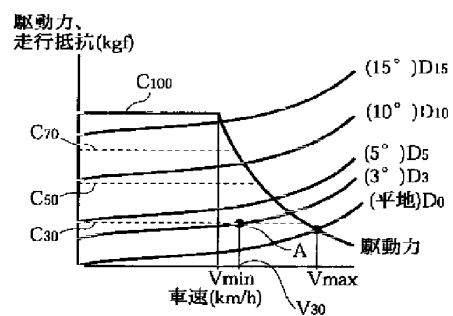
【図5】



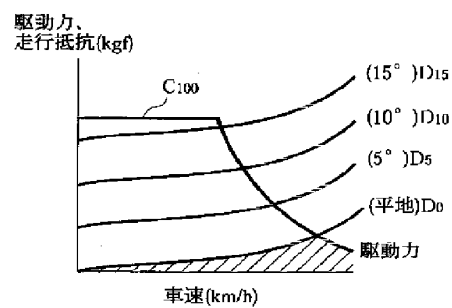
【図2】



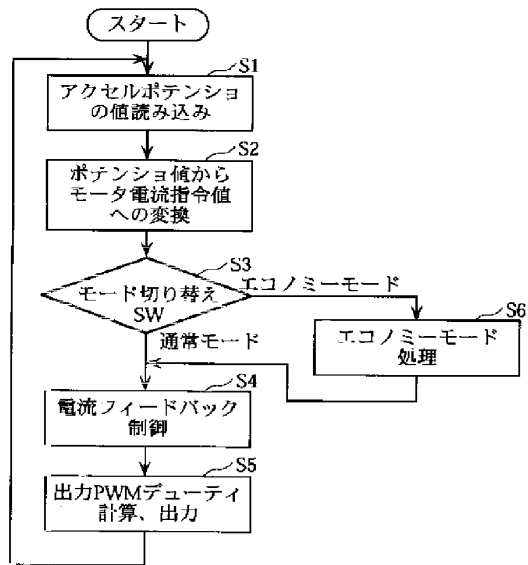
【図6】



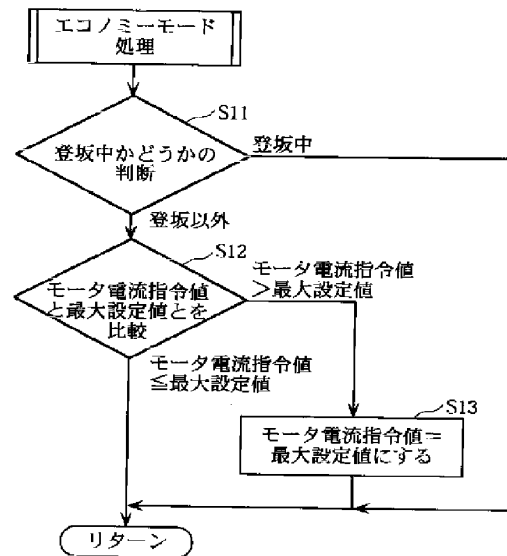
【図7】



【図3】



【図4】



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Record 21/25 JP2000341868A BATTERY REPLACING APPARATUS

Publication Number: JP2000341868A

Publication Date: 2000-12-08

Title: BATTERY REPLACING APPARATUS

Application Number: JP1999144910A

Application Date: 1999-05-25

Abstract (English):

PROBLEM TO BE SOLVED: To provide a small-sized battery replacing apparatus suitable for indoor use.

SOLUTION: A battery replacing apparatus 1 has a plurality of slots 4 for charging by chargers batteries 2 inserted respectively into the plurality of slots 4. The batteries 2, after completing their chargings are lent to users according to the indications of the apparatus 1. When lending the battery 2, its battery- lock provided in the holding mechanism of the apparatus 1 is released to protrude it more forward than the adjacent batteries 2. The height of the battery replacing apparatus 1 is set to 120 cm so that it suits to the securing of a perspective and to the maintaining of a good appearance, even when it is provided in a convenience store, etc.

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Abstract - DWPI:

Abstract - DWPI Novelty:

The battery exchange installation (1) has a low structure that allows a battery (2) to be easily withdrawn. The installation has slots (4) that allow easy insertion of discharged batteries. A payment system releases a lock to allow the user to remove a charged battery when they have inserted a discharged battery. The height of the installation is limited to 120 cm to be acceptable in shops.

Abstract - DWPI Use:

Exchange of depleted battery for fully charged battery for electrically powered bicycles

Abstract - DWPI Advantage:

Easily handled battery that is fully enclosed and is easily fitted to bicycle and easily inserted into charging station.

Abstract - DWPI Drawing Description: The drawing shows a front elevation of the installation

1 Battery exchange installation

2 Batteries

4 Slots housing battery units



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3 0 1 A 5 G 0 0 3

A 5 H 0 3 0

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Fターム(参考) 5G003 AA01 BA01 FA01

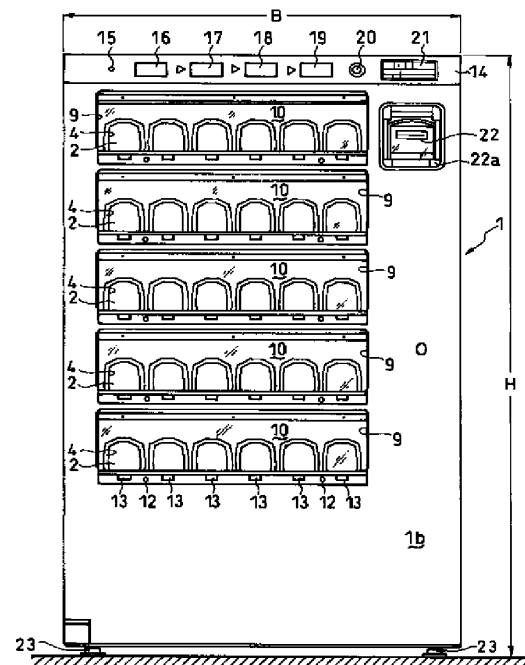
5H030 AS01 BB01 DD27 FF41 FF68

(54) 【発明の名称】 バッテリー交換装置

(57) 【要約】

【課題】 屋内での利用に適した小型のバッテリー交換装置を提供すること。

【解決手段】 バッテリー交換装置1は複数のスロット4を有し、このスロット4に挿入されたバッテリー2は充電器7で充電される。充電済みのバッテリー2は指示に従ってユーザに貸出される。貸出しに際しては保持機構5に設けられたバッテリーロックが外され、バッテリー2は隣接するバッテリー2よりも前方に突出される。バッテリー交換装置1の高さは、コンビニエンスストア等に設置しても、見通しの確保や美観の維持に適したように120cmに設定している。



【特許請求の範囲】

【請求項 1】 バッテリーを収納する収納部と、前記バッテリーを充電する充電器とを有し、充電済みバッテリーを提供するバッテリー交換装置において、屋内設置され、内部雰囲気が設置雰囲気との換気のみ依存して維持されるとともに、全高が略 80～120センチメートルに設定されていることを特徴とするバッテリー交換装置。

【請求項 2】 前記バッテリー収納部における上下方向のバッテリーの数よりも左右方向のバッテリーの数を多くしたことを特徴とする請求項 1 記載のバッテリー交換装置。

【請求項 3】 電源装置と、制御装置とを具備し、前記制御装置が、受入れたバッテリーを前記収納部に保持するロック制御手段と、前記収納部に受入れたバッテリーを充電するための充電制御手段と、充電済みバッテリーを収納している収納部の保持を利用者の要求に応じて解除するロック解除制御手段とからなることを特徴とする請求項 1 または 2 記載のバッテリー交換装置。

【請求項 4】 前記収納部が複数の有底筒体からなり、前記有底筒体のうち、空いている有底筒体、および充電済みバッテリーを収納している有底筒体をそれぞれ認識可能に表示する表示手段を具備したことを特徴とする請求項 1～請求項 3 のいずれかに記載のバッテリー交換装置。

【請求項 5】 前記電源装置および制御装置を最下段に、前記収納部を中段に、前記表示手段を含む案内手段を最上段に配置したことを特徴とする請求項 1～請求項 4 のいずれかに記載のバッテリー交換装置。

【請求項 6】 内部雰囲気を換気するファンを具備したことを特徴とする請求項 1～請求項 5 のいずれかに記載のバッテリー交換装置。

【請求項 7】 前記屋内は、コンビニエンスストアであることを特徴とする請求項 1～請求項 6 のいずれかに記載のバッテリー交換装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、バッテリー交換装置に関し、特に、電動機を駆動源とする電動車両に搭載されるバッテリーの充電および貸出し等を集中して管理するのに好適なバッテリー交換装置に関する。

【0002】

【従来の技術】近年、人の脚力を補助するため、電動機を補助動力源として搭載した自転車（以下、「電動アシスト自転車」という）が利用されている。この電動機には、充電を繰り返して再使用することができるニッケル-カドミウム電池等のバッテリーが電源として使用され

る。

【0003】ところで、電動アシスト自転車のユーザがバッテリーを個人的に所有した場合、充電等の管理を自己で行わなければならない煩わしさがある。この煩わしさを解消するため、バッテリーの充電を集中して管理するシステムが考えられる。例えば、電動アシスト自転車のユーザが、集中管理されているバッテリーを借り受けて使用し、バッテリーが消耗したならば、そのバッテリーを返却してフル充電されたバッテリーを新たに借り受けるバッテリー交換システムが考えられる。

【0004】特開平10-293874号公報には、登録されたユーザに対して、バッテリーの貸出しおよび返却を自動的に行うバッテリー交換装置が開示されている。このようなバッテリー交換装置を随所に配備することにより、ユーザは充電や保管等のバッテリー管理の煩わしさから解放されるだけでなく、バッテリー消耗を気にすることなく広い範囲で電動アシスト自転車を利用することができる。

【0005】

【発明が解決しようとする課題】上述のバッテリーの自動交換装置は、電動アシスト自転車等の車両で訪れるユーザの利用に便利のように、屋外設置に適した構造になっている。しかし、ユーザの利用の快適性を考慮すると、屋内設置も検討されるべきである。ところが、屋外設置を前提としているバッテリー交換装置は、設置地域、気候、気象等の状態に適合させたり、バッテリー充電時に生じる熱を排除したりするための空調装置が必須となっている。そのために、バッテリー交換装置が大型化し、屋内設置には適さないという問題点があった。

【0006】本発明は、上述の課題を解決し、屋内設置に適した小型のバッテリー交換装置を提供することを目的とする。

【0007】

【課題を解決するための手段】上記目的を達成するための本発明は、バッテリーを収納する収納部と、前記バッテリーを充電する充電器とを有し、充電済みバッテリーを提供するバッテリー交換装置において、屋内設置され、内部雰囲気が設置雰囲気との換気のみ依存して維持されるとともに、全高が略 80～120センチメートルに設定されている点に第 1 の特徴がある。第 1 の特徴によれば、バッテリー交換装置は屋内での利用に適したものとされ、特に、全体高さが略 80～120 cm に設定されているので、収納部に対して人がバッテリーを出入れしやすい上に、交換装置の上面に物を置くなどの有効な利用が図れる。

【0008】また、本発明は、前記バッテリー収納部における上下方向のバッテリーの数よりも左右方向のバッテリーの数を多くした点に第 2 の特徴がある。第 2 の特徴によれば、高さを 120 cm 程度と低くしながら、バッテリーの収納数を多くできる。

【0009】また、本発明は、電源装置と、制御装置とを具備し、前記制御装置が、受入れたバッテリーを前記収納部に保持するロック制御手段と、前記収納部に受入れたバッテリーを充電するための充電制御手段と、充電済みバッテリーを収納している収納部の保持を利用者の要求に応じて解除するロック解除制御手段とからなる点に第3の特徴がある。第3の特徴によれば、受入れられたバッテリーは収納部にロックされ、充電済みのバッテリーはロック解除されて利用に供される。

【0010】また、本発明は、前記収納部が複数の有底筒体からなり、前記有底筒体のうち、空いている有底筒体、および充電済みバッテリーを収納している有底筒体をそれぞれ認識可能に表示する表示手段を具備した点に第4の特徴がある。第4の特徴によれば、ユーザは、収納部内のバッテリーの有無および充電済みバッテリーの有無を、表示を通じて認識できる。

【0011】さらに、本発明は、前記電源装置および制御装置を最下段に、前記収納部を中段に、前記表示手段を含む案内手段を最上段に配置した点に第5の特徴がある。第5の特徴によれば、案内手段は見易い位置に、バッテリーは出入しやすい位置に配置される。

【0012】また、さらに、本発明は、内部雰囲気を換気するファンを具備した点に第6の特徴があり、前記屋内が、コンビニエンスストアである点に第7の特徴がある。第6の特徴によれば、バッテリー交換装置が設置された場所の雰囲気で内部が換気される。第7の特徴によれば、当該バッテリー交換装置は高さが120cmに設定されているので、他の商品棚と一緒に並べて設置したときにコンビニエンスストアの店内の見通しが確保される上、交換装置の上面にも物や商品を置くのに好適となる。

【0013】

【発明の実施の形態】以下、図面を参照して本発明を説明する。図1は、本発明の一実施形態に係るバッテリー交換装置を示す正面図、図2は同側面断面図である。図において、バッテリー交換装置1は、外形が直方体をなす筐体からなる。この筐体は、複数のバッテリー2、コントローラ（電源装置および制御装置からなる）3とを収容するスペースを有する本体1aと、本体1aに対して開閉自在な蓋体1bとからなる。なお、バッテリー2は複数のバッテリーセルを樹脂等のケース内に装填したバッテリーパックとして構成される。

【0014】本体1aには、バッテリー2を1つずつ収納した収納部としてのスロット4が設けられており、スロット4はそれぞれ横に6列、縦に5段設けられている。すなわち、本実施形態のバッテリー交換装置1は合計30個のバッテリーを同時に収容可能である。スロット4はバッテリー2の保持機構（詳細は後述）5を有している。スロット4の底部つまり奥の壁面にはバッテリー充電のための端子6が設けられていて、この端子6は充電器7に接

続されている。

【0015】スロット4はバッテリー2が挿入されたことを検出するセンサ手段（後述のリミットスイッチ56）を有していて、バッテリー2の挿入が検出されたならば充電器7を付勢して該バッテリー2の充電を行う。バッテリー2の検出、充電の開始指示等は前記コントローラ3によって実行できる。コントローラ3の制御装置は、バッテリー2の充電が完了した場合、どのスロット4に充電済みバッテリーが収納されているかが認識できるレジスタを含む制御手段を有している。このレジスタの内容によって後述の表示手段による充電バッテリー表示が行われる。なお、充電器7は個々のスロット4にそれぞれ別個に設けるのではなく、例えば、3つのスロットで1つの充電器7を共用することができる。

【0016】本体1aの上部背面には排気用のファン8が設けられている。バッテリー交換装置1に空調手段を設けると、そのために大きいスペースをとることになり、屋内での使用に適しない。そこで、本実施形態では、スペースを大きくとる空調手段を用いず、ファン8で外気（設置場所の雰囲気）との換気をするだけにした。その結果、後述のようにバッテリー交換装置1の小型化が達成されている。

【0017】蓋体1bには、スロット4の配置に対応して横長の窓9が5段設けられていて、この窓9には6列のスロット4の前面を一体的に覆う共通の扉10が設けられている。扉10は透明の樹脂板で形成でき、上部に設けたヒンジ11によって開閉自在に支持されている。窓9の縁には、扉10を閉じたときにこの扉10の下端部裏面が当接するストッパ12が設けられている。ストッパ12は緩衝機能があるゴム等の弾性材料であるのが好ましい。また、窓9には各スロット4に対応して表示灯（例えばLED）13が設けられていて、この表示灯13が点灯または点滅しているスロット4およびこのスロット4に収容されているバッテリー2に関してユーザがアクセス可能である。図1においては図の繁雑を避けるため最下段のスロットについてのみストッパおよび表示灯を示す符号12、13を付している。

【0018】バッテリー2を収納するスロット4は、上述の数に限らないのはもちろんである。また、窓9は横長に限らず、スロット4の列に合わせて縦長としてもよい。この場合、扉10も縦長となり、上下方向に伸びた回動軸を有するヒンジで支持するのがよいのはもちろんである。さらに、スロット4の数に応じて必要な数の窓9だけに開閉自在な扉10を設けることとし、スロット4の数が少ない場合は、使用しない窓9に蓋を取付けて塞いでおくようにしてもよい。そして、スロット4を増設した場合は、これに応じて、塞いであつた窓9を開放し、そこに扉10を取付けられればよい。

【0019】蓋体1bの上部には表示パネル14が形成され、電源ランプ15、準備中表示器16、操作手順表

示器17、18、19、カード返却ランプ20、およびカード使用残数表示器21が設けられている。準備中表示器16ならびに操作手順表示器17、18、19は、予めメッセージを書込んだ文字板と、この文字板を照射するランプとからなる。準備中表示器16には「準備中」の文字が、操作手順表示器17には「充電池を点灯の所に入れて下さい」の文字が、操作手順表示器18には「カードを入れて下さい」の文字が、操作手順表示器19には「点滅の所から充電池を取出して下さい」の文字がそれぞれ表示される。蓋体1bの最上段の窓9の側部にはプリペイドカードを挿入するための挿入口22が形成されている。挿入口22には、開閉自在な透明樹脂カバー22aを設けることができる。

【0020】バッテリー交換装置1の下部には、脚23が設けられている。このバッテリー交換装置1の高さHは120cm、奥行Dは45cm、幅Bは72.5cmである。これらの寸法のうち、特に、高さHは、人間工学的にみたバッテリー2の出し入れ容易性や、コンビニエンスストア等の店舗に設置した場合の見通しの確保ならびに他の商品陳列台と共に配列したときの美観を考慮して決定するのが好ましく、120cmの前後10cmの範囲であるのが好ましく、80～120cm程度の範囲で設定される。

【0021】次に、バッテリー交換装置1の動作について説明する。バッテリー交換装置1は、充電済みのバッテリー2がない場合は準備中表示器16をオンにして「準備中」の文字を表示している。充電済みバッテリー2を貸出しできる場合は、準備中表示器16をオフにして「準備中」の文字を消し、これに代わって操作手順表示器17をオンにして「充電池を点灯の所に入れて下さい」の文字を表示する。また、この表示と共に、空きスロット4に対応した表示灯13を点灯させる。空きスロット4が複数あるときは、それらのすべての表示灯13を点灯させてもよいし、各スロット4が平均して利用されるようにスロット4のうち1つを選択して表示灯13を点灯させてもよい。

【0022】図3はバッテリー交換の処理を示すフローチャートである。この処理はコントローラ3内の制御装置（マイクロコンピュータを含む）によって実行される。ステップS1では、バッテリー2がスロット4に入ったか否かが判別される。バッテリー2が入れられたならばステップS2に進み、受入れたバッテリー2が純正なものかどうかをチェックする。バッテリー2が純正のものであって、かつ異常がない場合（ステップS3が否定）はステップS4に進む。なお、異常の際に点灯して注意を促す警告ランプを前記蓋体1bに設けることができる。

【0023】ステップS4では操作手順表示器18をオンにして操作手順表示器17をオフにする。これによって、「充電池を点灯のところに入れて下さい」の文字は消え、代わりに「カードを入れて下さい」の文字が表示

される。ステップS5では、プリペイドカードが前記挿入口22に挿入されたか否かを判断する。カードが挿入されたならばステップS6に進み、挿入されたカードのチェックを行う。具体的には、受入れたカードがバッテリー交換装置1に適合し、予定の貸出し条件に合致した適正なプリペイドカードであるか否かを判断し、正しいカードの場合に料金を減算して残数をカード使用残数表示器21に表示する。

【0024】ステップS7では、操作手順表示器18をオフにし、操作手順表示器19をオンにする。これによって、「カードを入れて下さい」の文字は消え、代わりに「点滅の所から充電池を取り出して下さい」の文字が表示される。この「点滅の所から充電池を取り出して下さい」の文字の表示と共に、充電済みバッテリー2が収容されているスロット4に対応した表示灯13を点滅させる。

【0025】充電済みバッテリー2が複数あるときは、それらのすべてに対応するスロット4の表示灯13を点滅させてもよいし、すべてのスロット4がまんべんなく利用されるように、例えばランダムにスロット4の1つを選択して表示灯13を点滅させてもよい。ステップS8では、バッテリー2が取り出されたか否かが判断される。バッテリー2が取出されたならばステップS9に進み、カード返却ランプ20をオンにしてカードを返却する。

【0026】上述の例では、バッテリー交換装置1を利用するためにプリペイドカードを使用するようにしたが、予め登録ユーザにだけ発行されたIDカードが使用された場合にのみバッテリー2の交換をできるようにしてもよい。

【0027】バッテリー交換装置1は複数台を集中して管理するようにしてもよい。図4は複数のバッテリー交換装置1を集中して管理するバッテリー・レンタルシステムの構成図である。バッテリー交換装置1はネットワーク24を介して管理装置25に接続されている。バッテリー交換装置1は、例えばコンビニエンスストア等に配備されており、管理装置25は複数台のバッテリー交換装置1を集中して管理している。ユーザはシステム提供者と契約してユーザ登録し、IDカードの発行を受ける。IDカードが使用された場合、バッテリー交換装置1はIDカードに記述された情報を認識し、管理装置25との通信によりユーザの個人情報をやり取りしてバッテリー2の受け付け（返却）や貸出しを行う。このようなバッテリー・レンタルシステムについては本出願人による先願（特開平10-293874号）に詳述されている。また、プリペイドカードやIDカードに限らず、現金を受け付けてバッテリー交換に応じるようにしてもよいのはもちろんである。

【0028】図5は、バッテリー2の斜視図であり、図6はバッテリー2の正面図、図7は同底面図である。これらの図において、バッテリー2は複数のバッテリーセル（図示せず）、およびバッテリーセルを収容した略直方体のバッ

テリパック 26 を有している。バッテリーパック 26 は、その長手方向に沿った剖面 27 で 2 分割されたパック部分 26 R、26 L からなり、これらパック部分 26 R、26 L は剖面 27 を境に対称形状に形成されている。パック部分 26 R、26 L の形状を剖面 27 に対して対称とすることにより、例えば、パック部分 26 R、26 L を成型するときの型の設計が容易になる。

【0029】バッテリー 2 の正面には、バッテリーセルの正極および負極にそれぞれ接続される端子 28、29 が、前記剖面 27 に対して対称位置に露出して配置されている。バッテリーパック 26 の正面寄り頂部にはスロット 4 に設けられるロック装置（後述する）に係合する係合穴 30 が形成されている。また、バッテリー 2 をスロット 4 に収容するときのスロット 4 の壁面との摺動性、および収容した後の安定性を確保するため、バッテリーパック 26 a の底面には長手方向に延びた 2 条の筋状凸部 31 が形成されている。

【0030】パック部分 26 R、26 L はネジ孔 32、33 を利用してボルト 33 A（図 7）で一体に組み付けることができる。溝 34 は持ち運びの際の手掛かりとなり、把持操作性の向上に貢献する。また、バッテリーパック 26 の横断面形状の寸法は、人が手でつかみ易いように、いわゆる手のひらサイズに設定されているのがよい。例えば、正面から見たときの高さ h は約 80 mm であり、幅 b が手のひらサイズの約 55 mm である。

【0031】バッテリーパック 26 を横に貫通した孔 35 は、バッテリー 2 を電動アシスト自転車に搭載したときに、鍵の一部をなすワイヤまたはロープ部分を通すのに利用できる。また、バッテリーパック 26 の角に形成された段部分 36 はバッテリー 2 を電動アシスト自転車に搭載したときに、バッテリー 2 を車体に固定するのに利用される引掛部となる。バッテリー 2 を電動アシスト自転車に搭載した例は図 17 等に関して後述する。バッテリーパック 26 の底面には、前記筋状凸部 31 で挟まれた領域にバッテリー 2 の種類、製造者名、取扱注意表示等を記載したシール（意匠シール）37 が貼付けられている。このシール 37 は筋状凸部 31 間に貼ることにより、スロット 4 内への挿入や取出しの際に筋状凸部 31 で保護され、傷みにくいという利点がある。

【0032】バッテリーパック 26 の形状をさらに説明する。なお、パック部分 26 R、26 L は対称形状であるので、パック部分 26 で代表して説明する。図 8 はバッテリーパック 26 のパック部分 26 R の側面図、図 9 は同内面図、図 10 は要部断面（図 9 の A-A 断面）図であり、図 5 と同符号は同一部分を示す。特に、図 9 および図 10 において、パック部分 26 R の内面にはリブ 38 が設けられ、パック部分 26 R の補強、収容されるバッテリーセル 39 の位置決め、および緩衝に供することができる。なお、リブ 38 の形状はこれに限定されない。

【0033】図 9 において、バッテリーセル 39 は一部の

みを想像線で示しているが、さらに図示した数以上のものが、例えば熱収縮性チューブ等で一体に形成されてバッテリーパック 26 に装填されている。パック部分 26 R の正面側の壁面には前記端子 29 を固定するための多段の溝 40 が形成されている。

【0034】バッテリー 2 の端子近傍をさらに説明する。図 11 はバッテリーパック 26 の要部正面図であり、図 12 はバッテリーパック 26 の要部断面図である。端子 28、29 は樹脂製のアタッチメント 41 に所定の間隔を保持して組付けられている。端子 28、29 にはネジ部があり、このネジ部にはバッテリーセル 39 との接続のためのケーブル 39 a、39 b を締結するためのナット 42 が螺装されている。

【0035】アタッチメント 41 はパック部分 26 R、26 L の多段溝 40 に嵌合され、両者に挟まれて固定される。端子 28、29 の端部はパック部分 26 R、26 L の孔 42 A から外側に臨んでいる。なお、バッテリーセル 39 とパック部分との間にはゴム等の弾性材料からなるクッション 39 c が配設されている。バッテリーパック 26 には、スロット 4 のロックロッド（後述）と係合される係合穴 30 が形成されるほか、この係合穴 30 が形成されている面とは反対側の面にもうひとつの係合穴 30 A が形成することができる。これら係合穴 30、30 A の機能については後述する。

【0036】次に、スロット 4 の構造を説明する。図 13 は、バッテリー保持機構を含むスロット 4 の側面図、図 14 はスロット 4 の要部横断面図、図 15 はスロット 4 の内面を示す透視図である。これらの図において、スロット 4 にはバッテリー 2 の挿入が容易となるようにテーパ 43 a を施した入口部材 43 が設けられ、この入口部材 43 は板金加工によって形成されたスロット本体 44 に、ボルト 43 b で固定されている。スロット本体 44 は、バッテリー 2 を収容するスペースを確保するための下板 44 a および上板 44 b からなる。上板 44 b はバッテリー保持機構 5 を搭載するベースを兼ねている。上板 44 b 上には上下動自在なロックロッド 45 と、ロックロッド 45 を上下動させるアーム 46 と、アーム 46 を一方に付勢するソレノイド 47 と、アーム 46 をソレノイド 47 による付勢方向とは逆方向に付勢する引張コイルばね 48 とを有する。

【0037】ロックロッド 45 は部材 49、50 によって上下動自在に支持されており、アーム 46 はピボット軸 51 a によって部材 51 に回転自在に支持されている。アーム 46 の一端はフォーク状に二分になっていて、その二分がロックロッド 45 のピン 45 a に係合している。アーム 46 の他端には引張コイルばね 48 の一端が引掛けられていて、引張コイルばね 48 の他端は部材 52 に引掛けられている。ピボット軸 51 a と引張コイルばね 48 一端の引掛部との中間部には連結ロッド 53 の一端が引掛けられていて、連結ロッド 53 の他端は

ソレノイド4 7のプランジャ5 4に引掛けられている。

【0038】部材5 2にはピボット軸5 5 aで支持された揺動板5 5が設けられている。この揺動板5 5の一端はリミットスイッチ5 6のアクチュエータ5 6 aに当接可能に設定されており、他端はスロット4に挿入されたバッテリー2の上面に当接可能に設定されている。揺動板5 5の前記他端はねじりコイルばね5 7でバッテリー2側に付勢されている。

【0039】上板4 4 bに対して摺動自在なプレート5 8が設けられていて、このプレート5 8にはその立板5 8 aを貫通してシャフト5 9が係合されている。シャフト5 9の両端は上板4 4 bの側板6 0に設けられた長孔6 0 aに係合している。シャフト5 9の、前記長孔6 0 aから外方に突出した部分にはブラケット6 1の一端が結合されている。ブラケット6 1の他端には、スロット4を横断するように下板4 4 aを貫通しているプッシュバー6 2が結合されている。プッシュバー6 2は下板4 4 aの側板に穿たれたガイド溝6 3によってバッテリー2の出し入れ方向に移動可能に案内されている。

【0040】上板4 4 bに固定されたプレート6 4の一方の立板6 4 aには前記リミットスイッチ5 6が取付けられている。プレート6 4の他方の立板6 4 bには引張コイルばね6 5の一端が引掛けられており、引張コイルばね6 5の他端はシャフト5 9に引掛けられている。引張コイルばね6 5の作用によって、プレート5 8はスロット4の開口側に付勢されている。スロット4の底部つまり奥には端子板6 6が設けられ、この端子板6 6には前記充電器7に接続される端子6、6（図15）が埋設されている。なお、バッテリー2が挿入されてバッテリー2の端子2 8、2 9が端子6、6に接触する位置に達したとき、ロックロッド4 5が下方方向に偏倚してバッテリー2の係合穴3 0に係合できるように、プレート6 4には落とし孔5 8 cが形成されている。

【0041】動作時、バッテリー2が挿入されていない時は、ソレノイド4 7が付勢されていて、プランジャ5 4がソレノイド4 7内に引き込まれている。そのため、アーム4 6は図13において時計方向に回転し、ロックロッド4 5は上方に引き上げられている。ロックロッド4 5が引き上げられているときは、プレート5 8とロックロッド4 5の係合が解除されており、プレート5 8は引張コイルばね6 5に引っ張られて図13において左方向に偏倚している。これにより、ブラケット6 1を介してプレート5 8に結合されているプッシュバー6 2は、ガイド溝6 3内でスロットの開口寄りに偏倚されている。

【0042】バッテリー2がスロット4内に挿入されると、バッテリー2の端面（前記端子2 8、2 9が配置されている面）がプッシュバー6 2に当接して、プッシュバー6 2はスロット4の奥の方へ押しやられる。一方、バッテリー2が挿入されることにより、バッテリー2の上面がアクチュエータ5 6 aに当接してこれを上方に押し上げ

るため、リミットスイッチ5 6がオンになる。このリミットスイッチ5 6のオン動作は前記コントローラ3で認識され、コントローラ3はソレノイド4 7の付勢を停止する信号を出力する。この信号にตอบสนองしてソレノイド4 7の付勢が停止されると、アーム4 6は引張コイルばね4 8に引張られて反時計方向に回転し、ロックロッド4 5は下方に付勢される。但し、プッシュバー6 2がスロット4の奥へ押しやられ、この動きに伴ってプレート5 8が所定位置へ偏倚するまでは、プレート5 8の上面にロックロッド4 5の下端面が当接するので、ロックロッド4 5はそのストロークの下端に至らず、途中でとどまっている。

【0043】プッシュバー6 2がスロット4の奥へ押しやられ、それによってプレート5 8がプッシュバー6 2と同方向に偏倚し、バッテリー2の端子2 8、2 9が端子6、6にそれぞれ接触したときに前記落とし孔5 8 bを貫通してロックロッド4 5は下方に落下する。こうしてバッテリー2の係合穴3 0にロックロッド4 5の下端が係合してバッテリー2はスロット4内にロックされる。

【0044】バッテリー2がスロット4内に挿入されると、コントローラ3は充電器7を付勢して当該バッテリー2の充電を開始する。バッテリー2が充電され、ユーザがバッテリー2をスロット4から取出す準備ができると、コントローラ3の指示によりソレノイド4 7が付勢されてロックロッド4 5が上方に引き上げられ、ロックが解除される。その結果、プッシュバー6 2は引張コイルばね6 5で引っ張られてバッテリー2をスロット4から押し出すように作用する。

【0045】図16はスロット4の形状を模式的に示した断面図である。この図のように、スロット4はバッテリー2が支持される奥部分4 aと、バッテリー2が突出していて、ユーザが手で掴み易いように形成された膨出部分4 bとからなり、この膨出部分4 bは入口部材4 3から前方方向つまり前記扉10寄りへ開口されている。図中鎖線で示したように、バッテリー2はプッシュバー6 2による押し出し動作によって扉10方向に突出される。

【0046】上記押し出し動作により、バッテリー2の先端つまりスロット4から外に臨んでいる部分が他のスロット4のバッテリー2より前方に突出するのでユーザの取り出し操作は容易になる。また、前記膨出部分4 bにより、バッテリー2の断面形状が手のひらサイズであることも相俟ってその端部はをより一層つかみ易くなっている。

【0047】次に、上記バッテリー2を搭載した電動アシスト自転車の説明する。図17、図18および図19は、いずれも電動アシスト自転車の右側面図であり、互いに同符号は同一または同等部分を示す。図17において、車体フレーム6 7は、その前端のヘッドパイプ6 8と、ヘッドパイプ6 8から後下がり延びるダウンパイプ6 9と、ダウンパイプ6 9の下端近傍に結合されたり

アフォーク 70 と、ダウンパイプ 69 の下端に結合され、後上方に立ち上がるシートポスト 71 とを有する。前記ヘッドパイプ 68 にはフロントフォーク 72 が操舵可能に支承され、フロントフォーク 72 の下端には前輪 73 が軸支されている。フロントフォーク 72 の上端にはハンドル 74 が結合されている。

【0048】シートポスト 71 にはこのシートポスト 71 に対して伸縮自在に嵌合された支持軸 75 が設けられ、かつ支持軸 75 の上端にはシート 76 が装着されている。シートポスト 71 の上端から後下がりステア 77 が延び、このステア 77 とリアフォーク 70 との交差部は一体的に結合されて後輪 78 の軸受を形成している。

【0049】シートポスト 71 とダウンパイプ 69 との交差部には車体の左右に延びた軸受パイプ（図示せず）が結合されていて、この軸受パイプを貫通したクランク軸にはペダル 79 および前スプロケット 80 が設けられている。ペダル 79 は車体左側にも設けられているのはもちろんである。後輪 78 の中心には後スプロケット 81 が連結され、前スプロケット 80 および後スプロケット 81 間にはチェーン 82 が架けられている。

【0050】電動アシスト自転車にはペダル 79 にかかる踏力を補助するための動力を与える電動機を含むパワーユニット 86 が設けられ、その電動機の出力軸 83 が前スプロケット 80 後方に隣接して配置されている。出力軸 83 に結合されたアシストスプロケット 84 には、その上部に載るようにチェーン 82 が架けられている。チェーン 82 の張力は張力調節スプロケット 85 の位置を変化させることによって調節される。パワーユニット 86 はリアフォーク 70 に溶接等で固定されたブラケット 70a とダウンパイプ 69 の下端に溶接等で固定されたブラケット（図示せず）にボルト締めされて結合されている。

【0051】シートポスト 71 には、後輪 78 との間のスペースにバッテリー受 87 が溶接されている。バッテリー受 87 は皿状に形成されていてバッテリー 2 が前記端子 28、29 を下にしてシートポスト 71 に沿って縦長で収まっている。シートポスト 71 には、さらにバックル 88 とバックル 88 に連結された止め輪 89 が設けられている。止め輪 89 をバッテリー 2 の上端部角の前記段部分 36 に引掛け、かつバックル 88 を回動させることによってバッテリー 2 の上端がシートポスト 71 に確実に固定される。

【0052】バッテリー 2 の下端には前記端子 28、29 と接触する接点を含む給電部 90 が設けられていて、この給電部 90 を通じてパワーユニット 86 に電力が供給される。チェーン 82 上側を覆うチェーンカバー 91 は、さらに前スプロケット 80 およびアシストスプロケット 84 を全体的に覆うように形状が設定されている。バッテリー受 87 にはバッテリーパック 26 に穿たれた貫通

孔 35 に適合する孔 92 が形成されているので、この孔 92 およびバッテリーパック 26 の貫通孔 35 に鍵の一部をなすワイヤまたはロープ部分を通し、それを後輪 78 にかけて渡して施錠することにより、電動アシスト自転車の盗難だけでなくバッテリー 2 の盗難防止が図られる。

【0053】図 18 において、バッテリー受 87 はシートポスト 71 の前方に固定されていて、バッテリー 2 はシートポスト 71 前方に位置している。このように、シートポスト 71 後方に設置スペースが確保できない車体フレームにおいてもバッテリー 2 を搭載することができる。また、チェーンカバー 91 は前スプロケット 80 についてはその一部（上部）のみを覆うような形状に設定されている。

【0054】図 19 においては、ダウンパイプ 69 はシートポスト 71 の中間部に端部が突合わされて結合されている。そして、リアフォーク 70 はシートポスト 71 の下端部つまりクランク軸付近から後方に延びている。このような車体フレーム 67 の構造では、パワーユニット 86 を前スプロケット 80 の後方に配置するスペースの確保が困難である。そこで、パワーユニット 86 は前スプロケット 80 よりも前方に配置して、アシストスプロケット 84 は前スプロケット 80 より前方でチェーン 82 に巻き架けられるようにしている。このようなパワーユニット 86 の配置を実現するため、電動機 86 の一部はダウンパイプ 69 の下部に溶接されたブラケット 93 を介して車体フレーム 67 に結合されている。

【0055】車体フレーム 67 に対するパワーユニット 86 の取付態様をさらに説明する。図 20 は電動アシスト自転車の要部を示す図 17 の要部拡大図であり、図 17 と同符号は同一部分である。チェーンカバー 91 は取り除いてある。図 20 において、パワーユニット 86 は電動機 94 を内蔵しており、この電動機 94 の回転は図示しない伝達機構を介して出力軸 23 に伝達される。ケーシング 95 にはボス 96、97 が外方に張出すようにして形成されている。ボス 96 はリアフォーク 70 に設けられたブラケット 70a にボルト・ナット 98 で結合され、ボス 97 はダウンパイプ 69 およびシートポスト 71 を結合している軸受パイプ 99 から下方に突出したブラケット 100 にボルト・ナット 101 で結合されている。

【0056】パワーユニット 86 は、種々想定される車体フレームの型に対応できることが製造上好ましい。そこで、共通の「型」を使用してケーシング 95 を製造し、かつ種々の車体フレームに適合して取り付けられるようにした。すなわち、ボス 96、97 に形成されるボルト孔の距離を S としたとき、これら双方のボルト孔から距離 S の位置にボルト孔が位置するように第 3 のボス 102 を想定する。そして、これらのボスのいずれを成品に残すかは、取付けられる車体フレームの型に応じて決定する。このように製造の「型」を設定することによ

り、多様な取付け態様にも対応できる種々のケーシングを容易に製造できる。

【００５７】張力調節スプロケット８５は、ケーシング９５にピボット軸１０３で軸支されたレバー１０４に取付けられている。レバー１０４は図示しないばね手段により、図中反時計方向に回転付勢されており、これによって、張力調節スプロケット８５が回転し、チェーン８２に適当な張力が付与されている。

【００５８】上述の実施形態では、バッテリー２を電動アシスト自転車に搭載した。しかし、このバッテリー２はこれに限らず他の電気製品、例えば、ポータブルのカセットデッキやＣＤプレーヤに使用できる。これらの電気製品の電源として使用する場合、バッテリー２とこれら電気製品の入力端子とを接続するためのアダプタが必要となる。そして、このアダプタをバッテリー２に確実に結合させるときに前記係合穴３０、３０Ａが有用である。

【００５９】すなわち、図１２において、係合穴３０、３０Ａを利用してアダプタ１０５をバッテリーパック２６に保持させることができる。アダプタ１０５は、このアダプタ１０５がバッテリーパック２６に結合されたときに前記端子２８、２９と接触する端子（図示せず）を有していて、この端子から引出されたコード１０６を通じてバッテリー２を電気製品に接続することができる。

【００６０】こうして、バッテリー２は電動アシスト自転車およびその他の電気製品で共用できるので、例えば、電動アシスト自転車を使用したサイクリング先で、電動アシスト自転車からバッテリーを外して音響製品に電力を供給し、野外等で容易に電源が得られないときにも音楽を楽しむことができる。

【００６１】

【発明の効果】以上の説明から明らかなように、請求項１ないし請求項７の発明によれば、屋内での利用に適した小型のバッテリー交換装置が提供される。特に、請求項１の発明では、内部雰囲気を設置雰囲気に依存させているので空調装置が不要である。請求項２の発明では、高さを低くしつつも、多くのバッテリー収納数を確保することができる。請求項３の発明では、充電期間中は収納部にバッテリーは確実に保持される。請求項４の発明では、バッテリーの受入状態および充電済みバッテリーの有無を認識でき、利便性が高められている。

【００６２】請求項５の発明では、バッテリーの収納部が装置中間高さにあるのでバッテリーの出入が容易であるとともに、案内手段の視認が容易である。請求項６の発明では、設置雰囲気と機内雰囲気がファンによって強制的に換気される。請求項７の発明では、コンビニエンスト

アに設置されることによって、特に、店内の見通しや美観の確保による効果が一層顕著である。

【図面の簡単な説明】

【図１】 本発明の一実施形態に係るバッテリー交換装置の正面図である。

【図２】 本発明の一実施形態に係るバッテリー交換装置の側面断面図である。

【図３】 バッテリー交換のフローチャートである。

【図４】 バッテリー・レンタルシステムの構成図である。

【図５】 バッテリーの斜視図である。

【図６】 バッテリーの正面図である。

【図７】 バッテリーの底面図である。

【図８】 バッテリーパックのパック部分の側面図である。

【図９】 パック部分の内面図である。

【図１０】 図９のＡ－Ａ断面図である。

【図１１】 バッテリーパックの要部正面図である。

【図１２】 バッテリーパックの要部断面図である。

【図１３】 スロットの側面図である。

【図１４】 スロットの要部横断面図である。

【図１５】 スロットの内面を示す透視図である。

【図１６】 スロットの形状を模式的に示した断面図である。

【図１７】 電動アシスト自転車の右側面図である。

【図１８】 電動アシスト自転車の右側面図である。

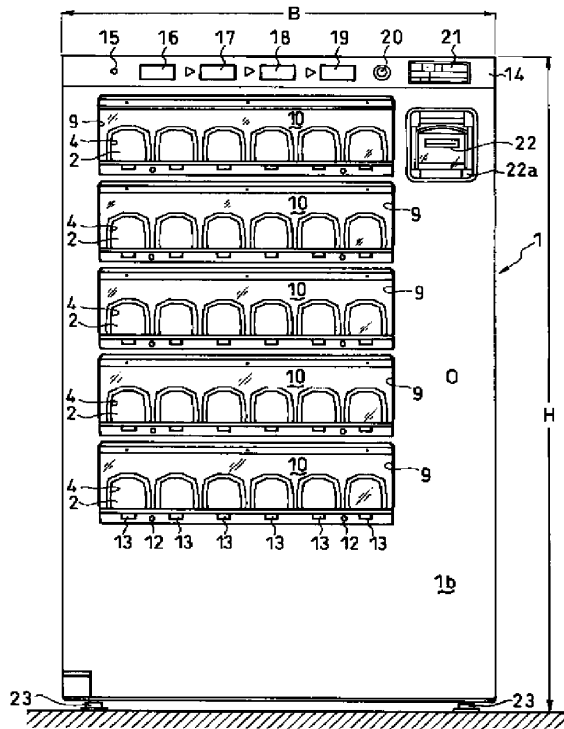
【図１９】 電動アシスト自転車の右側面図である。

【図２０】 電動アシスト自転車の要部を示す要部拡大図である。

【符号の説明】

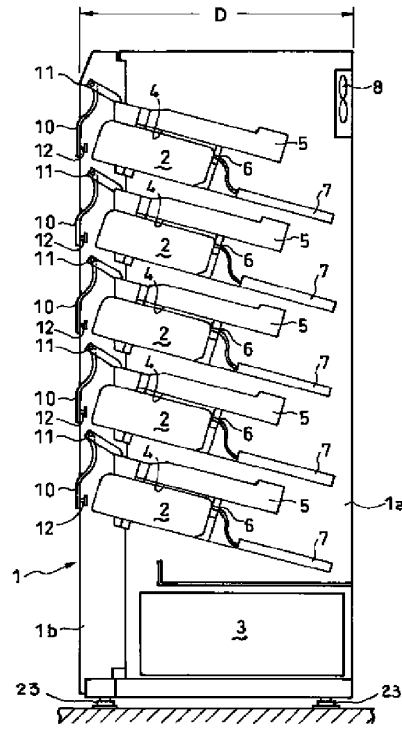
１…バッテリー交換装置、２…バッテリー、３…コントローラ、４…スロット、５…バッテリー保持機構、６…端子、７…充電器、９…窓、１０…扉、１１…ヒンジ、１２…ストッパ、１３…表示灯、１４…表示パネル、２２…カード挿入口、２６…バッテリーパック、２６Ｌ、２６Ｒ…パック部分、２７…側面、２８、２９…端子、３０、３０Ａ…係合穴、３１…筋状凸部、３５…貫通孔、３６…段部分、３７…意匠シール、３９…バッテリーセル、４０…端子固定溝、４５…ロックロッド、４６…アーム、４７…ソレノイド、５６…リミットスイッチ、６１…ブラケット、６２…プッシュバー、７１…シートポスト、８６…パワーユニット、８７…バッテリー受、８８…バックル、８９…止め輪

【図 1】



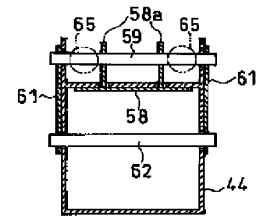
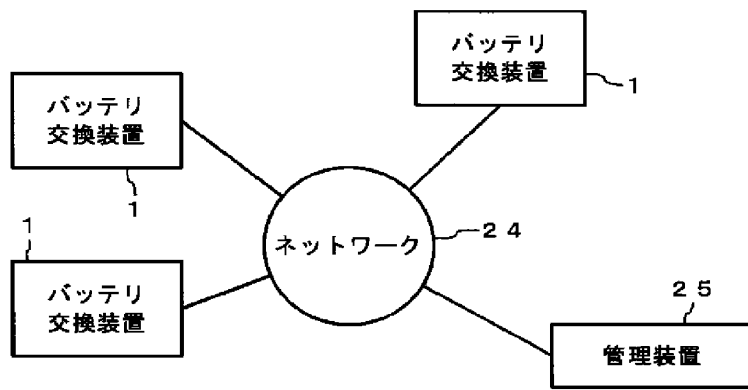
【図 4】

【図 2】

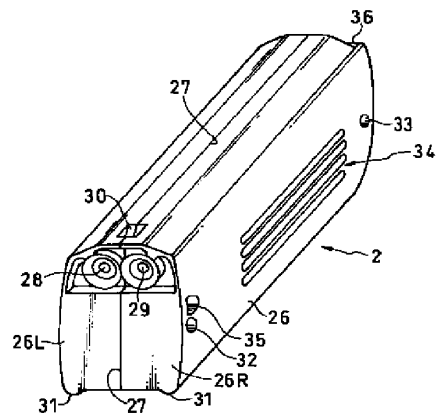


【図 5】

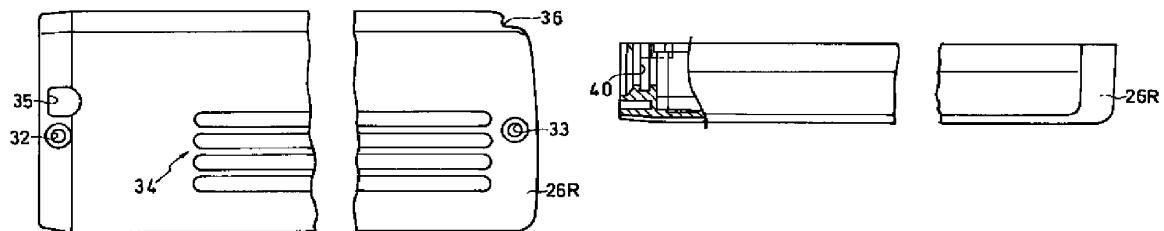
【図 1 4】



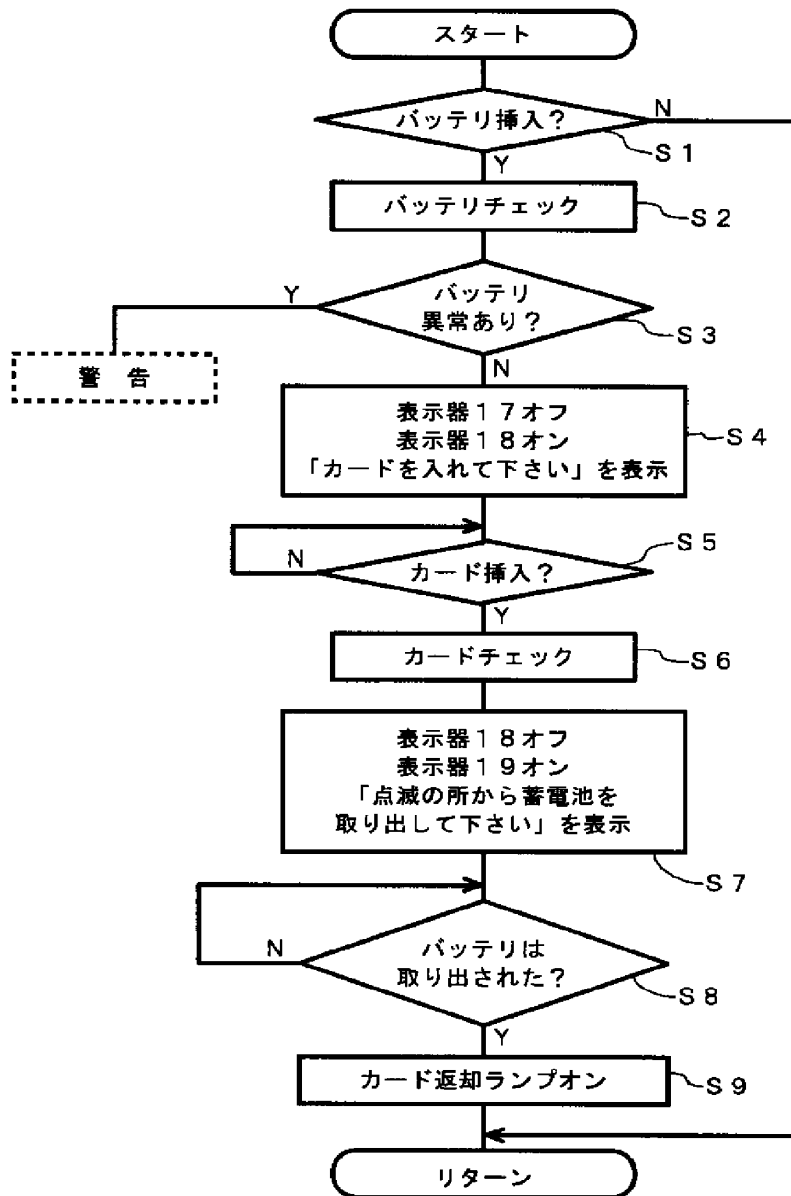
【図 8】



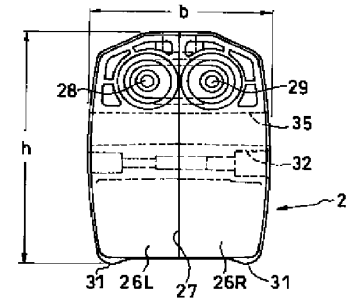
【図 1 0】



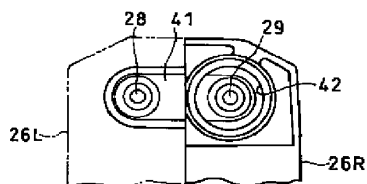
【図 3】



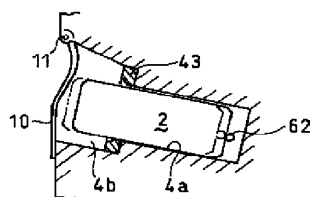
【図 6】



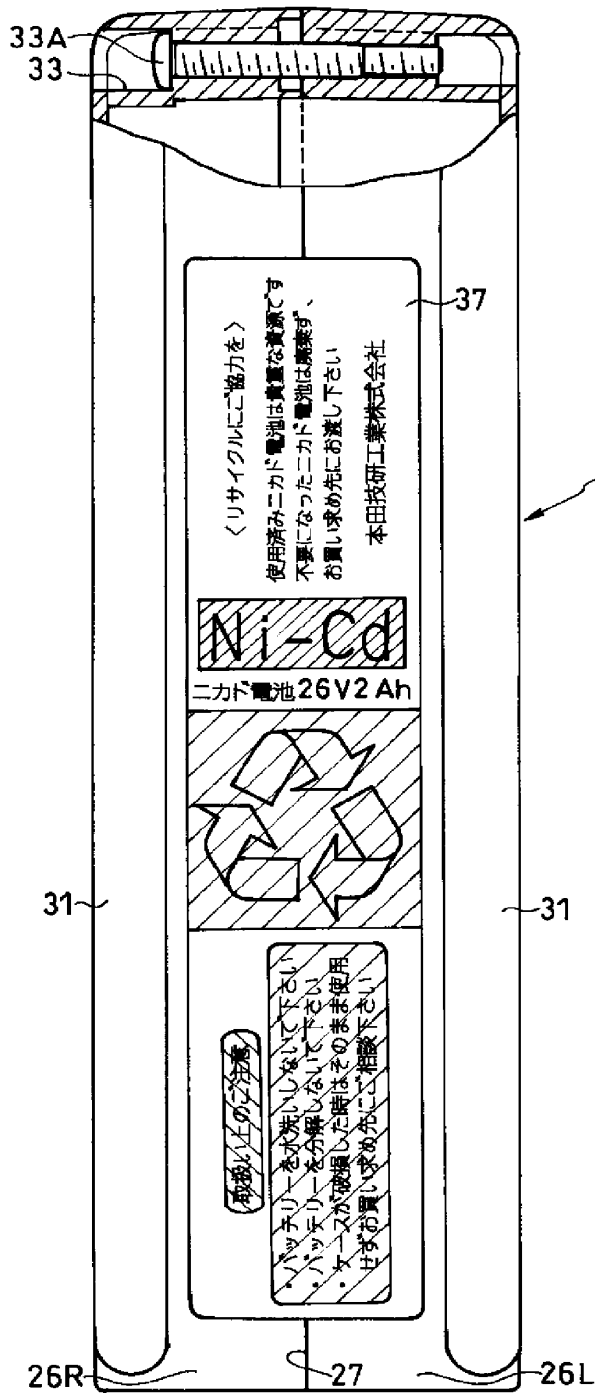
【図 11】



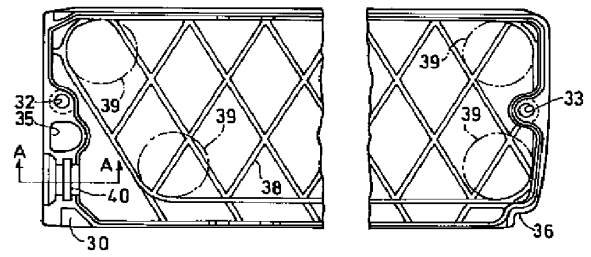
【図 16】



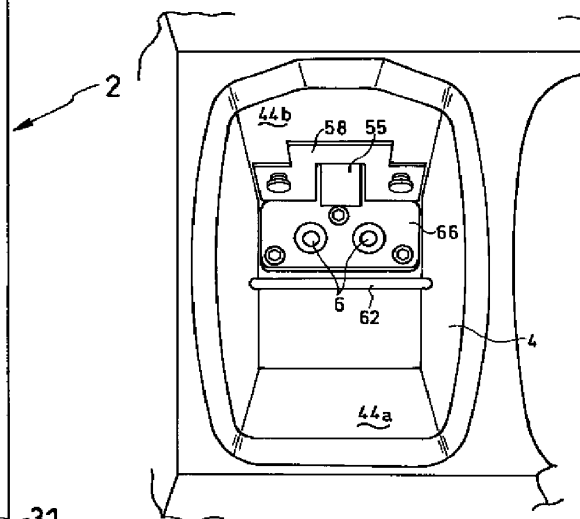
【図7】



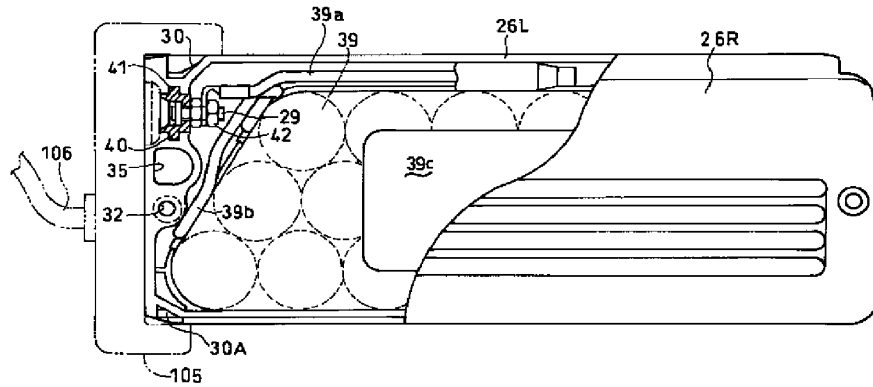
【図9】



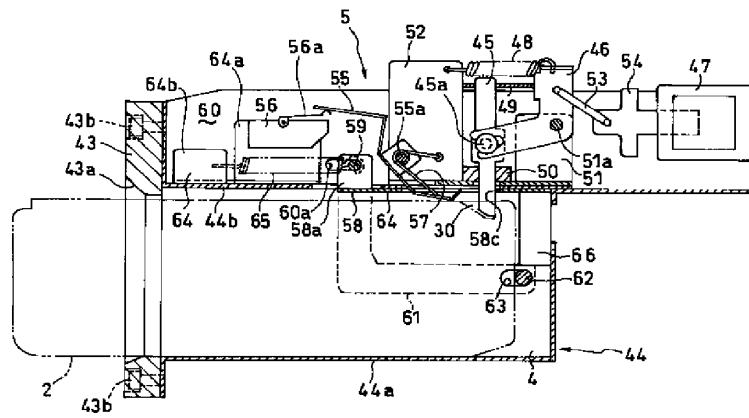
【図15】



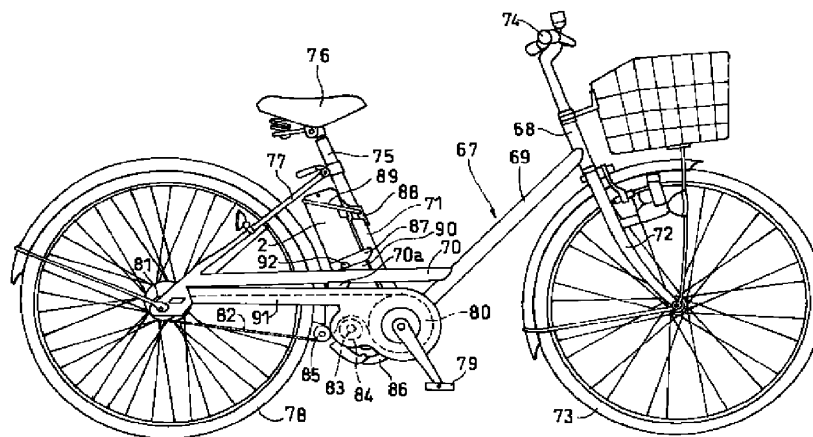
【図12】



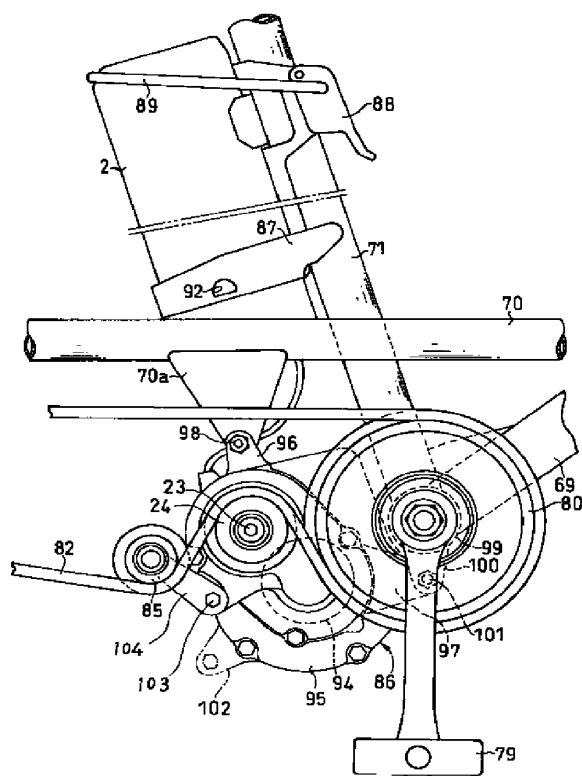
【図13】



【図17】



【图 20】



PATENT ABSTRACTS OF JAPAN

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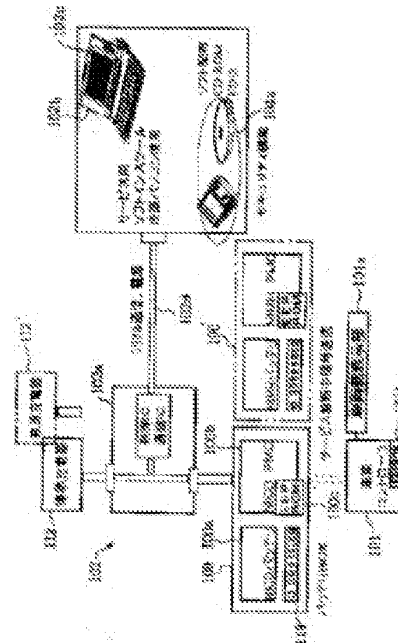
(72)Inventor : **YAMAMOTO SATOSHI**

(54) ELECTRIC VEHICLE AND INTEGRATED DIAGNOSTIC SYSTEM OF THE ELECTRIC VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an electric vehicle and an integrated diagnostic system of the electric vehicle which can grasp abnormal parts simply by a user and a selling shop and to cope with problems based on a usage circumstance of a user.

SOLUTION: In a diagnostic system of an electric vehicle, a battery case 100, including a charging type battery 100a and a battery unit constituted of a battery control device 100b and the like, is mounted on the vehicle body, and a vehicle control device 101 controlling the running state of a vehicle is installed in the vehicle. The battery control device 100b has a battery side abnormality diagnostic mode for diagnosing abnormality of the battery unit, displays the diagnostic results on a battery side display part 119 installed in the battery case, and stores usage circumstance data for showing an applying state of a user. An external service unit 102 is installed detachably on the battery control device 100b. By operating the external service unit 102, the usage circumference data stored in the battery control device 100b can be displayed in an external display part 102c on the external service unit 102.



CLAIMS

[Claim(s)]

[Claim 1] A rechargeable battery.

A vehicle control device which mounts a cell case having a battery device consisting of a battery control device etc. which manage a battery state of this cell on a vehicle body, and controls a run state of vehicles to this vehicle body side.

In an electric motor provided with the above,

An electric motor, wherein the above-mentioned battery control device carries out memory accumulation of the operating environment data to have the cell side abnormality-diagnosis mode in which abnormalities of the above-mentioned battery device are diagnosed, display and combine the diagnostic result with the cell side display part provided by the above-mentioned cell case, and for a user's operating condition to be shown.

[Claim 2] An electric motor also being able to display battery states, such as remaining capacity (a relative capacitor, absolutely capacity) of the above-mentioned cell, and charging frequency, on the above-mentioned cell side display part in Claim 1.

[Claim 3] In Claim 1 or 2, the above-mentioned vehicle control device, If it has the vehicles side abnormality-diagnosis mode in which abnormalities of vehicle running equipment are diagnosed and diagnosis of a battery state by the above-mentioned cell side abnormality-diagnosis mode is started, An electric motor notifying that to the above-mentioned vehicle control device, and this vehicle control device's performing the vehicles side abnormality-diagnosis mode automatically, and displaying this diagnostic result on the above-mentioned vehicles side display part.

[Claim 4] An electric motor setting they to be [any of Claims 1-3], and having a display switch which makes the above-mentioned cell case perform a display by the above-mentioned cell side display part.

[Claim 5] A rechargeable battery.

A vehicle control device which mounts a cell case having a battery device consisting of a battery control device etc. which manage a battery state of this cell on a vehicle body, and controls a run state of vehicles to this vehicle body side.

In comprehensive-diagnosis equipment of an electric motor provided with the above,

The above-mentioned battery control device has cell side abnormality-diagnosis Mohd who diagnoses abnormalities of the above-mentioned battery device, The diagnostic result is displayed on the cell side display part provided by the above-mentioned cell case, Are constituted so that memory accumulation of the operating environment data for a user's operating condition to be shown collectively may be carried out at a battery control device, enable attachment and detachment of an external service unit at the above-mentioned battery control device, and by operation of this external service unit, Comprehensive-diagnosis equipment of an electric motor enabling a display of operating environment data memorized in the above-mentioned battery control device in an external display part on this external service unit.

[Claim 6]Comprehensive-diagnosis equipment of an electric motor characterized by enabling a display also of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (a relative capacitor, absolutely capacity), and charging frequency, at the above-mentioned external display part by operation of the above-mentioned external service unit in Claim 5.

[Claim 7]Comprehensive-diagnosis equipment of an electric motor enabling a display of operating environment data which provided a display switch which makes the above-mentioned cell case perform a display by the above-mentioned cell side display part in Claim 5 or 6, and was memorized by the above-mentioned external display part in the above-mentioned battery control device by operation of this display switch.

[Claim 8]Comprehensive-diagnosis equipment of an electric motor characterized by enabling a display also of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (a relative capacitor, absolutely capacity), and charging frequency, at the above-mentioned external display part by operation of the above-mentioned display switch in Claim 7.

[Claim 9]Comprehensive-diagnosis equipment of an electric motor, wherein it sets they to be [any of Claims 5-8], that is notified to the above-mentioned vehicle control device at the time of connection of the above-mentioned external service unit and this vehicle control device outputs assistant prohibition instructions.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]The present invention relates to the comprehensive-diagnosis technology which enabled it to also cope with the problem which originates in the operating condition of the electric motor especially by a user, and occurs about the comprehensive-diagnosis equipment which performs abnormality diagnosis of an electric motor and this electric motor, etc.

[0002]

[Description of the Prior Art]The service tool for diagnosing the abnormalities of the part according to each of a battery-assisted bicycle and failure from the former is proposed. There is a thing which enabled it to display diagnosis original with vehicles especially with a vehicle control device. On the other hand, about diagnosis of the abnormalities of the cell mounted on an electric motor, etc., there is a thing which enabled it to display the charging time value of a cell by sending fixed discharge current through a discharger. Most part abnormality diagnosis can be performed with these service tools.

[0003]

[Problem to be solved by the invention]These phenomena can be diagnosed when the

phenomenon which can be reliably said to be abnormalities or failure occurs in the case of the above-mentioned conventional service tool. however, a user's operating environment, i.e., the problem which a user senses are dissatisfied owing to usage, for example, the problem "flight range is short." Many points, such as a memory effect of a cell, frequency of refresh discharge, how to run, or insufficient charging resulting from charge environment, are the cause, in diagnosis of simple abnormalities and failure, a cause cannot be analyzed and a user cannot be advised.

[0004]The present invention was made in view of the above-mentioned conventional problem, and an unusual part can be easily grasped in a user and a store by displaying a simple diagnostic result on the display part by the side of vehicles (for example, a cell case), The problem based on a user's operating environment by carrying out memory accumulation of the operating environment data in which a user's operating condition etc. are furthermore shown, For example, it is making into problem to provide the comprehensive-diagnosis equipment of an electric motor and this electric motor which enabled it to also cope with a problem unsolvable in the simple failure diagnosis "flight range is short."

[0005]

[Means for solving problem]In the electric motor which invention of Claim 1 mounted the cell case having the battery device consisting of the battery control device etc. which manage the battery state of a rechargeable battery and this cell on the vehicle body, and equipped this vehicle body side with the vehicle control device which controls the run state of vehicles, The above-mentioned battery control device is characterized by carrying out memory accumulation of the operating environment data to have the cell side abnormality-diagnosis mode in which the abnormalities of the above-mentioned battery device are diagnosed, display and combine the diagnostic result with the cell side display part provided by the above-mentioned cell case, and for a user's operating condition to be shown.

[0006]Invention of Claim 2 is characterized by the ability to also display battery states, such as remaining capacity (relative capacitor, absolutely capacity) of the above-mentioned cell, and charging frequency, on the above-mentioned cell side display part in Claim 1.

[0007]In Claim 1 or 2, invention of Claim 3 the above-mentioned vehicle control device, If it has the vehicles side abnormality-diagnosis mode in which the abnormalities of vehicle running equipment are diagnosed and diagnosis of the battery state by the above-mentioned cell side abnormality-diagnosis mode is started, That is notified to the above-mentioned vehicle control device, this vehicle control device performs the vehicles side abnormality-diagnosis mode automatically, and it is characterized by displaying this diagnostic result on the above-mentioned vehicles side display part.

[0008]Invention of Claim 4 is characterized by setting they to be [any of Claims 1-3], and having a display switch which makes the above-mentioned cell case perform the display by the above-mentioned cell side display part.

[0009]Invention of Claim 5 mounts the cell case having a rechargeable battery and the battery device consisting of the battery control device etc. which manage the battery state of this cell on

a vehicle body, To this vehicle body side, the vehicle control device which controls the run state of vehicles in the diagnostic equipment of the electric motor which it had the above-mentioned battery control device, Have the cell side abnormality-diagnosis mode in which the abnormalities of the above-mentioned battery device are diagnosed, and the diagnostic result is displayed on the cell side display part provided by the above-mentioned cell case, Are constituted so that memory accumulation of the operating environment data for a user's operating condition to be shown collectively may be carried out at a battery control device, enable attachment and detachment of an external service unit at the above-mentioned battery control device, and by operation of this external service unit, It is characterized by enabling the display of the operating environment data memorized in the above-mentioned battery control device in the external display part on this external service unit.

[0010]Invention of Claim 6 is characterized by enabling the display also of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, by operation of the above-mentioned external service unit in Claim 5 at the above-mentioned external display part.

[0011]In Claim 5 or 6, invention of Claim 7 provides the display switch which makes the above-mentioned cell case perform the display by the above-mentioned cell side display part, and is characterized by enabling a display of the operating environment data memorized by the above-mentioned external display part in the above-mentioned battery control device by operation of this display switch.

[0012]Invention of Claim 8 is characterized by enabling the display also of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, at the above-mentioned external display part by operation of the above-mentioned display switch in Claim 7.

[0013]Invention of Claim 9 is set they to be [any of Claims 5-8], that is notified to the above-mentioned vehicle control device at the time of connection of the above-mentioned external service unit, and it is characterized by this vehicle control device outputting assistant prohibition instructions.

[0014]Although generating of fault will be presumed by the present invention here based on the operating environment data in which a user's use situation is shown, as the example, it is as follows.

- (1) Presume and display charge environment based on charge end conditions.
- (2) Presume and display operating depth of discharge and the number of times from charging frequency and charge starting capacity.
- (3) Presume and display a hour of use based on the charge total time.
- (4) Presume and display the occurrence frequency of a memory effect from the number of times of refreshment information.
- (5) Take out at the time of a run, and presume and display running environment from the number

of times of the end.

(6) Presume and display the present remaining capacity from the learning capacity of a cell.

(7) Take out from learning frequency, and presume and display an end run and the number of times of refreshment release.

(8) Presume and display a study interval by the charging frequency from learning capacity.

(9) Presume and display cell cryogenic-service environment from cell ambient air temperature.

(10) Presume generating of a memory effect by capacity jump generating frequency, and reset the number of times of the optimal of refresh discharge.

[0015]About operation of the display switch in invention of Claim 4, multidata input of the operating pattern is carried out, and it may be made to perform a relative-capacitor display, an absolute capacity display, a charging frequency display, an abnormality (or normal) display, etc. to the above-mentioned cell side display part according to the operating pattern of this display switch. In under charge and RIFURISSHU discharge, it may always be made to display cell capacity.

[0016]

[Function and Effect of the Invention]According to invention of Claim 1, since it was made to display on the cell side display part which diagnosed abnormalities and was provided by the above-mentioned cell case in the diagnostic result with the above-mentioned battery control device, while being able to perform the check of a battery state simply also in a user and a store, an unusual check can be performed and serviceability can be improved.

[0017]Since it was made to carry out memory accumulation of the operating environment data for a user's operating condition to be shown at a battery control device, Like invention of Claim 5, enable attachment and detachment of an external service unit (computer) at the above-mentioned battery control device, and by operation of this external service unit, Can enable the display in the external display part on this external service unit of the operating environment data memorized in the above-mentioned battery control device, and by this servicemen, such as a store, Although it is not unusual, a cause can be analyzed to the problem which originates in user's use environment and occurs, and a user can be advised.

[0018]Since battery states, such as remaining capacity (relative capacitor, absolutely capacity) of the above-mentioned cell and charging frequency, can also be displayed on the above-mentioned cell side display part according to invention of Claim 2, not only a battery abnormality but a battery state can be checked easily, and serviceability can be improved.

[0019]Since according to invention of Claim 3 that is notified to the above-mentioned vehicle control device, this vehicle control device performs the vehicles side abnormality-diagnosis mode automatically and this diagnostic result was displayed on the above-mentioned vehicles side display part when diagnosis of the battery state was started, While being able to check the state of a cell and vehicles by easy operation, the consistency and accuracy of a diagnosis detail can be raised, and serviceability can be improved further.

[0020]According to invention of Claim 4, since the display switch which makes the above-mentioned cell case perform the display by the above-mentioned cell side display part was

provided, the display operation of the above-mentioned diagnostic result is easy, and can improve serviceability also from this point.

[0021]According to invention of Claim 6, by operation of the above-mentioned external service unit, battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, can also be displayed on the above-mentioned external display part, and serviceability can be improved further.

[0022]According to invention of Claim 7, by operation of the display switch of a cell case, Operating environment data can be displayed on the external display part of an external service unit, According to invention of Claim 8, battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, can also be displayed further, and display operation, such as the above-mentioned operating environment data and a diagnostic result, is easy, and can improve serviceability further.

[0023]Since assistant prohibition instructions were made to be outputted at the time of connection of the above-mentioned external service unit according to invention of Claim 9, an adverse effect can be prevented from arising in diagnostic accuracy according to assist current.

[0024]

[Mode for carrying out the invention]Hereafter, an embodiment of the invention is described based on an accompanying drawing. Fig.1 - Fig.7 are the figures for describing the comprehensive-diagnosis equipment of the electric bicycle by one embodiment of the present invention, A figure for the block diagram in which Fig.1 shows the entire configuration of comprehensive-diagnosis equipment, the side view of the electric bicycle to which, as for Fig.2, the above-mentioned comprehensive-diagnosis equipment is connected, Fig.3 - Fig.6 to describe the function of the above-mentioned comprehensive-diagnosis equipment, and Fig.7 are the mimetic diagrams showing the cell side display device.

[0025]In Fig.2, 1 is an electric bicycle as an electric motor which presupposed un-mounting the battery charger 112 and considered the attachment-and-detachment type battery box (cell case) 100 as mount. The down tube 4 which extends the vehicle body frame 2 of this electric bicycle 1 to the head tube 3 and this head-tube 3 empty-vehicle object back slanting lower part, From the back end of this down tube 4, abbreviated to the upper part The seat tube 5 stood up and extended, The left extended to back approximately horizontally from the back end of the above-mentioned down tube 4, and the chain stay 6 of the Uichi pair, It has the top tube 11 which connects the left which combines the rear end part of these both chain stays 6, and the upper end part of the above-mentioned seat tube 5, the seat stay 7 of the Uichi pair, and the above-mentioned head tube 3 and the seat tube 5.

[0026]The front fork 8 is supported pivotably by the above-mentioned head tube 3 rotatable at right and left. The front wheel 9 is supported pivotally by the lower end of this front fork 8, and the steering wheel 10 is fixed to the upper end. The upper end of the above-mentioned seat tube 5 is equipped with the saddle 12. Furthermore, the rear wheel 13 is supported pivotally by the

back end of the above-mentioned chain stay 6.

[0027]Here, in the center of the above-mentioned steering wheel 10, instruments panel (not shown) provided with speed meter etc. is provided, and the vehicles side display part 101a (refer to Fig.1) which displays the below-mentioned vehicles side diagnostic result on this panel part is provided.

[0028]The control force by foot (human power) input into the pedal 16b via the crank arm 16a attached to the lower end part of the above-mentioned vehicle body frame at the both-ends projection part of the crankshaft 16, The power unit 15 which outputs the resultant with the auxiliary power proportional to the size of the human power from the electric motor to incorporate is mounted. The output from this power unit 15 is transmitted to the above-mentioned rear wheel 13 via the chain 30.

[0029]The charging port 100a is formed in the above-mentioned battery box 100, and the charge plug 121 of the battery charger 112 can connect here freely. And the comprehensive-diagnosis equipment 102 later mentioned between the charging ports 100a is connected with the above-mentioned charge plug 121. 123 is a power plug connected to 100V power supply.

[0030]The above-mentioned battery box 100 is connected to the vehicle controller (vehicle control device) 101 at the time of mount. This vehicle controller 101 controls the amount of electric supply to an electric motor based on the detection value of the torque sensor for control-force-by-foot detection, and the vehicle speed sensor for vehicle speed detection to the value according to control force by foot and the vehicle speed.

[0031]The above-mentioned vehicle controller 101 has vehicles side abnormality-diagnosis Mohd who performs abnormality diagnoses, such as the above-mentioned torque sensor, a speed sensor, a motor, and communication, and the display of it is attained in this abnormality-diagnosis result at the above-mentioned vehicles side display part 101a. The above-mentioned vehicle controller 101 contains further again the nonvolatile memory (EEPROM) 101b which carries out memory accumulation of the vehicles operating environment data by a user.

[0032]This embodiment bicycle 1 is provided also with the self-propelled lever 14 for inputting a motor drive command from outside, and running only under the power from an electric motor is also possible by operating this self-propelled lever 14, without inputting into the pedal 16b.

[0033]The above-mentioned battery box 100 is arranged to the vehicle body, enabling free attachment and detachment so that it may be along the back face of the above-mentioned seat tube 5, and so that it may be inserted into the seat stays 7 and 7 of the left and the right. The rechargeable battery (nickel-Cd battery) 100a with which this battery box 100 carries out the series connection of the many cell, The battery device consisting of the nonvolatile memory (EEPROM) 100c etc. which carry out memory accumulation of the battery control device 100b which manages the battery state of this cell 100a, the operating environment data mentioned later, etc. is built in in a casing.

[0034]The above-mentioned battery control device 100b has the cell side abnormality-diagnosis mode in which various kinds of abnormalities which the above-mentioned battery device mentions later are diagnosed, and it is constituted so that memory accumulation of the operating

environment data to display the diagnostic result on the cell side display part 119, combine it, and for a user's operating condition to be shown may be carried out at the above-mentioned nonvolatile memory 100c. If diagnosis of the battery state by the above-mentioned cell side abnormality-diagnosis mode is started here, that is notified to the above-mentioned vehicle controller 101, and this vehicle controller 101 will perform the vehicles side abnormality-diagnosis mode automatically, and will display this diagnostic result on the above-mentioned vehicles side display part 101a.

[0035]And the comprehensive-diagnosis equipment (external service unit) 102 can detach in this embodiment equipment and attach freely between the charge plug 121 of the battery charger 112, and the charging port 100a of the battery box 100. The service tool (interface) 102a which this comprehensive-diagnosis equipment 102 is interposed between the above-mentioned charge plug 121 and the charging port 100a, and has control IC and communication IC, It comprises the commercial personal computer 102b connected to this service tool 102a via 102 d of communication lines.

[0036]The above-mentioned comprehensive-diagnosis equipment 102 can display the operating environment data memorized in the nonvolatile memory 100c of the above-mentioned battery control device 100b on the screen (external display part) 102c by keyboard grabbing of the above-mentioned personal computer 102b. The information which shows battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, to the above-mentioned screen 102c by the above-mentioned keyboard grabbing can also be displayed.

[0037]Here by operation of the display switch 138 of the cell side display part 119 of the above-mentioned battery box 100, A display of the operating environment data memorized at the above-mentioned above-mentioned battery control device 100b side is enabled, and it is good also as a display of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, being possible by the further operation of this display switch 138.

[0038]At the time of connection of the above-mentioned comprehensive-diagnosis equipment 102, that is notified to the above-mentioned vehicle controller 101, and this vehicle controller 101 outputs assistant prohibition instructions further again.

[0039]The above-mentioned cell side display part 119 is formed in the outside surface of the above-mentioned battery box 100. The main display 119a which consists of LED140a-140g of seven pieces, and displays battery states, such as an abnormality-diagnosis result, cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, as this cell side display part 119 is shown in Fig.7, It consisted of one LED140h and has the refresh discharge demand and the information display part for [a certain] being and announcing you the refresh discharge middle class. Fig.3 - the LED numbers 1-8 in six mean the above-mentioned LED140a-140h in Fig.7.

[0040]The display switch 138 is arranged by the end of the above-mentioned main display 119a. the display information according to the above-mentioned LED based on the press pattern of this display switch 138 -- usually -- a display (relative-capacitor indicator chart 3) -- it switches absolutely at a capacity display (Fig.4), a charging frequency display (Fig.5), and an abnormality display (Fig.6).

[0041]In the above-mentioned cell side display device 119 provided by the above-mentioned battery box 100 here, The display of the lighting -, the putting out lights O, and the blink O is possible for LED 1-7 (140a-140g) for a display, and its display of the lighting -, the putting out lights O, blink O yellow, or blink O red is possible for the above-mentioned LED8 (140h) for information.

[0042]Memory accumulation of the service information (operating environment data) ** which shows a user's use situation, and ** is carried out at the nonvolatile memory 100c of the above-mentioned battery control device 100b. Detection memory of the following matters is first carried out as the above-mentioned service information **.

(1) Battery kind:, for example, NI-CD, the number of times of going into the number (3) stop mode of NI-MH (2) cell series parallel : if cell voltage turns into below the predetermined low voltage, will become a stop mode which stops assistance, but. Minimum (8) learning frequency of the output-time (6) learning-capacity (7) learning capacity to the vehicle controller of the number-of-times [of integration count (4) refreshment information]:(5) discharge-stop signal of this: The number of times (9) of 0% of discharge study + refreshment study It learns [0%-] or learns [refreshment-]. the time of **'s and others charge counted-number-of-times (10) discharge -- battery temperature: -- number-of-times of number-of-times of becoming less than - 5 degree C (11) capacity jump: -- the number of times that two or more pieces flew to the blink LED display is counted [0043]Detection memory of the following matters is carried out as the above-mentioned service information **.

(1) The number of times of a charging stop : count the number of times of a charging stop to every cause of a charging stop (a peak, ΔV , dT/dt , ΔT , T_{co} , a timer, V_{co}).

(2) Count the number of times of starting charge for every Type of the remaining capacity (0-29, 30-79, 80 to 95%) classified into charging frequency:, for example, a three-stage. If it continues pushing the switch of the service tool 102a for 20 seconds, it will be made to perform the charging frequency display below for 5 seconds.

(3) The charge total time : carry out a counter +1 every charging time 30.

[0044]The comprehensive-diagnosis equipment 102 of this embodiment is connected between this battery box 100 and the normalized form battery charger 112 at the time of charge of the battery box 100, as shown in Fig.1. The various function of the above-mentioned comprehensive-diagnosis equipment 102 is realized by installing the software 104a for exclusive use in the commercial personal computer 102b. Of course, boost charge machine 112' can also be adopted as the above-mentioned battery charger in addition to the thing of the above-mentioned normalized form, and for example, a NI-MH cell is also further adopted as the cell of the above-mentioned battery box 100 besides a NI-CD cell.

[0045]The comprehensive-diagnosis equipment 102 of this embodiment can realize the following functions.

(1) service tool initial-setting function: -- specification -- soft installation function (2) service-tool start function: -- the soft start function in the password which a specification serviceman has, and copy protection function (3) abnormality-diagnosis function: -- at the time of exchange of the battery control device 100b, That is, it has a function which sets up learning capacity in refresh discharge starting as a function only at the time of communication improper [with the vehicle controller 101], and carries out the manual input of the charging frequency, or carries out the mass entry of the battery data. Reading of ID information and writing (only the data) are performed by password correspondence in this case. When a password is displayed as a function at the time of a changing battery, it has a write initializing function of the data of the new cell to the battery control device 100b.

[0046]The grasp display function of user's use environment : (4) This comprehensive-diagnosis equipment 102, If predetermined key operation is performed in the personal computer 102b, the service information (operating environment data) ** memorized by the nonvolatile memory 100c of the above-mentioned battery control device 100b and ** will be displayed on Screen 102c of the above-mentioned personal computer 102b.

[0047]Based on the above-mentioned service information **, specifically, (1) a battery kind, the number of (2) cell series parallel, and (3) The minimum of the number of times of going into a stop mode, the number of times of (4) refreshment information, the output time to the vehicle controller of (5) discharge stop signals, (6) learning capacity, and (7) learning capacity, (8) learning frequency, and (9) It learns [0-%-] or learns [refreshment-]. Based on the above-mentioned service information **, the number of times of (1) charging stop, (2) charging frequency, and the (3) charge total time are displayed for battery temperature and the number of times of (11) capacity jump on Screen 102c of the above-mentioned personal computer 102b again at the time of the charge counted number of times of ** and others, and (10) discharge.

[0048]By the display of the above-mentioned service information (operating environment data), a serviceman, getting to know the appearance of the cell in the battery box 100 of the bicycle concerned, and being based on this -- for example, -- "--/with a high operating environment temperature -- it is low -- " -- "--/which has charged after using up cell capacity sufficiently -- it has charged briskly -- " -- etc. -- presumption of how the bicycle concerned by a user is used can be performed.

[0049]It can be made to display on the above-mentioned display parts 119a and 119b during a display and (3) refreshment during a display and (2) charge during (1) discharge (under neglect) with the press pattern of the display switch 138 of the cell side display part 119 of the above-mentioned battery box 100. As mentioned above, to the above-mentioned cell side display part 119, seven LED 1-7 and one LED8 arrange, and they are arranged at the single tier at it, The display for turning on the above-mentioned display switch 138, or transmitting this ON state to the color of lighting -, putting-out-lights O, blink O, and LED8 of above-mentioned LED 1-7, the lighting -, and the putting out lights O, and transmitting various kinds of information to a user by

the blink O by continuing for 10, 20, and 30 seconds is performed. It may be made to make it display on the screen 102b during a display and (3) refreshment during a display and (2) charge during (1) discharge (under neglect) like the above by keyboard grabbing of the above-mentioned personal computer 102b. .

[0050]First, by display, the usual display (relative-capacitor display) shown in [Fig.3](#) is performed during discharge of the above (1) (under neglect). If all the LED 1-8 is putting-out-lights O Carrying out in this usual display at the time of switch off as shown in the top line of the figure, and a user or a diagnostic enforcer does short-time ON of the above-mentioned display switch 138, As shown in a lower part from the two-dot chain line of [Fig.3](#), the refreshment information display ** about the display of the relative capacitor (the present remaining capacity) of a cell and refresh discharge is performed.

[0051]It is shown that there is so much remaining capacity specifically that there is much lighting - number of LED 1-7. It is shown that the cell has deteriorated when it is being further lighting - Carried out in red that it is during refresh discharge when it is being lighting - Carried out in yellow that refresh discharge is demanded when LED8 is blink O Carrying out in yellow.

[0052]If a user or an abnormality-diagnosis enforcer continues the above-mentioned switch-on, for example for 10 seconds, as shown in [Fig.4](#), the display of absolute capacity (potential capacity of a cell) and refreshment information display of a cell will be performed. In this case, it is shown that there is so much capacity absolutely that there is much lighting - number of LED 1-7. It is shown that the cell has deteriorated when it is being further lighting - Carried out in red that it is during refresh discharge when it is being lighting - Carried out in yellow that refresh discharge is demanded when LED8 is blink O Carrying out in yellow.

[0053]If a user or an abnormality-diagnosis enforcer continues the above-mentioned switch-on for 10 seconds (20 seconds after an ON start) further, for example, as shown in [Fig.5](#), the display of charging frequency will be performed. It is shown that there is so much charging frequency specifically that there is much lighting - number of LED 2-7 except LED1 and 8.

[0054]If a diagnostic enforcer continues the above-mentioned switch-on for 10 seconds (30 seconds after an ON start) further, for example in a user or the above, as shown in [Fig.6](#), the display with abnormalities or an abnormalities-less display will be performed. In this case, the contents of the abnormalities differ by lighting - LED of what position is carrying out. For example, in lighting of LED2, lighting of LED3 those with charging current at the time of a charge end the hard abnormalities of the battery control device 100b, lighting of LED4 -- the abnormalities of the above-mentioned nonvolatile memory 100c -- lighting of LED5 shows the abnormalities in voltage difference, lighting of LED6 shows the abnormalities in cell voltage, and lighting of LED7 shows the abnormalities in a thermistor, respectively. LED 2-7 -- when all are carrying out late blink O, those without abnormalities are shown.

[0055]Connection of the battery charger 112 will perform a display in the above-mentioned service tool 102a during charge of the above (2) irrespective of turning on and off of the switch of the above-mentioned service tool unit 102. In this case, as shown in the upper part from the two-dot chain line of [Fig.3](#), the lighting - number of above-mentioned LED 1-7 increases with

the increase in a charge. blink O During this charge, in a display, when there is a demand of refresh discharge, LED8 carries out in yellow. LED8 becomes yellow lighting in being under refreshment.

[0056]By display, a start of refresh discharge will always perform the capacity display in which the lighting number of LED 1-7 decreases in connection with the amount of refresh discharge during the above-mentioned (3) refreshment. It may be made to display the amount of refresh discharge by operation of the above-mentioned switch.

[0057]The following is displayed by the battery charger 112 during charge further again. That is, by lighting of the green lamp of the battery charger 112, blink shows under charge and putting out lights shows under a cell no connection or a charge end, and a supplementary current for the preliminary charging at the time of overdischarge, and battery temperature normal range waiting, respectively.

[0058]Blink shows the abnormalities in a refresh circuit for under refreshment by lighting of a yellow lamp, respectively. By lighting which is a red lamp further again, early blink shows the abnormalities in communication with a battery device, and late blink shows the abnormalities in a battery charger for battery abnormalities (abnormal voltage, abnormal temperature, etc.), respectively.

[0059]And the above-mentioned comprehensive-diagnosis equipment 102 will notify the above-mentioned vehicle controller 101 that this diagnosis was started, if the cell side abnormality-diagnosis modes, such as a battery state by the above-mentioned battery control device 100b, are started. Then, this vehicle controller 101 performs the above-mentioned vehicles side abnormality-diagnosis mode.

[0060]Thus, since it was made to display on the cell side display part 119 which diagnosed the abnormalities of the battery device and was provided by the above-mentioned battery box 100 in the diagnostic result with the above-mentioned battery control device 100b, While being able to perform the check of a battery state simply also in a user and a store, an unusual check can be performed and serviceability can be improved.

[0061]Since it was made to carry out memory accumulation of the operating environment data for a user's operating condition to be shown at the nonvolatile memory 100c of the battery control device 100b, By connecting the external comprehensive-diagnosis equipment 102 to this battery control device 100b, the operating environment data memorized [above-mentioned] can be displayed on Screen 102b of the personal computer 102b, and thereby, although it is not unusual, the problem which originates in user's use environment and occurs can also be coped with. When a user carries in specifically the complaint that "flight range is short", it becomes possible to advise that how bicycles, such as a user's operating environment or charge environment, and a memory effect, are used based on the above-mentioned operating environment data is presumed, and it becomes more suitable usage.

[0062]Since battery states, such as remaining capacity (relative capacitor, absolutely capacity) of the above-mentioned cell and charging frequency, can also be displayed on the above-mentioned cell side display part 119, not only a battery abnormality but a battery state can be checked

easily, and serviceability can be improved.

[0063]By the pressing operation of the display switch 138 of the battery box 100, If diagnosis of a battery state is started in the battery control device 100b, that will be notified to the above-mentioned vehicle controller 101 side, Since this vehicle controller 101 performs the vehicles side abnormality-diagnosis mode automatically and displays this diagnostic result on the above-mentioned vehicles side display part 101a, while being able to check the state of a cell and vehicles by easy operation, the consistency and accuracy of a diagnosis detail can be raised, and serviceability can be improved further.

[0064]By operation of the above-mentioned comprehensive-diagnosis equipment 102, also in Screen 102b of the above-mentioned personal computer 102b, battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, can also be displayed, and serviceability can be improved further.

[0065]Since assistant prohibition instructions were made to be outputted at the time of connection of the comprehensive-diagnosis equipment 102, an adverse effect can be prevented from arising in diagnostic accuracy according to assist current.

[0066]Although the comprehensive-diagnosis equipment 102 described the case where it comprised the service tool 102a, the commercial personal computer 102b, etc., in the above-mentioned embodiment, The above-mentioned service tool 102a itself may be considered as the exclusive design which provided a display part, a control part, a switch operation part, etc., and it may constitute so that the information on others, such as a display, a battery state, etc. of the above-mentioned operating environment data, can be displayed with this service tool.

[0067]In the above-mentioned embodiment, although the battery state and the failure-diagnosis result were displayed on the cell side display part 119 of a battery box, when charging with the battery charger provided with the display part, it is also possible to display the above-mentioned battery state and a failure-diagnosis result on the display part of this battery charger.

[0068]Although operating environment data was displayed on the computer screen in the above-mentioned embodiment, further again, A serviceman is able to carry out estimated calculation of how the vehicles by a user are used by the software processing of a computer based on operating environment data, furthermore, to display that result on a computer screen, and to make it advise a user according to this display information.

TECHNICAL FIELD

[Field of the Invention]The present invention relates to the comprehensive-diagnosis technology which enabled it to also cope with the problem which originates in the operating condition of the electric motor especially by a user, and occurs about the comprehensive-diagnosis equipment which performs abnormality diagnosis of an electric motor and this electric motor, etc.

PRIOR ART

[Description of the Prior Art]The service tool for diagnosing the abnormalities of the part according to each of a battery-assisted bicycle and failure from the former is proposed. There is a thing which enabled it to display diagnosis original with vehicles especially with a vehicle control device. On the other hand, about diagnosis of the abnormalities of the cell mounted on an electric motor, etc., there is a thing which enabled it to display the charging time value of a cell by sending fixed discharge current through a discharger. Most part abnormality diagnosis can be performed with these service tools.

EFFECT OF THE INVENTION

[Function and Effect of the Invention]In invention of Claim 1, with the above-mentioned battery control device, abnormalities are diagnosed and the diagnostic result was displayed on the cell side display part provided by the above-mentioned cell case.

Therefore, while being able to perform a check of a battery state simply also in a user and a store, an unusual check can be performed and serviceability can be improved.

[0017]Since it was made to carry out memory accumulation of the operating environment data for a user's operating condition to be shown at a battery control device, Like invention of Claim 5, enable attachment and detachment of an external service unit (computer) at the above-mentioned battery control device, and by operation of this external service unit, Can enable the display in the external display part on this external service unit of the operating environment data memorized in the above-mentioned battery control device, and by this servicemen, such as a store, Although it is not unusual, a cause can be analyzed to the problem which originates in user's use environment and occurs, and a user can be advised.

[0018]In invention of Claim 2, battery states, such as remaining capacity (relative capacitor, absolutely capacity) of the above-mentioned cell and charging frequency, can also be displayed on the above-mentioned cell side display part.

Therefore, not only a battery abnormality but a battery state can be checked easily, and serviceability can be improved.

[0019]In invention of Claim 3, when diagnosis of a battery state was started, that was notified to the above-mentioned vehicle control device, and this vehicle control device performs the vehicles side abnormality-diagnosis mode automatically, and displayed this diagnostic result on the above-mentioned vehicles side display part.

Therefore, while being able to check a state of a cell and vehicles by easy operation, consistency and accuracy of a diagnosis detail can be raised, and serviceability can be improved further.

[0020]In invention of Claim 4, a display switch which makes the above-mentioned cell case

perform a display by the above-mentioned cell side display part was provided. Therefore, display operation of the above-mentioned diagnostic result is easy, and can improve serviceability also from this point.

[0021]According to invention of Claim 6, by operation of the above-mentioned external service unit, battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, can also be displayed on the above-mentioned external display part, and serviceability can be improved further.

[0022]According to invention of Claim 7, by operation of the display switch of a cell case, Operating environment data can be displayed on the external display part of an external service unit, According to invention of Claim 8, battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, can also be displayed further, and display operation, such as the above-mentioned operating environment data and a diagnostic result, is easy, and can improve serviceability further.

[0023]In invention of Claim 9, assistant prohibition instructions were made to be outputted at the time of connection of the above-mentioned external service unit.

Therefore, an adverse effect can be prevented from arising in diagnostic accuracy according to assist current.

[0024]

[Mode for carrying out the invention]Hereafter, an embodiment of the invention is described based on an accompanying drawing. Fig.1 - Fig.7 are the figures for describing the comprehensive-diagnosis equipment of the electric bicycle by one embodiment of the present invention,A figure for the block diagram in which Fig.1 shows the entire configuration of comprehensive-diagnosis equipment, the side view of the electric bicycle to which, as for Fig.2, the above-mentioned comprehensive-diagnosis equipment is connected, Fig.3 - Fig.6 to describe the function of the above-mentioned comprehensive-diagnosis equipment, and Fig.7 are the mimetic diagrams showing the cell side display device.

[0025]In Fig.2, 1 is an electric bicycle as an electric motor which presupposed un-mounting the battery charger 112 and considered the attachment-and-detachment type battery box (cell case) 100 as mount. The down tube 4 which extends the vehicle body frame 2 of this electric bicycle 1 to the head tube 3 and this head-tube 3 empty-vehicle object back slanting lower part, From the back end of this down tube 4, abbreviated to the upper part The seat tube 5 stood up and extended, The left extended to back approximately horizontally from the back end of the above-mentioned down tube 4, and the chain stay 6 of the Uichi pair, It has the top tube 11 which connects the left which combines the rear end part of these both chain stays 6, and the upper end part of the above-mentioned seat tube 5, the seat stay 7 of the Uichi pair, and the above-mentioned head tube 3 and the seat tube 5.

[0026]The front fork 8 is supported pivotably by the above-mentioned head tube 3 rotatable at right and left. The front wheel 9 is supported pivotally by the lower end of this front fork 8, and the steering wheel 10 is fixed to the upper end. The upper end of the above-mentioned seat tube 5 is equipped with the saddle 12. Furthermore, the rear wheel 13 is supported pivotally by the back end of the above-mentioned chain stay 6.

[0027]Here, in the center of the above-mentioned steering wheel 10, instruments panel (not shown) provided with speed meter etc. is provided, and the vehicles side display part 101a (refer to Fig.1) which displays the below-mentioned vehicles side diagnostic result on this panel part is provided.

[0028]The control force by foot (human power) input into the pedal 16b via the crank arm 16a attached to the lower end part of the above-mentioned vehicle body frame at the both-ends projection part of the crankshaft 16, The power unit 15 which outputs the resultant with the auxiliary power proportional to the size of the human power from the electric motor to incorporate is mounted. The output from this power unit 15 is transmitted to the above-mentioned rear wheel 13 via the chain 30.

[0029]The charging port 100a is formed in the above-mentioned battery box 100, and the charge plug 121 of the battery charger 112 can connect here freely. And the comprehensive-diagnosis equipment 102 later mentioned between the charging ports 100a is connected with the above-mentioned charge plug 121. 123 is a power plug connected to 100V power supply.

[0030]The above-mentioned battery box 100 is connected to the vehicle controller (vehicle control device) 101 at the time of mount. This vehicle controller 101 controls the amount of electric supply to an electric motor based on the detection value of the torque sensor for control-force-by-foot detection, and the vehicle speed sensor for vehicle speed detection to the value according to control force by foot and the vehicle speed.

[0031]The above-mentioned vehicle controller 101 has the vehicles side abnormality-diagnosis mode in which abnormality diagnoses, such as the above-mentioned torque sensor, a speed sensor, a motor, and communication, are performed, and the display of it is attained in this abnormality-diagnosis result at the above-mentioned vehicles side display part 101a. The above-mentioned vehicle controller 101 contains further again the nonvolatile memory (EEPROM) 101b which carries out memory accumulation of the vehicles operating environment data by a user.

[0032]This embodiment bicycle 1 is provided also with the self-propelled lever 14 for inputting a motor drive command from outside, and running only under the power from an electric motor is also possible by operating this self-propelled lever 14, without inputting into the pedal 16b.

[0033]The above-mentioned battery box 100 is arranged to the vehicle body, enabling free attachment and detachment so that it may be along the back face of the above-mentioned seat tube 5, and so that it may be inserted into the seat stays 7 and 7 of the left and the right. The rechargeable battery (nickel-Cd battery) 100a with which this battery box 100 carries out the series connection of the many cell, The battery device consisting of the nonvolatile memory (EEPROM) 100c etc. which carry out memory accumulation of the battery control device 100b

which manages the battery state of this cell 100a, the operating environment data mentioned later, etc. is built in in a casing.

[0034]The above-mentioned battery control device 100b has the cell side abnormality-diagnosis mode in which various kinds of abnormalities which the above-mentioned battery device mentions later are diagnosed, and it is constituted so that memory accumulation of the operating environment data to display the diagnostic result on the cell side display part 119, combine it, and for a user's operating condition to be shown may be carried out at the above-mentioned nonvolatile memory 100c. If diagnosis of the battery state by the above-mentioned cell side abnormality-diagnosis mode is started here, that is notified to the above-mentioned vehicle controller 101, and this vehicle controller 101 will perform the vehicles side abnormality-diagnosis mode automatically, and will display this diagnostic result on the above-mentioned vehicles side display part 101a.

[0035]And the comprehensive-diagnosis equipment (external service unit) 102 can detach in this embodiment equipment and attach freely between the charge plug 121 of the battery charger 112, and the charging port 100a of the battery box 100. The service tool (interface) 102a which this comprehensive-diagnosis equipment 102 is interposed between the above-mentioned charge plug 121 and the charging port 100a, and has control IC and communication IC, It comprises the commercial personal computer 102b connected to this service tool 102a via 102 d of communication lines.

[0036]The above-mentioned comprehensive-diagnosis equipment 102 can display the operating environment data memorized in the nonvolatile memory 100c of the above-mentioned battery control device 100b on the screen (external display part) 102c by keyboard grabbing of the above-mentioned personal computer 102b. The information which shows battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, to the above-mentioned screen 102c by the above-mentioned keyboard grabbing can also be displayed.

[0037]Here by operation of the display switch 138 of the cell side display part 119 of the above-mentioned battery box 100, A display of the operating environment data memorized at the above-mentioned above-mentioned battery control device 100b side is enabled, and it is good also as a display of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, being possible by the further operation of this display switch 138.

[0038]At the time of connection of the above-mentioned comprehensive-diagnosis equipment 102, that is notified to the above-mentioned vehicle controller 101, and this vehicle controller 101 outputs assistant prohibition instructions further again.

[0039]The above-mentioned cell side display part 119 is formed in the outside surface of the above-mentioned battery box 100. The main display 119a which consists of LED140a-140g of seven pieces, and displays battery states, such as an abnormality-diagnosis result, cell remaining

capacity (relative capacitor, absolutely capacity), and charging frequency, as this cell side display part 119 is shown in Fig.7. It consisted of one LED140h and has the refresh discharge demand and the information display part for [a certain] being and announcing you the refresh discharge middle class. Fig.3 - the LED numbers 1-8 in six mean the above-mentioned LED140a-140h in Fig.7.

[0040]The display switch 138 is arranged by the end of the above-mentioned main display 119a. the display information according to the above-mentioned LED based on the press pattern of this display switch 138 -- usually -- a display (relative-capacitor indicator chart 3) -- it switches absolutely at a capacity display (Fig.4), a charging frequency display (Fig.5), and an abnormality display (Fig.6).

[0041]In the above-mentioned cell side display device 119 provided by the above-mentioned battery box 100 here, The display of the lighting -, the putting out lights O, and the blink O is possible for LED 1-7 (140a-140g) for a display, and its display of the lighting -, the putting out lights O, blink O yellow, or blink O red is possible for the above-mentioned LED8 (140h) for information.

[0042]Memory accumulation of the service information (operating environment data) ** which shows a user's use situation, and ** is carried out at the nonvolatile memory 100c of the above-mentioned battery control device 100b. Detection memory of the following matters is first carried out as the above-mentioned service information **.

(1) Battery kind:, for example, NI-CD, the number of times of going into the number (3) stop mode of NI-MH (2) cell series parallel : if cell voltage turns into below the predetermined low voltage, will become a stop mode which stops assistance, but. Minimum (8) learning frequency of the output-time (6) learning-capacity (7) learning capacity to the vehicle controller of the number-of-times [of integration count (4) refreshment information]:(5) discharge-stop signal of this: The number of times (9) of 0% of discharge study + refreshment study It learns [0%-] or learns [refreshment-]. the time of **'s and others charge counted-number-of-times (10) discharge -- battery temperature: -- number-of-times of number-of-times of becoming less than - 5 degree C (11) capacity jump: -- the number of times that two or more pieces flew to the blink LED display is counted [0043]Detection memory of the following matters is carried out as the above-mentioned service information **.

(1) The number of times of a charging stop : count the number of times of a charging stop to every cause of a charging stop (a peak, ΔV , dT/dt , ΔT , T_{co} , a timer, V_{co}).

(2) Count the number of times of starting charge for every Type of the remaining capacity (0-29, 30-79, 80 to 95%) classified into charging frequency:, for example, a three-stage. If it continues pushing the switch of the service tool 102a for 20 seconds, it will be made to perform the charging frequency display below for 5 seconds.

(3) The charge total time : carry out a counter +1 every charging time 30.

[0044]The comprehensive-diagnosis equipment 102 of this embodiment is connected between this battery box 100 and the normalized form battery charger 112 at the time of charge of the battery box 100, as shown in Fig.1. The various function of the above-mentioned

comprehensive-diagnosis equipment 102 is realized by installing the software 104a for exclusive use in the commercial personal computer 102b. Of course, boost charge machine 112' can also be adopted as the above-mentioned battery charger in addition to the thing of the above-mentioned normalized form, and for example, a NI-MH cell is also further adopted as the cell of the above-mentioned battery box 100 besides a NI-CD cell.

[0045]The comprehensive-diagnosis equipment 102 of this embodiment can realize the following functions.

(1) service tool initial-setting function: -- specification -- soft installation function (2) service-tool start function: -- the soft start function in the password which a specification serviceman has, and copy protection function (3) abnormality-diagnosis function: -- at the time of exchange of the battery control device 100b, That is, it has a function which sets up learning capacity in refresh discharge starting as a function only at the time of communication improper [with the vehicle controller 101], and carries out the manual input of the charging frequency, or carries out the mass entry of the battery data. Reading of ID information and writing (only the data) are performed by password correspondence in this case. When a password is displayed as a function at the time of a changing battery, it has a write initializing function of the data of the new cell to the battery control device 100b.

[0046]The grasp display function of user's use environment : (4) This comprehensive-diagnosis equipment 102, If predetermined key operation is performed in the personal computer 102b, the service information (operating environment data) ** memorized by the nonvolatile memory 100c of the above-mentioned battery control device 100b and ** will be displayed on Screen 102c of the above-mentioned personal computer 102b.

[0047]Based on the above-mentioned service information **, specifically, (1) a battery kind, the number of (2) cell series parallel, and (3) The minimum of the number of times of going into a stop mode, the number of times of (4) refreshment information, the output time to the vehicle controller of (5) discharge stop signals, (6) learning capacity, and (7) learning capacity, (8) learning frequency, and (9) It learns [0-%-] or learns [refreshment-]. Based on the above-mentioned service information **, the number of times of (1) charging stop, (2) charging frequency, and the (3) charge total time are displayed for battery temperature and the number of times of (11) capacity jump on Screen 102c of the above-mentioned personal computer 102b again at the time of the charge counted number of times of ** and others, and (10) discharge.

[0048]By the display of the above-mentioned service information (operating environment data), a serviceman, getting to know the appearance of the cell in the battery box 100 of the bicycle concerned, and being based on this -- for example, -- "--/with a high operating environment temperature -- it is low -- " -- "--/which has charged after using up cell capacity sufficiently -- it has charged briskly -- " -- etc. -- presumption of how the bicycle concerned by a user is used can be performed.

[0049]It can be made to display on the above-mentioned display parts 119a and 119b during a display and (3) refreshment during a display and (2) charge during (1) discharge (under neglect) with the press pattern of the display switch 138 of the cell side display part 119 of the above-

mentioned battery box 100. As mentioned above, to the above-mentioned cell side display part 119, seven LED 1-7 and one LED8 arrange, and they are arranged at a single tier at it.

A display for turning on the above-mentioned display switch 138, or transmitting this ON state to a color of lighting -, putting-out-lights O, blink O, and LED8 of above-mentioned LED 1-7, the lighting -, and the putting out lights O, and transmitting various kinds of information to a user by the blink O by continuing for 10, 20, and 30 seconds is performed.

It may be made to make it display on the screen 102b during a display and (3) refreshment during a display and (2) charge during (1) discharge (under neglect) like the above by keyboard grabbing of the above-mentioned personal computer 102b. .

[0050]First, by display, the usual display (relative-capacitor display) shown in Fig.3 is performed during discharge of the above (1) (under neglect). If all the LED 1-8 is putting-out-lights O Carrying out in this usual display at the time of switch off as shown in the top line of the figure, and a user or a diagnostic enforcer does short-time ON of the above-mentioned display switch 138, As shown in a lower part from the two-dot chain line of Fig.3, the refreshment information display ** about the display of the relative capacitor (the present remaining capacity) of a cell and refresh discharge is performed.

[0051]It is shown that there is so much remaining capacity specifically that there is much lighting - number of LED 1-7. It is shown that the cell has deteriorated when it is being further lighting - Carried out in red that it is during refresh discharge when it is being lighting - Carried out in yellow that refresh discharge is demanded when LED8 is blink O Carrying out in yellow.

[0052]If a user or an abnormality-diagnosis enforcer continues the above-mentioned switch-on, for example for 10 seconds, as shown in Fig.4, the display of absolute capacity (potential capacity of a cell) and refreshment information display of a cell will be performed. In this case, it is shown that there is so much capacity absolutely that there is much lighting - number of LED 1-7. It is shown that the cell has deteriorated when it is being further lighting - Carried out in red that it is during refresh discharge when it is being lighting - Carried out in yellow that refresh discharge is demanded when LED8 is blink O Carrying out in yellow.

[0053]If a user or an abnormality-diagnosis enforcer continues the above-mentioned switch-on for 10 seconds (20 seconds after an ON start) further, for example, as shown in Fig.5, the display of charging frequency will be performed. It is shown that there is so much charging frequency specifically that there is much lighting - number of LED 2-7 except LED1 and 8.

[0054]If a diagnostic enforcer continues the above-mentioned switch-on for 10 seconds (30 seconds after an ON start) further, for example in a user or the above, as shown in Fig.6, the display with abnormalities or an abnormalities-less display will be performed. In this case, the contents of the abnormalities differ by lighting - LED of what position is carrying out. For example, in lighting of LED2, lighting of LED3 those with charging current at the time of a charge end the hard abnormalities of the battery control device 100b, lighting of LED4 -- the abnormalities of the above-mentioned nonvolatile memory 100c -- lighting of LED5 shows the abnormalities in voltage difference, lighting of LED6 shows the abnormalities in cell voltage, and lighting of LED7 shows the abnormalities in a thermistor, respectively. LED 2-7 -- when all

are carrying out late blink O, those without abnormalities are shown.

[0055]Connection of the battery charger 112 will perform a display in the above-mentioned service tool 102a during charge of the above (2) irrespective of turning on and off of the switch of the above-mentioned service tool unit 102. In this case, as shown in the upper part from the two-dot chain line of Fig. 3, the lighting - number of above-mentioned LED 1-7 increases with the increase in a charge. blink O During this charge, in a display, when there is a demand of refresh discharge, LED8 carries out in yellow. LED8 becomes yellow lighting in being under refreshment.

[0056]By display, a start of refresh discharge will always perform the capacity display in which the lighting number of LED 1-7 decreases in connection with the amount of refresh discharge during the above-mentioned (3) refreshment. It may be made to display the amount of refresh discharge by operation of the above-mentioned switch.

[0057]The following is displayed by the battery charger 112 during charge further again. That is, by lighting of the green lamp of the battery charger 112, blink shows under charge and putting out lights shows under a cell no connection or a charge end, and a supplementary current for the preliminary charging at the time of overdischarge, and battery temperature normal range waiting, respectively.

[0058]Blink shows the abnormalities in a refresh circuit for under refreshment by lighting of a yellow lamp, respectively. By lighting which is a red lamp further again, early blink shows the abnormalities in communication with a battery device, and late blink shows the abnormalities in a battery charger for battery abnormalities (abnormal voltage, abnormal temperature, etc.), respectively.

[0059]And the above-mentioned comprehensive-diagnosis equipment 102 will notify the above-mentioned vehicle controller 101 that this diagnosis was started, if cell side abnormality-diagnosis Mohd, such as a battery state by the above-mentioned battery control device 100b, is started. Then, this vehicle controller 101 performs above-mentioned vehicles side abnormality-diagnosis Mohd.

[0060]Thus, since it was made to display on the cell side display part 119 which diagnosed the abnormalities of the battery device and was provided by the above-mentioned battery box 100 in the diagnostic result with the above-mentioned battery control device 100b, While being able to perform the check of a battery state simply also in a user and a store, an unusual check can be performed and serviceability can be improved.

[0061]Since it was made to carry out memory accumulation of the operating environment data for a user's operating condition to be shown at the nonvolatile memory 100c of the battery control device 100b, By connecting the external comprehensive-diagnosis equipment 102 to this battery control device 100b, the operating environment data memorized [above-mentioned] can be displayed on Screen 102b of the personal computer 102b, and thereby, although it is not unusual, the problem which originates in user's use environment and occurs can also be coped with. When a user carries in specifically the complaint that "flight range is short", it becomes possible to advise that how bicycles, such as a user's operating environment or charge

environment, and a memory effect, are used based on the above-mentioned operating environment data is presumed, and it becomes more suitable usage.

[0062]Since battery states, such as remaining capacity (relative capacitor, absolutely capacity) of the above-mentioned cell and charging frequency, can also be displayed on the above-mentioned cell side display part 119, not only a battery abnormality but a battery state can be checked easily, and serviceability can be improved.

[0063]By the pressing operation of the display switch 138 of the battery box 100, If diagnosis of a battery state is started in the battery control device 100b, that will be notified to the above-mentioned vehicle controller 101 side, Since this vehicle controller 101 performs the vehicles side abnormality-diagnosis mode automatically and displays this diagnostic result on the above-mentioned vehicles side display part 101a, while being able to check the state of a cell and vehicles by easy operation, the consistency and accuracy of a diagnosis detail can be raised, and serviceability can be improved further.

[0064]By operation of the above-mentioned comprehensive-diagnosis equipment 102, also in Screen 102b of the above-mentioned personal computer 102b, battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, can also be displayed, and serviceability can be improved further.

[0065]Since assistant prohibition instructions were made to be outputted at the time of connection of the comprehensive-diagnosis equipment 102, an adverse effect can be prevented from arising in diagnostic accuracy according to assist current.

[0066]Although the comprehensive-diagnosis equipment 102 described the case where it comprised the service tool 102a, the commercial personal computer 102b, etc., in the above-mentioned embodiment, The above-mentioned service tool 102a itself may be considered as the exclusive design which provided a display part, a control part, a switch operation part, etc., and it may constitute so that the information on others, such as a display, a battery state, etc. of the above-mentioned operating environment data, can be displayed with this service tool.

[0067]In the above-mentioned embodiment, although the battery state and the failure-diagnosis result were displayed on the cell side display part 119 of a battery box, when charging with the battery charger provided with the display part, it is also possible to display the above-mentioned battery state and a failure-diagnosis result on the display part of this battery charger.

[0068]Although operating environment data was displayed on the computer screen in the above-mentioned embodiment, further again, A serviceman is able to carry out estimated calculation of how the vehicles by a user are used by the software processing of a computer based on operating environment data, furthermore, to display that result on a computer screen, and to make it advise a user according to this display information.

TECHNICAL PROBLEM

[Problem to be solved by the invention]These phenomena can be diagnosed when the phenomenon which can be reliably said to be abnormalities or failure occurs in the case of the above-mentioned conventional service tool. however, a user's operating environment, i.e., the problem which a user senses are dissatisfied owing to usage, for example, the problem "flight range is short." Many points, such as a memory effect of a cell, frequency of refresh discharge, how to run, or insufficient charging resulting from charge environment, are the cause, in diagnosis of simple abnormalities and failure, a cause cannot be analyzed and a user cannot be advised.

[0004]The present invention was made in view of the above-mentioned conventional problem, and an unusual part can be easily grasped in a user and a store by displaying a simple diagnostic result on the display part by the side of vehicles (for example, a cell case), The problem based on a user's operating environment by carrying out memory accumulation of the operating environment data in which a user's operating condition etc. are furthermore shown, For example, it is making into problem to provide the comprehensive-diagnosis equipment of an electric motor and this electric motor which enabled it to also cope with a problem unsolvable in the simple failure diagnosis "flight range is short."

MEANS

[Means for solving problem]In the electric motor which invention of Claim 1 mounted the cell case having the battery device consisting of the battery control device etc. which manage the battery state of a rechargeable battery and this cell on the vehicle body, and equipped this vehicle body side with the vehicle control device which controls the run state of vehicles, The above-mentioned battery control device is characterized by carrying out memory accumulation of the operating environment data to have the cell side abnormality-diagnosis mode in which the abnormalities of the above-mentioned battery device are diagnosed, display and combine the diagnostic result with the cell side display part provided by the above-mentioned cell case, and for a user's operating condition to be shown.

[0006]Invention of Claim 2 is characterized by the ability to also display battery states, such as remaining capacity (relative capacitor, absolutely capacity) of the above-mentioned cell, and charging frequency, on the above-mentioned cell side display part in Claim 1.

[0007]In Claim 1 or 2, invention of Claim 3 the above-mentioned vehicle control device, If it has the vehicles side abnormality-diagnosis mode in which the abnormalities of vehicle running equipment are diagnosed and diagnosis of the battery state by the above-mentioned cell side abnormality-diagnosis mode is started, That is notified to the above-mentioned vehicle control device, this vehicle control device performs the vehicles side abnormality-diagnosis mode automatically, and it is characterized by displaying this diagnostic result on the above-mentioned vehicles side display part.

[0008]Invention of Claim 4 is characterized by setting they to be [any of Claims 1-3], and having a display switch which makes the above-mentioned cell case perform the display by the above-mentioned cell side display part.

[0009]Invention of Claim 5 mounts the cell case having a rechargeable battery and the battery device consisting of the battery control device etc. which manage the battery state of this cell on a vehicle body, To this vehicle body side, the vehicle control device which controls the run state of vehicles in the diagnostic equipment of the electric motor which it had the above-mentioned battery control device, Have the cell side abnormality-diagnosis mode in which the abnormalities of the above-mentioned battery device are diagnosed, and the diagnostic result is displayed on the cell side display part provided by the above-mentioned cell case, Are constituted so that memory accumulation of the operating environment data for a user's operating condition to be shown collectively may be carried out at a battery control device, enable attachment and detachment of an external service unit at the above-mentioned battery control device, and by operation of this external service unit, It is characterized by enabling the display of the operating environment data memorized in the above-mentioned battery control device in the external display part on this external service unit.

[0010]Invention of Claim 6 is characterized by enabling the display also of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, by operation of the above-mentioned external service unit in Claim 5 at the above-mentioned external display part.

[0011]In Claim 5 or 6, invention of Claim 7 provides the display switch which makes the above-mentioned cell case perform the display by the above-mentioned cell side display part, and is characterized by enabling a display of the operating environment data memorized by the above-mentioned external display part in the above-mentioned battery control device by operation of this display switch.

[0012]Invention of Claim 8 is characterized by enabling the display also of battery states, such as a diagnostic result of the above-mentioned cell, a diagnostic result by the side of the above-mentioned vehicles and cell remaining capacity (relative capacitor, absolutely capacity), and charging frequency, at the above-mentioned external display part by operation of the above-mentioned display switch in Claim 7.

[0013]Invention of Claim 9 is set they to be [any of Claims 5-8], that is notified to the above-mentioned vehicle control device at the time of connection of the above-mentioned external service unit, and it is characterized by this vehicle control device outputting assistant prohibition instructions.

[0014]Although generating of fault will be presumed by the present invention here based on the operating environment data in which a user's use situation is shown, as the example, it is as follows.

- (1) Presume and display charge environment based on charge end conditions.
- (2) Presume and display operating depth of discharge and the number of times from charging

frequency and charge starting capacity.

(3) Presume and display a hour of use based on the charge total time.

(4) Presume and display the occurrence frequency of a memory effect from the number of times of refreshment information.

(5) Take out at the time of a run, and presume and display running environment from the number of times of the end.

(6) Presume and display the present remaining capacity from the learning capacity of a cell.

(7) Take out from learning frequency, and presume and display an end run and the number of times of refreshment release.

(8) Presume and display a study interval by the charging frequency from learning capacity.

(9) Presume and display cell cryogenic-service environment from cell ambient air temperature.

(10) Presume generating of a memory effect by capacity jump generating frequency, and reset the number of times of the optimal of refresh discharge.

[0015]About operation of the display switch in invention of Claim 4, multidata input of the operating pattern is carried out, and it may be made to perform a relative-capacitor display, an absolute capacity display, a charging frequency display, an abnormality (or normal) display, etc. to the above-mentioned cell side display part according to the operating pattern of this display switch. In under charge and RIFURISSHU discharge, it may always be made to display cell capacity.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a block configuration diagram of the comprehensive-diagnosis equipment by one embodiment of the present invention.

[Drawing 2]It is a left side view of the electric bicycle to which the above-mentioned comprehensive-diagnosis equipment is connected.

[Drawing 3]It is a figure showing the display information of the cell side display part.

[Drawing 4]It is a figure showing the display information of the above-mentioned cell side display part.

[Drawing 5]It is a figure showing the display information of the above-mentioned cell side display part.

[Drawing 6]It is a figure showing the display information of the above-mentioned cell side display part.

[Drawing 7]It is a mimetic diagram of the above-mentioned cell side display part.

[Explanations of letters or numerals]

1 Electric bicycle (electric motor)

100 Battery box (cell case)

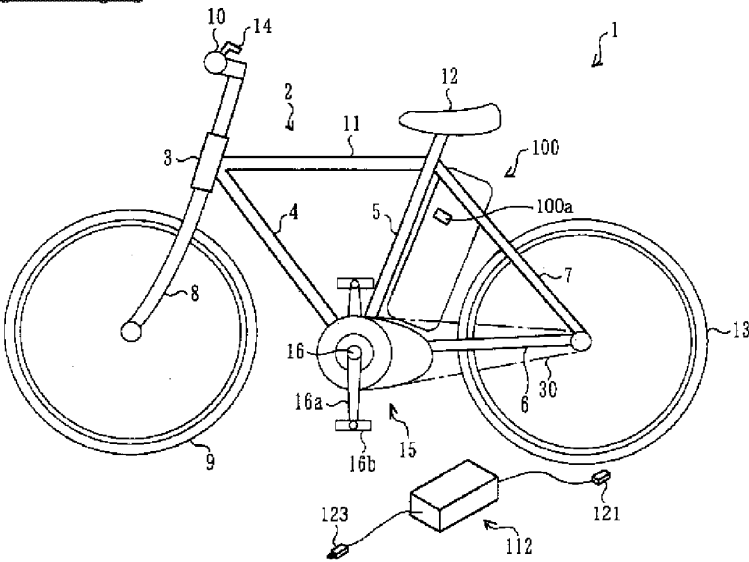
100a Rechargeable battery

100b Battery control device

- 101 Vehicle controller (vehicle control device)
- 101a Vehicles side display part
- 102 Comprehensive-diagnosis equipment (external service unit)
- 102c Screen (external display part)
- 119 Cell side display part
- 138 Display switch

DRAWINGS

[Drawing 2]

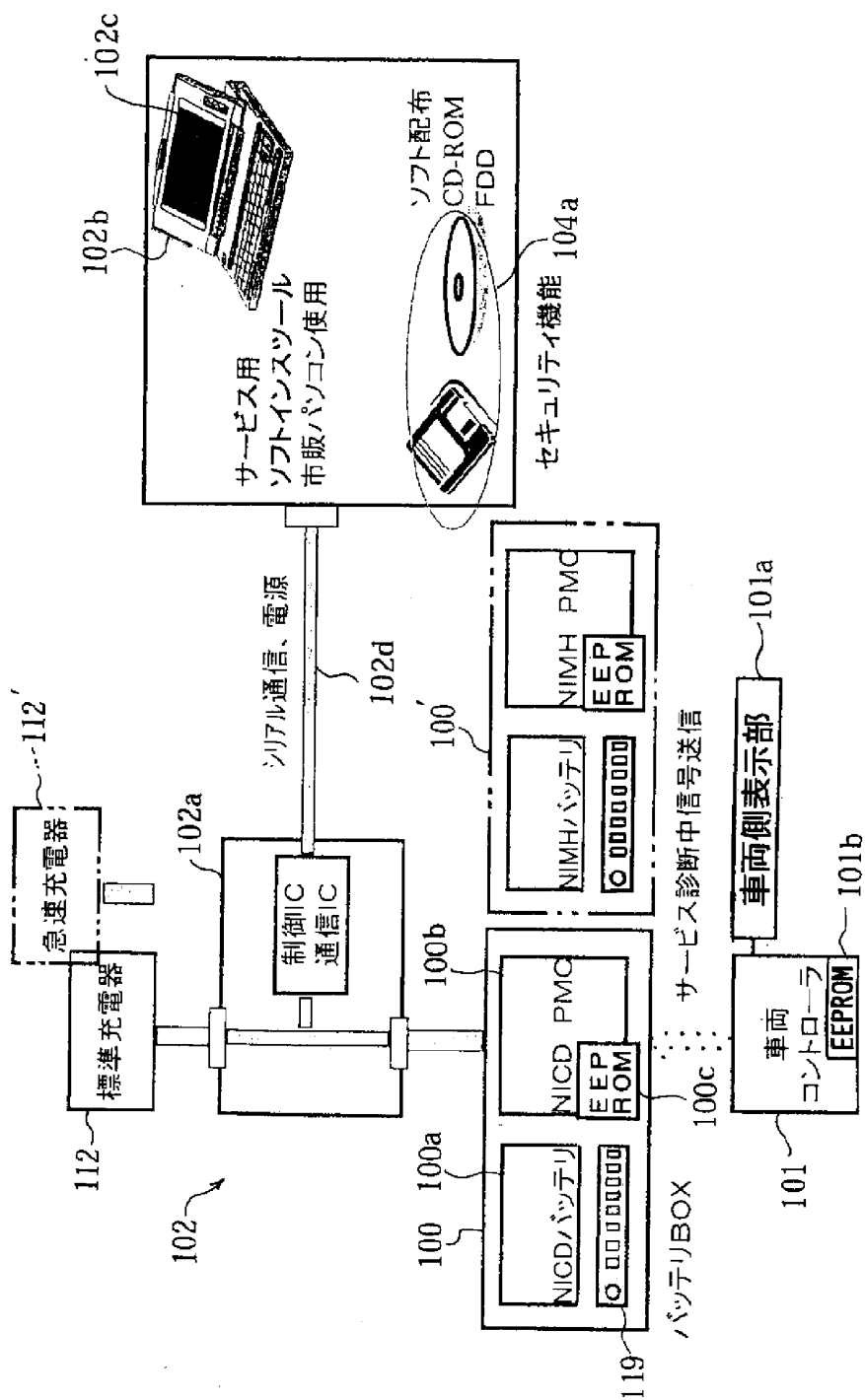


[Drawing 4]

絶対容量表示(10秒後)

	SW	絶対容量	LED番号								お知らせLED色
			1	2	3	4	5	6	7	8	
充放電／放置	オン	90～100%	●	●	●	●	●	●	●	○	—
充放電／放置	オン	80～89%	●	●	●	●	●	●	●	○	—
充放電／放置	オン	70～79%	●	●	●	●	●	●	●	○	—
充放電／放置	オン	60～69%	●	●	●	●	●	●	●	○	—
充放電／放置	オン	45～59%	●	●	●	○	○	○	○	○	—
充放電／放置	オン	30～44%	●	●	○	○	○	○	○	○	—
充放電／放置	オン	0～29%	●	○	○	○	○	○	○	○	—
充放電／放置	オン	1～14%	◎	○	○	○	○	○	○	○	—
充放電／放置	オン	0%	◎	○	○	○	○	○	○	○	—
充放電／放置	オン	リフレッシュ要求	○	○	○	○	○	○	○	◎	黄点滅
充放電／放置	オン	リフレッシュ中	○	○	○	○	○	○	○	●	黄点灯
充放電／放置	オン	—	○	○	○	○	○	○	○	●	赤 電池劣化優先

[Drawing 1]



[Drawing 3]

通常表示

SW	相対容量値	LED番号								お知らせLED色
		1	2	3	4	5	6	7	8	
放電／放置オフ	—	○	○	○	○	○	○	○	○	—
充電	0%	◎	○	○	○	○	○	○	○	—
充電	1～14%	◎	○	○	○	○	○	○	○	—
充電	15～25%	●	○	○	○	○	○	○	○	—
充電	26～36%	●	●	○	○	○	○	○	○	—
充電	37～48%	●	●	●	○	○	○	○	○	—
充電	49～61%	●	●	●	●	○	○	○	○	—
充電	62～74%	●	●	●	●	●	○	○	○	—
充電	75～87%	●	●	●	●	●	●	○	○	—
充電	88～100%	●	●	●	●	●	●	●	○	—
充電	リフレッシュ要求	○	○	○	○	○	○	○	◎	黄75%未満
充電	リフレッシュ中	○	○	○	○	○	○	○	●	黄75%未満
放電／放置オン	88～100%	●	●	●	●	●	●	●	○	—
放電／放置オン	75～87%	●	●	●	●	●	●	○	○	—
放電／放置オン	62～74%	●	●	●	●	●	○	○	○	—
放電／放置オン	49～61%	●	●	●	●	○	○	○	○	—
放電／放置オン	37～48%	●	●	●	○	○	○	○	○	—
放電／放置オン	26～36%	●	●	○	○	○	○	○	○	—
放電／放置オン	15～25%	●	○	○	○	○	○	○	○	—
放電／放置オン	1～14%	◎	○	○	○	○	○	○	○	—
放電／放置オン	0%	◎	○	○	○	○	○	○	○	—
放電／放置オン	リフレッシュ要求	○	○	○	○	○	○	○	◎	黄75%未満
放電／放置オン	リフレッシュ中	○	○	○	○	○	○	○	●	黄75%未満
劣化	オン	—	—	—	—	—	—	—	●	赤点灯(絶対容量値4.4%以下)

[Drawing 5]

充電回数表示(20秒後)

充電回数	LED番号							
	1	2	3	4	5	6	7	8
0～49	○	◎	○	○	○	○	○	○
50～99	○	●	○	○	○	○	○	○
100～149	○	●	◎	○	○	○	○	○
150～199	○	●	●	○	○	○	○	○
200～249	○	●	●	◎	○	○	○	○
250～299	○	●	●	●	○	○	○	○
300～349	○	●	●	●	◎	○	○	○
350～399	○	●	●	●	●	○	○	○
400～449	○	●	●	●	●	◎	○	○
450～499	○	●	●	●	●	●	○	○
500～549	○	●	●	●	●	●	◎	○
550～599	○	●	●	●	●	●	●	○

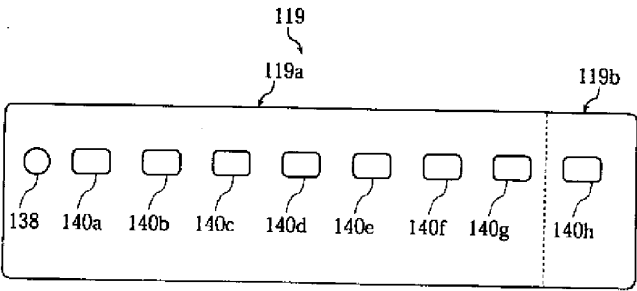
[Drawing 6]

異常表示(30秒後)

異常内容	LED 番号								禁止項目
	1	2	3	4	5	6	7	8	
充電終了時、充電電流あり	○	●	○	○	○	○	○	○	
PMCハード異常	○	○	●	○	○	○	○	○	
EEPROM異常	○	○	○	●	○	○	○	○	充電禁止
電圧差異常	○	○	○	○	●	○	○	○	
電池電圧異常	○	○	○	○	○	●	○	○	アシスト禁止
サーミスター異常	○	○	○	○	○	○	●	○	
異常なし	○	◎	◎	◎	◎	◎	◎	◎	

◎:遅い点滅 ●:点灯 ○:消灯

[Drawing 7]



PATENT ABSTRACTS OF JAPAN

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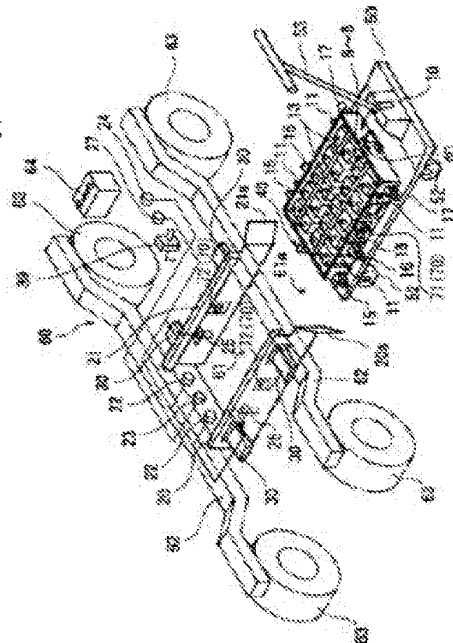
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(54) MOUNTING STRUCTURE FOR BATTERY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a mounting structure allowing easy installation of a battery device under the floor by means of a lock device and preventing rattling, which is conventionally caused by an over-stroke and the like by a conventional lock device used for mounting the battery device under the floor of an electric automobile, of the mounted battery device during travel and the like.

SOLUTION: In this mounting structure for the battery device, pad members 71 and 71 having resiliency are arranged on the battery device 1 side, and receiving members 72 and 72 having resiliency are mounted on the battery mounting part 61 side. When the battery device 1 is mounted to the battery mounting part 61, the pad member 71 is pressed to the receiving member 72, and consequently, rattling of the battery device 1 can be prevented.



CLAIMS

[Claim(s)]

[Claim 1]It is a structure characterized by comprising the following for attaching aforementioned Battery Unit to the aforementioned battery mounting part via an attaching means, Fitting structure of Battery Unit provided with a shakiness prevention means for preventing shakiness of Battery Unit in an attachment state separately from the aforementioned attaching means.

A locking device attached to either a battery mounting part or Battery Unit.

A striker which is attached to another side and held at the aforementioned locking device.

[Claim 2]Are the fitting structure of Battery Unit according to claim 1, and a shakiness prevention means, A receptacle surface which is provided by the aforementioned battery mounting part and inclines to an attaching direction of aforementioned Battery Unit, Aforementioned Battery Unit provides and it has a reliance part which can abut on the aforementioned receptacle surface, Fitting structure of Battery Unit considered as composition which at least 1 side of the aforementioned receptacle surface or the aforementioned reliance part makes the aforementioned receptacle surface abut the aforementioned reliance part in an attachment state of aforementioned Battery Unit using an elastic member, and prevents shakiness of aforementioned Battery Unit.

[Claim 3]Fitting structure of Battery Unit considered as composition which is the fitting structure of Battery Unit according to claim 2, and provided a reliance surface substantially parallel to a receptacle surface as a reliance part.

[Claim 4]Fitting structure of Battery Unit which is the fitting structure of Battery Unit according to claim 2 or 3, and made a receptacle surface incline in the direction of an acute angle to an attaching direction of Battery Unit.

[Claim 5]Are the fitting structure of Battery Unit described in either of the Claims 1-4, and a locking device, Have a latch who holds a striker to secession impossible, and this latch, It provides so that a change of between an unlocked position, an imperfect locking position, and a complete lock position is possible, Fitting structure of Battery Unit considered as composition which will move forcibly to the aforementioned complete lock position, and will hold the aforementioned striker to secession impossible if it is pushed on the aforementioned striker with movement of aforementioned Battery Unit, and is switched to said imperfect locking position from the aforementioned unlocked position and this imperfect locking position is reached.

[Claim 6]Fitting structure of Battery Unit considered as composition which will move to a complete lock position by making an electric motor into a driving source if it is the fitting structure of Battery Unit according to claim 5 and a latch reaches an imperfect locking position.

[Claim 7]Fitting structure of Battery Unit which was the fitting structure of Battery Unit described in either of the Claims 1-6, moved upwards and was attached.

[Claim 8]Fitting structure of Battery Unit which is the fitting structure of Battery Unit described in either of the Claims 1-7, and was attached along a floor of vehicles.

[Claim 9] Vehicles provided with fitting structure of Battery Unit described in either of the Claims 1-8.

[Claim 10] A reliance part characterized by comprising the following which can abut on aforementioned Battery Unit on the other hand in the aforementioned receptacle surface is provided, A mounting arrangement of Battery Unit considered as composition which at least 1 side of the aforementioned receptacle surface or the aforementioned reliance part makes the aforementioned receptacle surface abut the aforementioned reliance part in an attachment state of aforementioned Battery Unit using an elastic member, and prevents shakiness of aforementioned Battery Unit.

A locking device attached to either a battery mounting part or Battery Unit.

A receptacle surface which is a method for being attached to another side and attaching aforementioned Battery Unit to the aforementioned battery mounting part via an attaching means provided with a striker held at the aforementioned locking device, and inclines to an attaching direction of aforementioned Battery Unit in the aforementioned battery mounting part.

[Claim 11] A mounting arrangement of Battery Unit which is a mounting arrangement of Battery Unit according to claim 11, and was considered as composition using a reliance surface substantially parallel to the aforementioned receptacle surface as a reliance part.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates, for example to the fitting structure of Battery Unit preferable for vehicles, such as an electric vehicle and what is called a hybrid car.

[0002]

[Description of the Prior Art] the thing of the form which fixes Battery Unit with a bolt nut along with the vehicle body bottom part of an electric vehicle having been conventionally, provided as technology about the fitting structure of Battery Unit of vehicles, as it disclosed, for example in JP,H11-180164,A, but. In this fitting structure, since it was forced stiff attitudes, such as squatting down to an under floor in desorption, there was a problem to which work becomes troublesome. Then, as it discloses in the former, for example, JP,S47-36412,A. While providing a striker to the Battery Unit side, a locking device is provided to the battery mounting part provided to the under floor of vehicles, After making Battery Unit advance into an under floor, it is made to go up and the fitting structure considered as the composition which makes each striker hold to a corresponding locking device, and attaches this Battery Unit to a battery mounting part is disclosed. According to the fitting structure using this locking device, as compared with the case where it attaches using a bolt nut, Battery Unit was able to be reliably attached by easier work.

[0003]

[Problem to be solved by the invention]However, according to the fitting structure of the above-mentioned conventional locking-device type, there were the following problems. Namely, when the thing of composition of rotating the latch having the lock groove into which a striker is made to advance, and holding a striker to secession impossible is used as a locking device, in order to make a striker hold reliably by latch, What is called an exaggerated stroke is set to movement toward a latch, and this caused [slight / which jounces (vibration)] Battery Unit in an attachment state. In order to secure the smooth movement toward the latch at the time of a lock and to secure the smooth penetration operation to the lock groove of a striker, slight clearance is set up between the lock groove and the striker, and this also caused shakiness of Battery Unit. Then, without imposing time and effort like [in the case of attaching with a bolt nut], the present invention can be reliably attached with a locking device, and an object of the present invention is to provide the fitting structure by which shakiness (vibration, displacement) of Battery Unit in an attachment state is moreover prevented.

[0004]

[Means for solving problem]For this reason, the present invention was made into the fitting structure of composition of having described in each aforementioned claim. According to the fitting structure of Battery Unit according to claim 1, a striker is made to hold to a locking device, and where Battery Unit is attached to a battery mounting part, shakiness of Battery Unit is inhibited or prevented by the shakiness prevention means provided separately from the attaching means. Thus, shakiness of Battery Unit can be prevented, securing the proper exaggerated stroke or clearance which can set a locking device, since shakiness of Battery Unit is prevented by the shakiness prevention means provided separately from the attaching means. According to the fitting structure of Battery Unit according to claim 2 or 3, or the mounting arrangement of the battery according to claim 10 or 11. In the stage of attaching Battery Unit to a battery mounting part, the receptacle surface by the side of a battery mounting part is abutted in the reliance part by the side of Battery Unit, this contact state is maintained in the attachment state of Battery Unit, and shakiness of Battery Unit is prevented. Thus, shakiness of Battery Unit can be prevented by easy composition. Since the receptacle surface inclines to the attaching direction of Battery Unit, shakiness of the direction which intersects perpendicularly in the shakiness and the direction of the attaching direction of Battery Unit can be prevented. Shakiness of Battery Unit can be prevented more reliably, without producing problems, such as generating of an allophone, since the elastic member is used for at least 1 side of the receptacle surface or the reliance part.

[0005]According to the fitting structure of Battery Unit according to claim 4, the positioning function of Battery Unit can be given to the shakiness prevention means concerned by hitting against a receptacle surface and making it abut a surface. In this Description, about the slope direction of a receptacle surface, "the direction of an acute angle" shall mean the direction close to the Battery Unit side concerned, so that it results ahead about the attaching direction of Battery Unit. According to the fitting structure of Battery Unit according to claim 5, a striker

approaches a locking device by making Battery Unit approach a battery mounting part. By a striker's approaching the locking device in the state where a latch is placed at an unlocked position, and approaching further, a latch is pushed on a striker and moves from an unlocked position to an imperfect locking position. If a latch reaches an imperfect locking position, he will move forcibly to a complete lock position, a striker is held by this at secession impossible at the locking device concerned, and Battery Unit is attached to a battery mounting part.

[0006]Thus, since the latch holding a striker is forcibly switched to a complete lock position from an imperfect locking position, Without adjusting the position by the side of Battery Unit by hand, each striker is held reliably at a locking device, and, thereby, Battery Unit can be reliably attached to a battery mounting part. For this reason, since the worker needs to squat down, and does not need to check a locked state and does not need to adjust the position of Battery Unit by hand, he can work this kind comfortably. Since Battery Unit is reliably attached to a position by a locking device even if a road surface has inclination of some or it is irregular, since a latch moves to a complete lock position forcibly, It is not necessary to change a work site by moving vehicles like before, and attachment work can be efficiently performed comfortably also at this point. that it is forcible about the change to a complete lock position from latch's imperfect locking position, It says that a latch is positively switched by the original switching means which makes an electric motor etc. a driving source, for example rather than is switched by movement of a striker (pushed on a striker), and moves a striker to a complete lock position as a result.

[0007]According to the fitting structure of Battery Unit according to claim 6, a latch can be moved to a complete lock position from an imperfect locking position to suitable timing by controlling the electric motor as a driving source, This timing can be arbitrarily set up by changing a control content. According to the fitting structure of Battery Unit according to claim 7, it is a case where Battery Unit is attached, for example along the body lower surface of an automobile, After making Battery Unit advance into the under floor of an automobile by placing Battery Unit on carrying trucks, such as a hand lift truck, and moving this carrying truck, in the fitting structure considered as the composition which is raised and is attached, the operation effect by the composition of each aforementioned claim description can be obtained. According to the fitting structure of Battery Unit according to claim 8, in the fitting structure considered as the composition described by for example making Battery Unit slide along the floor line of an automobile, the operation effect by the composition of each aforementioned claim description can be obtained. According to the vehicles according to claim 9, for example in an electric vehicle, the operation effect by the composition described in each aforementioned claim can be obtained.

[0008]

[Mode for carrying out the invention]Next, one preferable embodiment of the present invention is described based on Fig.1 - Fig.15. According to this embodiment, the case where Battery Unit 1 is attached to the vehicles 60 is illustrated. Therefore, the present invention is widely applicable to Battery Unit attached in addition to vehicles. Now, Fig.1 and Fig.2 show signs that Battery Unit 1 of this embodiment is attached to the under floor (under the vehicles floor line 65)

of the vehicles 60 using the carrying truck 50. Only the right-and-left side members 62 and 62 and the wheels 63-63 of order are shown by Fig.2 among the vehicles 60. When this Battery Unit 1 is placed on the carrying truck 50 and a worker moves this carrying truck 50, By making it advance into the battery mounting part 61 provided to the under floor of the vehicles 60 from the vehicles side, and raising only constant distance with the rise-and-fall function of the carrying truck 50 the appropriate back and in this battery mounting part 61, it hangs to the battery fixing position along the floor line of the vehicles 60, and is attached to a state. In the following descriptions, when only calling it forward/rearward direction or right and left directions, it shall say in accordance with the direction of the vehicles 60. First, the carrying truck 50 is what is called hand-lift-truck equipment, and although this is publicly known and does not require change especially in this embodiment conventionally, it describes it simply below. This carrying truck 50 is provided with the base plate 51, the wheels 52-52 attached to the lower surface four corners of this base plate 51, and the handle 53 provided in the center of rear of the base plate 51. This carrying truck 50 is provided with the rise-and-fall function. As shown in Fig.5, each wheel 52 is supported pivotable at the tip of a rod of the oil hydraulic cylinder 52a, and the base plate 51 can be moved vertically by each oil hydraulic cylinder 52a carrying out an elastic operation, and changing the ejection dimension of the wheels 52-52 to the base plate 51. The extension operation of each oil hydraulic cylinder 52a is made by carrying out tilting operation of the above-mentioned handle 53. For this reason, you can place Battery Unit 1 on the base plate 51, and can make it go up and down this Battery Unit 1 by repeating the handle 53 up and down and carrying out tilting operation.

[0009] Battery Unit 1 is shown to Fig.3 by the simple substance. This Battery Unit 1 has the ten batteries B-B held to the battery carrier 10 which makes a frame, and this battery carrier 10. It is arranged at five rows by two rows, and is electrically connected in series, and the ten batteries B-B are connected to the connector 14 attached to the side part of the battery carrier 10 through the electric wiring which carried out figures omitted abbreviated. Each battery B is fixed by the presser-foot frames 13 and 13 in this battery carrier 10. This Battery Unit 1 advances into the battery mounting part 61 from that left side part, as an arrow shows Fig.3. Hereafter, the direction into which Battery Unit 1 advances is called battery approach direction. In this embodiment, this battery approach direction is a direction (cross direction) which intersects perpendicularly with vehicles forward/rearward direction. Therefore, in this embodiment, Battery Unit 1 advances from the left side part of the vehicles 60.

[0010] The three guide rollers 15-17 and the two strikers 11 and 11 are attached to the right and left side part to the battery approach direction of the battery carrier 10, respectively. These guide rollers 15-17 are equivalent to one embodiment of the transverse direction guidance component for guiding the position of the approach direction right and left sides of Battery Unit 1 concerned. Work of the guide rollers 15-17 and the strikers 11-11 is mentioned later. The reliance components 71 and 71 for preventing shakiness of Battery Unit 1 in an attachment state are attached to the right and left side parts of the battery carrier 10 via the bracket 73, respectively. Both the reliance components 71 and 71 are attached so that it may be

manufactured as a material and the urethane rubber which has appropriate elasticity may be projected to the side, respectively. The reliance surface 71a which inclines in the direction of an acute angle (direction gone down toward the side) to the attaching direction (direction which goes upwards) of Battery Unit 1, respectively is formed in the upper part of both the reliance components 71 and 71. These reliance components 71 and 71 and the receptacle components 72 and 72 mentioned later constitute the shakiness prevention means described in Claims. The fail-safe locking device 40 is attached to the side part before and behind a battery approach direction of the battery carrier 10, respectively. These fail-safe locking devices 40 and 40 are also mentioned later.

[0011]Next, the battery mounting part 61 for storing Battery Unit 1 is provided by the under floor of the vehicles 60. The guide wall parts 20 and 21 are provided by the front side and rear side (approach direction right and left sides) of this battery mounting part 61. Both the guide wall parts 20 and 21 set a fixed interval mutually, and are arranged in parallel. The space part between both this guide wall part 20 and 21 is the aforementioned battery mounting part 61. The position which is the back side upper part of this battery mounting part 61, and met the vehicles floor line is set as the battery fixing position. The interval of both the guide wall parts 20 and 21 is set up in accordance with the interval between the points of the right-and-left guide rollers 15 and 15 (or 16, 16, or 17, 17) of the battery carrier 10. Thereby, in the state where Battery Unit 1 concerned advanced into the battery mounting part 61, it ****s to the right-and-left guide rollers 15 and 15 (or 16, 16, or 17, 17) between both the guide wall parts 20 and 21 without a backlash.

[0012]As shown in Fig.4, what is called a sphere roller that protrudes from the sphere 15b (16b, 17b) to the end side of the holding pipe 15c (16c, 17c) so that rolling is possible, and is held is used for each guide roller 15-17. For this reason, each guide roller 15-17 can roll the inner surface side of the guide wall parts 20 and 21 in any direction. Each guide roller 15-17 is attached so that it may project to the side to the side part of the battery carrier 10 via the brackets 15a, 16a, and 17a, respectively. The guidance taper parts 20a and 21a which it comes to bend in the direction to which this end side opens mutually, respectively are provided, and between this guidance taper part 20a and 21a is on the end side (in Fig.2, it is an end of a near side) of both the guide wall parts 20 and 21 with the admission port 61a of the battery mounting part 61. If Battery Unit 1 is made to advance into the battery mounting part 61 through this admission port 61a, When both the guidance taper parts 20a and 21a **** to the guide rollers 15 and 15 of an approach direction front side first, Battery Unit 1 concerned is guided to the battery mounting part 61 at approach direction right and left, By making it advance furthermore, the inner surface of the guide wall parts 20 and 21 ****s to the guide rollers 16 and 17 sequentially, and, thereby, whole Battery Unit 1 is guided at the approach direction right and left (vehicles forward/rearward direction). Thus, when the guidance taper parts 20a and 21a are provided by the admission port 61a of the battery mounting part 61, Battery Unit 1 is guided smoothly at the battery mounting part 61.

[0013]The height of both the guide wall parts 20 and 21 is set up in accordance with the amount of rise and fall of the base plate 51 of the carrying truck 50 which placed Battery Unit 1. For this

reason, only not only in when Battery Unit 1 is made to advance into the battery mounting part 61 in the state where the base plate 51 was made to be placed at the lowest height (conveyance height) as shown in Fig.5, Also in the process in which raise the base plate 51 and Battery Unit 1 is raised in this battery mounting part 61, both the guide wall parts 20 and 21 always **** to the guide rollers 15-17, Thereby, the position of the approach direction right and left of this Battery Unit 1 is restricted also in any at the time of horizontal penetration and a rise. The height from the road surface G of the lower end edge of both the guide wall parts 20 and 21 is set as the position higher than the upper surface of this base plate 51 in the state where this base plate 51 was raised so that it might not interfere in the base plate 51 of the carrying truck 50 to illustrate.

[0014]Next, as shown in Fig.5, the pair of right and left stoppers 22 and 22 are attached to the inner of the battery mounting part 61. If Battery Unit 1 is made to advance into the battery mounting part 61 by making the base plate 51 which placed Battery Unit 1 be placed at conveyance height, and moving the carrying truck 50, the front face of an approach direction of the battery carrier 10 will abut both the above-mentioned stoppers 22 and 22, and penetration beyond it will be prevented. As shown in Fig.6 and Fig.7, the rise starting position confirmation sensor 23 is attached to the inner of the battery mounting part 61. This rise starting position confirmation sensor 23 is provided with the detection part 23a which makes the supporter 23b which makes a cylinder, and the sphere supported by this supporter 23b so that frequent appearance was pivotable and possible. If Battery Unit 1 advances into the battery mounting part 61 by movement of the carrying truck 50 and the front face of the battery carrier 10 abuts both the stoppers 22 and 22 eventually, The detection part 23a of the rise starting position confirmation sensor 23 abuts the front face of the battery carrier 10, this detection part 23a is pushed by this, and it is pushed in in the supporter 23b. This state is shown in Fig.7.

[0015]If the detection part 23a is pushed in in the supporter 23b, it will be detected that the rise starting position confirmation sensor 23 concerned turned on, and Battery Unit 1 was completely stored in the battery mounting part 61, and resulted in the position (henceforth a "rise starting position") which can go up by this. The rise starting position confirm lamp 24 is connected to the rise starting position confirmation sensor 23. This rise starting position confirm lamp 24 will be switched off if the rise starting position confirmation sensor 23 turns on. As shown in Fig.7, the detection part 23a of the rise starting position confirmation sensor 23, If it is in the state where Battery Unit 1 was stored by the rise starting position of the battery mounting part 61, It is held at the state where it was pushed in in the supporter 23b regardless of that height position, the front face of the battery carrier 10 is relatively rolled in this state where it was pushed in, and, thereby, the rise starting position confirmation sensor 23 concerned is maintained by the ON state. For this reason, the rise starting position confirm lamp 24 will be switched off regardless of that height position, if Battery Unit 1 is stored by the rise starting position of the battery mounting part 61, Conversely, the light is switched on where Battery Unit 1 is taken out from the state or the battery mounting part 61 which is not placed in the battery mounting part 61 in a rise starting position. In this way, after Battery Unit 1 being stored by the rise starting position and checking putting out lights of the rise starting position confirm lamp 24, tilting operation of the

wheel 53 of the carrying truck 50 is carried out up and down, the lift of the base plate 51 is carried out, and, thereby, Battery Unit 1 is raised.

[0016]As shown in Fig. 2, before and behind the approach direction, a fixed interval is set and two pieces of the main lock equipment 30 and 30 are attached at the right and left guide wall parts 20 and 21, respectively. The thing of the respectively same composition is used and a total of four pieces of these main lock equipment 30-30 are arranged corresponding to the strikers 11-11 of above-mentioned Battery Unit 1. According to this embodiment, these main lock equipment 30-30 is equivalent to the locking device described in Claims. What is conventionally used as door lock devices for slide doors, such as a one-box car, is used for this main lock equipment 30. Hereafter, it describes simply about the composition. This main lock equipment 30 is shown to Fig. 11 by the simple substance. The electric motor 32 with which this main lock equipment 30 was attached to the end of the base 36 of L form, and this base 36, The pinion gear 32a rotated with this electric motor 32, and the driving lever 33 which has the sector-gear part 33a clenched by this pinion gear 32a, The lock direction (the graphic display counter clockwise direction) which engaged with the shift lever 34 supported by this driving lever 33 pivotable focusing on the pivot 34a and the engagement part 34b provided to the rotation end side of this shift lever 34, and was shown by a figure Nakaya seal is equipped with the latch 35 who rotates forcibly. The driving lever 33 is supported by the base 36 rotatable focusing on the pivot 33b, and the latch 35 is supported by the base 36 pivotable focusing on the pivot 35a. The lock groove 35b of U type is formed in the latch 35, and the opening side of this lock groove 35b will be in the state where it was turned to the window part 36a provided at the base 36, in the state where this latch 35 is placed at an unlocked position. The striker 11 enters the latch's 35 lock groove 35b through this window part 36a so that it may describe below.

[0017]In the rise starting position of the battery mounting part 61, if Battery Unit 1 goes up with the lift function of the carrying truck 50, The lock groove 35b of the latch 35 of the main lock equipment 30 with which each striker 11 provided to the battery carrier 10 corresponds enters, the appropriate back this striker 11 abuts the side part of the lock groove 35b, and this latch 35 is pushed on a lock direction. As described above, each striker 11 enters the latch's 35 lock groove 35b through the window part 36a of the base 36. The striker 11 which entered the lock groove 35b rotates the latch 35 to a lock direction by moving further with a rise of Battery Unit 1 concerned, after abutting the side part of this lock groove 35b. The latch sensor (not shown) which detects this latch's 35 angle of rotation is included in the latch's 35 rotation center (pivot 35a). This latch 35 is energized by the twist spring which carried out figures omitted abbreviated in the unlocking direction (direction which is clockwise direction in Fig. 11 and makes the opening side of the lock groove 35b approach the window part 36a). For this reason, by pushing the edge of the lock groove 35b by the striker 11, the latch 35 resists the above-mentioned energization force, and rotates towards an imperfect locking position and also a complete lock position from an unlocked position. If the latch 35 does definite angle rotation from an unlocked position and reaches an imperfect locking position, this will be detected by a latch sensor and the electric motor 32 will start in this stage.

[0018]If the electric motor 32 starts, the driving lever 33 will rotate to clockwise direction in Fig.11 through engagement with the pinion gear 32a and the sector-gear part 33a, and, thereby, the pivot 34a of the shift lever 34 will be displaced in a graphic display lower part. Since the relative rotating to the driving lever 33 of the shift lever 34 is restricted in this stage by the cancel lever which carried out figures omitted abbreviated, The engagement part 34b of the shift lever 34 is displaced in a graphic display lower part by rotation of the graphic display clockwise direction of the driving lever 33, and thereby, the latch 35 rotates from an imperfect locking position forcibly to a lock direction, and reaches a complete lock position. Battery Unit 1 and the striker 11 which went up with the lift function of the carrying truck 50 are made for a motion of the striker 11 and Battery Unit 1 to be moved in the direction further pulled up upward to the main lock equipment 30 at this time by the latch 35 forcible rotation. that it is forcible about movement from the latch's 35 imperfect locking position to a complete lock position, It says that the latch 35 moves positively the electric motor 32 which is an original transportation device as a driving source rather than moves by movement of the striker 11 (pushed on the striker 11), and moves the striker 11 to a complete lock position as a result. In this embodiment, the electric circuit of the main lock equipment 30-30 is connected, and after all four latches 35 arrive at an imperfect locking position, the electric motor 32 starts it. In this way, by rotating the latch 35 from an imperfect locking position to a complete lock position forcibly, It hangs to the battery fixing position where each striker 11 was locked by secession impossible from the latch's 35 lock groove 35b, and Battery Unit 1 was along the floor line of the vehicles 60 by extension, and is held in the state.

[0019]The latch lock lever 37 is attached to the latch's 35 graphic display bottom rotatable. Spring energization of this latch lock lever 37 is carried out in the direction close to the latch 35. The imperfect lock claw part 35c and the perfect lock claw part 35d are formed in the latch's 35 lower part, If the above-mentioned latch lock lever 37 engages with the imperfect lock claw part 35c, the latch 35 will be held in an imperfect locking position, and if the latch lock lever 37 engages with the perfect lock claw part 35d, the latch 35 will be held in a complete lock position. By holding the latch 35 by the latch lock lever 37 in a complete lock position, as described above, Battery Unit 1 is firmly attached to the battery fixing position along the floor line of the vehicles 60. If the latch 35 is locked by the complete lock position, this will be detected by a latch sensor, The electric motor 32 is reversed based on this, the driving lever 33 rotates in the counter clockwise direction in Fig.11, the engagement part 34b of the shift lever 34 is displaced by this in the direction which keeps away from a latch, and the engagement state of this shift lever 34 and the latch 35 is released. The driving lever 33 and the shift lever 34 return to an initial position in this stage.

[0020]On the other hand, the latch lock lever 37 is rotated in the direction which secedes from the latch 35 by rotation to the unlocking direction of the lock release lever 38 supported rotatable at the base 36, and, thereby, a locked state is released in the latch's 35 complete lock position. In this way, as the locked state by the latch lock lever 37 was released and being described above, when the driving lever 33 and the shift lever 34 have returned to the initial position, The latch 35

will be in a rotatable state from a complete lock position towards an unlocked position, and, thereby, will be in a dismountable state about Battery Unit 1. The rotation to the unlocking direction of the above-mentioned lock release lever 38 is made by operating the Locke canceling switch 39 (refer to Fig.2) arranged on the vehicles 60. The wire (not shown) for release operation is connected to the lock release lever 38 of each main lock equipment 30, and each wire moves with the actuator which carried out figures omitted abbreviated. Each actuator operates simultaneously by operating the above-mentioned Locke canceling switch 39, the lock release lever 38 of four pieces of the main lock equipment 30-30 moves in the unlocking direction simultaneously by this, and lock release of these main lock equipment 30-30 is carried out. Since Battery Unit 1 (and carrying truck 50) leans to the vehicles 60, for example by the inclination of the road surface G according to these main lock equipment 30-30, Even if it is a case where Battery Unit 1 inclines and goes up to a fixing position, and the position of the strikers 11-11 to the main lock equipment 30-30 varies as a result, Since this latch 35 will rotate forcibly to a complete lock position if each striker 11 contacts the latch 35 and this latch 35 rotates to an imperfect locking position at least, Locke is reliably made about four pieces of all the main lock equipment 30-30.

[0021]Next, while acting to this battery fixing position as Locke of Battery Unit 1 with the main lock equipment 30-30 as described above if Battery Unit 1 reaches a battery fixing position, It attaches that this Battery Unit 1 went up to this battery fixing position, and it is detected by the localization sensor 25. method ** of penetration of both the aforementioned guide wall parts 20 and 21 -- the above-mentioned fixing position confirmation sensor 25 is substantially attached to the position of middle via the bracket 26, respectively. The same sensor as the aforementioned rise starting position confirmation sensor 23 is used also for this fixing position confirmation sensor 25, and it has the detection part 25a which makes the cylinder-shaped supporter 25b and the sphere held at the tip of this supporter 25b so that frequent appearance was pivotable and possible.

[0022]On the other hand, the detection plates 18 and 18 are attached to the side part of the battery carrier 10 of Battery Unit 1. For this reason, if Battery Unit 1 goes up to a battery fixing position as shown in Fig.9, The detection plate 18 abuts the detection parts 25a and 25a of both the fixing position confirmation sensors 25 and 25, respectively, these detection parts 25a and 25a are pushed in in the supporter 25b, respectively, and, thereby, both the fixing position confirmation sensors 25 and 25 turn on. It attaches to both the fixing position confirmation sensors 25 and 25, and the localization lamp 27 is connected. If both the fixing position confirmation sensors 25 and 25 turn on, this fixing position confirm lamp 27 will be switched off. on the other hand -- or attaching in the state of OFF of both fixing position confirmation sensors 25 and 25, the localization lamp 27 lighting up, and Battery Unit 1 carrying out a position shift to a fixing position, or being removed from a fixing position is reported. Each electric motor 32 of the above-mentioned fixing position confirmation sensors 25 and 25, the fixing position confirm lamp 27 and the aforementioned rise starting position confirmation sensors 23 and 23, the rise starting position confirm lamp 24, and also the aforementioned main

lock equipment 30-30, It operates as a power supply and the auxiliary battery 64 carried in the vehicles 60 separately from Battery Unit 1 concerned is turned on.

[0023]The receptacle components 72 and 72 which constitute the shakiness prevention means 70 for preventing shakiness of Battery Unit 1 in an attachment state are attached to both the guide wall parts 20 and 21. both the receptacle components 72 and 72 -- respectively -- the approach direction (cross direction) of the guide wall parts 20 and 21 -- it is a center substantially, and via the bracket 74, it opposes mutually and is attached to the position corresponding to the aforementioned reliance components 71 and 71. Both the receptacle components 72 and 72 are attached so that it may project over the inner surface side of the guide wall parts 20 and 21. Both these receptacle components 72 and 72 are manufactured considering the urethane rubber which has respectively appropriate elasticity as a material. The inclined plane 72a which inclines to the attaching direction (direction which goes upwards) of Battery Unit 1 in the direction of an acute angle (direction which goes up toward an inner direction) is formed in the lower surface side of both the receptacle components 72 and 72, respectively (refer to Fig.14). As described above, this receptacle component 72 and the reliance component 71 provided to the battery carrier 10 constitute the shakiness prevention means described in Claims. Shakiness of Battery Unit 1 of an attachment state is prevented or inhibited by this shakiness prevention means.

[0024]In this embodiment, a shakiness prevention means acts as follows. If it is made to go up after making Battery Unit 1 advance into the under floor of the vehicles 60 using the carrying truck 50, both the reliance components 71 and 71 will approach the receptacle components 72 and 72 gradually with a rise of Battery Unit 1. On the other hand, it advances into the lock groove 35b of the main lock equipment 30 with which each striker 11 corresponds with a rise of Battery Unit 1, and, thereby, each latch 35 begins to rotate from an unlocked position to an imperfect locking position. If the electric motor 32 starts in each main lock equipment 30 and the latch 35 begins to rotate to a complete lock position, Battery Unit 1 will go up and touch with the base plate 51 of the carrying truck 50 will be lost. In this stage, the reliance surfaces 71a and 71a of both the reliance components 71 and 71 are pressed against the receptacle surfaces 72a and 72a of the receptacle components 72 and 72 which oppose, respectively. If the reliance component 71 wins popularity and it is pressed against the component 72, both will do elastic deformation. Thus, where Battery Unit 1 is completely attached to the battery mounting part 61, The reliance surfaces 71a and 71a of both the reliance components 71 and 71 by the side of Battery Unit 1 are pressed against the receptacle surface 72a of the receptacle component 72 by the side of the battery mounting part 61, respectively, and, thereby, shakiness of Battery Unit 1 is prevented or inhibited.

[0025]Next, in the state where it was attached to the battery fixing position, Battery Unit 1 has a fail safe function so that it may not fall, even if the main lock equipment 30-30 unlocks by malfunction etc. As shown in Fig.3 and Fig.12, the fail-safe locking devices 40 and 40 are attached to two places, the front face of an approach direction of the battery carrier 10, and a rear face. Below both these fail-safe locking devices 40 and 40, the lock release stick 41 for releasing that locked state is arranged. The details of this fail-safe locking device 40 and the lock release

stick 41 are shown in Fig.14 and Fig.15. It is attached to the approach direction longitudinal dimension of the battery carrier 10 so that the bases 42 and 43 of two steps of upper and lower sides may project to the side, respectively. The fail-safe locking device 40 is attached on the upper upper bases 42, and the lock release stick 41 is supported by the lower lower base 43 so that up-and-down motion is possible.

[0026]First, the fail-safe locking device 40 is provided with the base 44 and the lock body 46 supported up and down focusing on the pivot 45 to this so that tilting was possible. The lock body 46 is energized by the lock direction (in a figure, it is the counter clockwise direction) with the spring (for example, twist spring (not shown)) with which the surroundings of the pivot 45 were equipped. The two lock pins 47 and 47 are provided movable by the base 44 in the plane direction (graphic display right and left directions) of this base 44. While retreating to the lock release position of the method of the graphic display right if the insertion amount of the lock release stick 41 to the lock release hole 44a provided on the lower surface of the base 44 is largely carried out as shown in Fig.15 (if it is made to move upwards to the base 44 in Fig.15), these lock pins 47 and 47, If the insertion amount to the lock release hole 44a of the lock release stick 41 is made small as shown in Fig.14, it will move to the locking position of a graphic display left according to spring energization force (if it is made to move below to the base 14 in Fig.14). About the composition which makes the lock pins 47 and 47 move by the size of the insertion amount of the lock release stick 41, Since it is technology this kind of not only locking device but publicly known, do not explain in full detail, but the tip of the lock release stick 41 is formed in the shape of semi-spherical, It has composition which converts up-and-down motion of the lock release stick 41 to movement to the right and left directions of both the lock pins 47 and 47 by slide contact operation with this semi-spherical shaped part 41a and the inclined plane provided to both the lock pin 47 and 47 side.

[0027]On the other hand, the lock holes 46a and 46a where both the above-mentioned lock pins 47 and 47 are inserted are formed in the lower part by the side of the rotation tip of the lock body 46 (graphic display left end surface side). As shown in Fig.14, where the lock pin 47 is fitted over both the lock holes 46a and 46a, respectively, The lock body 46 will be in the state where it was locked by rotation impossible, in the unlocking direction (in a figure, it is clockwise direction), If the insertion amount to the lock release hole 44a of the lock release stick 41 is carried out largely and both (inserting deeply) the lock pins 47 and 47 are retreated as described above, this lock body 46 will become rotatable in the unlocking direction focusing on the pivot 45.

[0028]Next, the lock release stick 41 is supported up and down by the insertion hole 43a and the above-mentioned lock release hole 44a of the lower base 43 movable. Between the insertion hole 43a and the lock release hole 44a, the snap ring 41b is attached at this lock release stick 41, and, thereby, the downward slip off stop of this lock release stick 41 is made. The sleeve 42a is attached between the upper bases 42 and the lower base 43, and the lock release stick 41 is inserted in the inner circumference side of this sleeve 42a. The head 48 of the disc shape projected largely is attached to the side rather than the lock release stick 41 at the lower end part

of the lock release stick 41. The compression spring 49 is interposed between this head 48 and lower base 43. The lock release stick 41 is energized by this compression spring 49 in the direction (graphic display lower part) which makes small the insertion amount to the lock release hole 44a. As shown in Fig.14, when the plug to the lock release hole 44a of the lock release stick 41 is in a shallow state, length, a position, etc. of this lock release stick 41 are set up so that the head 48 may project caudad rather than the lower surface of the battery carrier 10. The locking roller 46b is attached to the upper part by the side of the rotation tip of the lock body 46 pivotable. Axis of rotation of this locking roller 46b is set up in parallel with the rotating shaft line (axis line of the pivot 45) of the lock body 46. On the other hand, corresponding to both the above-mentioned fail-safe locking devices 40 and 40, the lock brackets 66 and 66 (pulling credit part) of U type are attached to the lower surface side of the floor line 65 of the vehicles 60.

[0029]According to the fail-safe locking devices 40 and 40 and the lock release sticks 41 and 41 which were constituted in this way. As shown in Fig.15, where Battery Unit 1 is placed on the base plate 51 of the carrying truck 50, By the head 48 of the lock release stick 41 abutting the upper surface of the base plate 51 in each fail-safe locking device 40, and this lock release stick 41 resisting the compression spring 49, respectively, and pushing it on the upper part, the plug to the lock release hole 44a of this lock release stick 41 is deeper. As described above in this state, while both the lock pins 47 and 47 resist spring energization force, retreat in the unlocking direction and are extracted from the lock holes 46a and 46a, The point (semi-spherical shaped part 41a) of the lock release stick 41 is dashed against the lower surface of the lock body 46, and thereby, as the lock body 46 is thrust up with the lock release stick 41 focusing on the pivot 45, it rotates to an unlocked position. This rotational operation resists spring energization force, and is made. If the lock body 46 rotates to an unlocked position, the locking roller 46b will move and will separate from a centering on pivot 45 circular arc top from the upper part of the lock bracket 66. In this state, the lock function of the fail-safe locking device 40 concerned is not exhibited.

[0030]On the other hand, as shown in Fig.14, Battery Unit 1 is attached to a battery fixing position by the aforementioned main lock equipment 30-30, and in the appropriate back, if the base plate 51 of the carrying truck 50 is dropped, this base plate 51 will separate from the lower surface of the battery carrier 10. For this reason, in each fail-safe locking device 40, the lock release stick 41 moves below with the compression spring 49, and, thereby, the plug to the lock release hole 44a of this lock release stick 41 becomes shallow. For this reason, the lock body 46 rotates in the graphic display counter clockwise direction focusing on the pivot 45 according to spring energization force, and is returned to a locking position, And both the lock pins 47 and 47 are projected by spring energization force, it is inserted in the lock holes 46a and 46a of the lock body 46, and, thereby, the lock body 46 is held in a locking position. If the lock body 46 is held in a locking position, it will fix to the state where engagement of the locking roller 46b was carried out to the upper surface side of the lock bracket 66, and, thereby, downward displacement (omission) of the battery carrier 10 and by extension, Battery Unit 1 concerned will be prevented. Unless it makes the lower surface of the battery carrier 10 abut the base plate 51 of the carrying truck 50 and the lock release sticks 41 and 41 are moved to it upwards from this,

even if the main lock equipment 30-30 is unlocked by malfunction or operation mistake, Battery Unit 1 is still fixed to a battery fixing position via these fail-safe locking devices 40 and 40, and, thereby, troubles, such as unprepared omission, are avoided beforehand.

[0031]When removing Battery Unit 1 attached to the battery fixing position for charge etc., If the base plate 51 of the carrying truck 50 is raised and the lower surface of the battery carrier 10 is made to abut, just before abutting, with the base plate 51, the head 48 of the lock release stick 41 will be pushed upwards, and this lock release stick 41 will move upwards (the unlocking direction). If the lock release stick 41 moves upwards, while the insertion amount to the lock release hole 44a of this lock release stick 41 becomes largely, the lock pins 47 and 47 will retreat and the lock body 46 will become rotatable to an unlocked position by this, Since the lower surface of the lock body 46 is pushed up upwards by the tip (semi-spherical shaped part 41a) of the lock release stick 41, the lock body 46 rotates forcibly to an unlocked position. If the lock body 46 rotates to an unlocked position, the locking roller 46b will separate from the lock bracket 66 by the side of the vehicles floor line 65, and the locked state by the fail-safe locking devices 40 and 40 concerned will be released. According to the fail-safe locking devices 40 and 40 of the above thing to this embodiment. While a locked state is automatically released by the act (usual act which removes Battery Unit 1 and which is performed for accumulating) which makes the lower surface of the battery carrier 10 abut, the base plate 51 of the carrying truck 50, Since it will be in a locked state automatically by the act (usual act which attaches Battery Unit 1 to a battery fixing position and which is performed for accumulating) which the base plate 51 of the carrying truck 50 is dropped, and is made to separate from the lower surface of the battery carrier 10, the lock unlocking operation by a worker is unnecessary at all.

[0032]According to the fitting structure of Battery Unit 1 of this embodiment constituted as mentioned above, shakiness of Battery Unit 1 of an attachment state is prevented or inhibited by the shakiness prevention means provided separately from the Battery Unit attaching means which makes a subject the main lock equipment 30-30. Therefore, for example in the main lock equipment 30, make small clearance over the striker 11 of the lock groove 35a, or the latch's 35 exaggerated stroke is made small, Shakiness of Battery Unit 1 can be prevented or inhibited, without inhibiting positive holding of the striker 11, or the smooth penetration operation to the lock groove 35a of the striker 11. Shakiness of Battery Unit 1 can be prevented with the easy and inexpensive composition which makes the receptacle component 72 provided to the battery mounting part 61 side abut the reliance component 71 provided to the Battery Unit 1 side. Since the reliance surface 71a of the reliance component 71 and the receptacle surface 72a of the receptacle component 72 incline to the attaching direction of Battery Unit 1, respectively, not only shakiness of the attaching direction of Battery Unit 1 but shakiness of the direction which intersects perpendicularly with an attaching direction can be prevented. And the reliance surface 71a and the receptacle surface 72a incline in the direction of an acute angle to the attaching direction of Battery Unit 1. According to this, in the stage where the latches 35-35 rotate from an imperfect locking position forcibly to a complete lock position, and Battery Unit 1 is lifted, Since popularity is won with the reliance surface 71a and Battery Unit 1 is guided by slide contact

operation of the surface 72a at a fixed position, the variation in the fixing position of Battery Unit 1 can be inhibited (positioning function of Battery Unit 1).

[0033]Change can be variously added to the embodiment described above. For example, although the composition which forms the inclined plane (the reliance surface 71a, the receptacle surface 72a) which wins popularity with the reliance component 71 and inclines to the attaching direction of Battery Unit 1 to the both sides of the component 72 was illustrated, an inclined plane is good also as composition formed only in either. It is good also as the level surface or the parallel vertical plane which wins popularity with the reliance surface 71a of the reliance component 71, and intersects perpendicularly the both sides of the receptacle surface 72a of the component 72 not to an inclined plane but to the attaching direction of Battery Unit 1. If a reliance surface and a receptacle surface are the level surface, shakiness of the vertical direction of Battery Unit 1 will be prevented, and if it is a vertical plane, shakiness of the forward/rearward direction of Battery Unit 1 will be prevented. The position which provides a reliance component and a receptacle component can be changed, for example before and behind the approach direction of the battery carrier 10 and the battery mounting part 61, and may be provided to approach direction right and left and order. Therefore, the shakiness prevention means 70 (the one reliance component 71 and the one receptacle component 72 should put together) is good also as composition which can be arranged with balance sufficient to two or more places, and is provided only to one place depending on the case. However, as for a shakiness prevention means, it is preferable to arrange in a symmetrical position to the center of Battery Unit 1 in the state where it attached from a viewpoint attached with sufficient balance, without inclining Battery Unit 1. It is good also as a product made of urethane rubber which has elasticity for either the reliance component 71 or the receptacle component 72. A damper may be used for either the reliance component 71 or the receptacle component 72. although it guessed as a reliance part and the surface 71a was illustrated, it is not necessary to be necessarily a surface for example, the corner of the reliance component 71 is received, and a surface is made to abut -- it may constitute.

[0034]Although the case where Battery Unit 1 was attached to the under floor of the vehicles 60 was illustrated, it can apply, also when storing a battery to the inside of the suitcase of the vehicles 60, the bottom of an indoor sheet, or a loading platform and a roof. While providing the locking devices 31 and 32 to the battery mounting part 61, the composition which provides the strikers 11-11 on the carrier 10 of Battery Unit 1 was illustrated, but it is good also as composition which provides a striker to the battery mounting part 61 conversely, and attaches a locking device to the Battery Unit 1 side. Although the case where Battery Unit 1 was made to advance from the side of vehicles was illustrated, it is applicable to the case where Battery Unit 1 is made to advance from the rear part or front part of vehicles to a vehicles under floor, similarly. After making Battery Unit 1 advance horizontally, the composition attached by making it go up was illustrated, but it is also applicable to the fitting structure of the pullout-type type which attachment completes only by horizontal slide operation. Although Battery Unit 1 attached to vehicles was illustrated, when attaching Battery Unit to the battery mounting object thing of

others, such as a machine, for example, it can apply widely. After all four latches 35 arrived at the imperfect locking position, made it the electric motor 32 start about the case where Battery Unit 1 is attached, but. It is good also as composition which makes four latches 35 electrically independent respectively, and makes the order which arrived at the imperfect locking position start the electric motor 32 sequentially.

TECHNICAL FIELD

[Field of the Invention]This invention relates, for example to the fitting structure of Battery Unit preferable for vehicles, such as an electric vehicle and what is called a hybrid car.

PRIOR ART

[Description of the Prior Art]the thing of the form which fixes Battery Unit with a bolt nut along with the vehicle body bottom part of an electric vehicle having been conventionally, provided as technology about the fitting structure of Battery Unit of vehicles, as it disclosed, for example in JP,H11-180164,A, but. In this fitting structure, since it was forced stiff attitudes, such as squatting down to an under floor in desorption, there was a problem to which work becomes troublesome. Then, as it discloses in the former, for example, JP,S47-36412,A. While providing a striker to the Battery Unit side, a locking device is provided to the battery mounting part provided to the under floor of vehicles, After making Battery Unit advance into an under floor, it is made to go up and the fitting structure considered as the composition which makes each striker hold to a corresponding locking device, and attaches this Battery Unit to a battery mounting part is disclosed. According to the fitting structure using this locking device, as compared with the case where it attaches using a bolt nut, Battery Unit was able to be reliably attached by easier work.

TECHNICAL PROBLEM

[Problem to be solved by the invention]However, according to the fitting structure of the above-mentioned conventional locking-device type, there were the following problems. Namely, when the thing of composition of rotating the latch having the lock groove into which a striker is made to advance, and holding a striker to secession impossible is used as a locking device, in order to make a striker hold reliably by latch, What is called an exaggerated stroke is set to movement toward a latch, and this caused [slight / which jounces (vibration)] Battery Unit in an attachment state. In order to secure the smooth movement toward the latch at the time of a lock and to secure the smooth penetration operation to the lock groove of a striker, slight clearance is set up between the lock groove and the striker, and this also caused shakiness of Battery Unit. Then, without imposing time and effort like [in the case of attaching with a bolt nut], the present invention can be reliably attached with a locking device, and an object of the present

invention is to provide the fitting structure by which shakiness (vibration, displacement) of Battery Unit in an attachment state is moreover prevented.

MEANS

[Means for solving problem]For this reason, the present invention was made into the fitting structure of composition of having described in each aforementioned claim. According to the fitting structure of Battery Unit according to claim 1, a striker is made to hold to a locking device, and where Battery Unit is attached to a battery mounting part, shakiness of Battery Unit is inhibited or prevented by the shakiness prevention means provided separately from the attaching means. Thus, shakiness of Battery Unit can be prevented, securing the proper exaggerated stroke or clearance which can set a locking device, since shakiness of Battery Unit is prevented by the shakiness prevention means provided separately from the attaching means. According to the fitting structure of Battery Unit according to claim 2 or 3, or the mounting arrangement of the battery according to claim 10 or 11. In the stage of attaching Battery Unit to a battery mounting part, the receptacle surface by the side of a battery mounting part is abutted in the reliance part by the side of Battery Unit, this contact state is maintained in the attachment state of Battery Unit, and shakiness of Battery Unit is prevented. Thus, shakiness of Battery Unit can be prevented by easy composition. Since the receptacle surface inclines to the attaching direction of Battery Unit, shakiness of the direction which intersects perpendicularly in the shakiness and the direction of the attaching direction of Battery Unit can be prevented. Shakiness of Battery Unit can be prevented more reliably, without producing problems, such as generating of an allophone, since the elastic member is used for at least 1 side of the receptacle surface or the reliance part.

[0005]According to the fitting structure of Battery Unit according to claim 4, the positioning function of Battery Unit can be given to the shakiness prevention means concerned by hitting against a receptacle surface and making it abut a surface. In this Description, about the slope direction of a receptacle surface, "the direction of an acute angle" shall mean the direction close to the Battery Unit side concerned, so that it results ahead about the attaching direction of Battery Unit. According to the fitting structure of Battery Unit according to claim 5, a striker approaches a locking device by making Battery Unit approach a battery mounting part. By a striker's approaching the locking device in the state where a latch is placed at an unlocked position, and approaching further, a latch is pushed on a striker and moves from an unlocked position to an imperfect locking position. If a latch reaches an imperfect locking position, he will move forcibly to a complete lock position, a striker is held by this at secession impossible at the locking device concerned, and Battery Unit is attached to a battery mounting part.

[0006]Thus, since the latch holding a striker is forcibly switched to a complete lock position from an imperfect locking position, Without adjusting the position by the side of Battery Unit by hand, each striker is held reliably at a locking device, and, thereby, Battery Unit can be reliably attached to a battery mounting part. For this reason, since the worker needs to squat down, and

does not need to check a locked state and does not need to adjust the position of Battery Unit by hand, he can work this kind comfortably. Since Battery Unit is reliably attached to a position by a locking device even if a road surface has inclination of some or it is irregular, since a latch moves to a complete lock position forcibly, It is not necessary to change a work site by moving vehicles like before, and attachment work can be efficiently performed comfortably also at this point. that it is forcible about the change to a complete lock position from latch's imperfect locking position, It says that a latch is positively switched by the original switching means which makes an electric motor etc. a driving source, for example rather than is switched by movement of a striker (pushed on a striker), and moves a striker to a complete lock position as a result.

[0007]According to the fitting structure of Battery Unit according to claim 6, a latch can be moved to a complete lock position from an imperfect locking position to suitable timing by controlling the electric motor as a driving source, This timing can be arbitrarily set up by changing a control content. According to the fitting structure of Battery Unit according to claim 7, it is a case where Battery Unit is attached, for example along the body lower surface of an automobile, After making Battery Unit advance into the under floor of an automobile by placing Battery Unit on carrying trucks, such as a hand lift truck, and moving this carrying truck, in the fitting structure considered as the composition which is raised and is attached, the operation effect by the composition of each aforementioned claim description can be obtained. According to the fitting structure of Battery Unit according to claim 8, in the fitting structure considered as the composition described by for example making Battery Unit slide along the floor line of an automobile, the operation effect by the composition of each aforementioned claim description can be obtained. According to the vehicles according to claim 9, for example in an electric vehicle, the operation effect by the composition described in each aforementioned claim can be obtained.

[0008]

[Mode for carrying out the invention]Next, one preferable embodiment of the present invention is described based on Fig.1 - Fig.15. According to this embodiment, the case where Battery Unit 1 is attached to the vehicles 60 is illustrated. Therefore, the present invention is widely applicable to Battery Unit attached in addition to vehicles. Now, Fig.1 and Fig.2 show signs that Battery Unit 1 of this embodiment is attached to the under floor (under the vehicles floor line 65) of the vehicles 60 using the carrying truck 50. Only the right-and-left side members 62 and 62 and the wheels 63-63 of order are shown by Fig.2 among the vehicles 60. When this Battery Unit 1 is placed on the carrying truck 50 and a worker moves this carrying truck 50, By making it advance into the battery mounting part 61 provided to the under floor of the vehicles 60 from the vehicles side, and raising only constant distance with the rise-and-fall function of the carrying truck 50 the appropriate back and in this battery mounting part 61, it hangs to the battery fixing position along the floor line of the vehicles 60, and is attached to a state. In the following descriptions, when only calling it forward/rearward direction or right and left directions, it shall say in accordance with the direction of the vehicles 60. First, the carrying truck 50 is what is called hand-lift-truck equipment, and although this is publicly known and does not require

change especially in this embodiment conventionally, it describes it simply below. This carrying truck 50 is provided with the base plate 51, the wheels 52-52 attached to the lower surface four corners of this base plate 51, and the handle 53 provided in the center of rear of the base plate 51. This carrying truck 50 is provided with the rise-and-fall function. As shown in Fig.5, each wheel 52 is supported pivotable at the tip of a rod of the oil hydraulic cylinder 52a, and the base plate 51 can be moved vertically by each oil hydraulic cylinder 52a carrying out an elastic operation, and changing the ejection dimension of the wheels 52-52 to the base plate 51. The extension operation of each oil hydraulic cylinder 52a is made by carrying out tilting operation of the above-mentioned handle 53. For this reason, you can place Battery Unit 1 on the base plate 51, and can make it go up and down this Battery Unit 1 by repeating the handle 53 up and down and carrying out tilting operation.

[0009]Battery Unit 1 is shown to Fig.3 by the simple substance. This Battery Unit 1 has the ten batteries B-B held to the battery carrier 10 which makes a frame, and this battery carrier 10. It is arranged at five rows by two rows, and is electrically connected in series, and the ten batteries B-B are connected to the connector 14 attached to the side part of the battery carrier 10 through the electric wiring which carried out figures omitted abbreviated. Each battery B is fixed by the presser-foot frames 13 and 13 in this battery carrier 10. This Battery Unit 1 advances into the battery mounting part 61 from that left side part, as an arrow shows Fig.3. Hereafter, the direction into which Battery Unit 1 advances is called battery approach direction. In this embodiment, this battery approach direction is a direction (cross direction) which intersects perpendicularly with vehicles forward/rearward direction. Therefore, in this embodiment, Battery Unit 1 advances from the left side part of the vehicles 60.

[0010]The three guide rollers 15-17 and the two strikers 11 and 11 are attached to the right and left side part to the battery approach direction of the battery carrier 10, respectively. These guide rollers 15-17 are equivalent to one embodiment of the transverse direction guidance component for guiding the position of the approach direction right and left sides of Battery Unit 1 concerned. Work of the guide rollers 15-17 and the strikers 11-11 is mentioned later. The reliance components 71 and 71 for preventing shakiness of Battery Unit 1 in an attachment state are attached to the right and left side parts of the battery carrier 10 via the bracket 73, respectively. Both the reliance components 71 and 71 are attached so that it may be manufactured as a material and the urethane rubber which has appropriate elasticity may be projected to the side, respectively. The reliance surface 71a which inclines in the direction of an acute angle (direction gone down toward the side) to the attaching direction (direction which goes upwards) of Battery Unit 1, respectively is formed in the upper part of both the reliance components 71 and 71. These reliance components 71 and 71 and the receptacle components 72 and 72 mentioned later constitute the shakiness prevention means described in Claims. The fail-safe locking device 40 is attached to the side part before and behind a battery approach direction of the battery carrier 10, respectively. These fail-safe locking devices 40 and 40 are also mentioned later.

[0011]Next, the battery mounting part 61 for storing Battery Unit 1 is provided by the under

floor of the vehicles 60. The guide wall parts 20 and 21 are provided by the front side and rear side (approach direction right and left sides) of this battery mounting part 61. Both the guide wall parts 20 and 21 set a fixed interval mutually, and are arranged in parallel. The space part between both this guide wall part 20 and 21 is the aforementioned battery mounting part 61. The position which is the back side upper part of this battery mounting part 61, and met the vehicles floor line is set as the battery fixing position. The interval of both the guide wall parts 20 and 21 is set up in accordance with the interval between the points of the right-and-left guide rollers 15 and 15 (or 16, 16, or 17, 17) of the battery carrier 10. Thereby, in the state where Battery Unit 1 concerned advanced into the battery mounting part 61, it ****s to the right-and-left guide rollers 15 and 15 (or 16, 16, or 17, 17) between both the guide wall parts 20 and 21 without a backlash. [0012]As shown in Fig.4, what is called a sphere roller that protrudes from the sphere 15b (16b, 17b) to the end side of the holding pipe 15c (16c, 17c) so that rolling is possible, and is held is used for each guide roller 15-17. For this reason, each guide roller 15-17 can roll the inner surface side of the guide wall parts 20 and 21 in any direction. Each guide roller 15-17 is attached so that it may project to the side to the side part of the battery carrier 10 via the brackets 15a, 16a, and 17a, respectively. The guidance taper parts 20a and 21a which it comes to bend in the direction to which this end side opens mutually, respectively are provided, and between this guidance taper part 20a and 21a is on the end side (in Fig.2, it is an end of a near side) of both the guide wall parts 20 and 21 with the admission port 61a of the battery mounting part 61. If Battery Unit 1 is made to advance into the battery mounting part 61 through this admission port 61a, When both the guidance taper parts 20a and 21a **** to the guide rollers 15 and 15 of an approach direction front side first, Battery Unit 1 concerned is guided to the battery mounting part 61 at approach direction right and left, By making it advance furthermore, the inner surface of the guide wall parts 20 and 21 ****s to the guide rollers 16 and 17 sequentially, and, thereby, whole Battery Unit 1 is guided at the approach direction right and left (vehicles forward/rearward direction). Thus, when the guidance taper parts 20a and 21a are provided by the admission port 61a of the battery mounting part 61, Battery Unit 1 is guided smoothly at the battery mounting part 61.

[0013]The height of both the guide wall parts 20 and 21 is set up in accordance with the amount of rise and fall of the base plate 51 of the carrying truck 50 which placed Battery Unit 1. For this reason, only not only in when Battery Unit 1 is made to advance into the battery mounting part 61 in the state where the base plate 51 was made to be placed at the lowest height (conveyance height) as shown in Fig.5, Also in the process in which raise the base plate 51 and Battery Unit 1 is raised in this battery mounting part 61, both the guide wall parts 20 and 21 always **** to the guide rollers 15-17, Thereby, the position of the approach direction right and left of this Battery Unit 1 is restricted also in any at the time of horizontal penetration and a rise. The height from the road surface G of the lower end edge of both the guide wall parts 20 and 21 is set as the position higher than the upper surface of this base plate 51 in the state where this base plate 51 was raised so that it might not interfere in the base plate 51 of the carrying truck 50 to illustrate.

[0014]Next, as shown in Fig.5, the pair of right and left stoppers 22 and 22 are attached to the

inner of the battery mounting part 61. If Battery Unit 1 is made to advance into the battery mounting part 61 by making the base plate 51 which placed Battery Unit 1 be placed at conveyance height, and moving the carrying truck 50, the front face of an approach direction of the battery carrier 10 will abut both the above-mentioned stoppers 22 and 22, and penetration beyond it will be prevented. As shown in Fig.6 and Fig.7, the rise starting position confirmation sensor 23 is attached to the inner of the battery mounting part 61. This rise starting position confirmation sensor 23 is provided with the detection part 23a which makes the supporter 23b which makes a cylinder, and the sphere supported by this supporter 23b so that frequent appearance was pivotable and possible. If Battery Unit 1 advances into the battery mounting part 61 by movement of the carrying truck 50 and the front face of the battery carrier 10 abuts both the stoppers 22 and 22 eventually, The detection part 23a of the rise starting position confirmation sensor 23 abuts the front face of the battery carrier 10, this detection part 23a is pushed by this, and it is pushed in in the supporter 23b. This state is shown in Fig.7.

[0015] If the detection part 23a is pushed in in the supporter 23b, it will be detected that the rise starting position confirmation sensor 23 concerned turned on, and Battery Unit 1 was completely stored in the battery mounting part 61, and resulted in the position (henceforth a "rise starting position") which can go up by this. The rise starting position confirm lamp 24 is connected to the rise starting position confirmation sensor 23. This rise starting position confirm lamp 24 will be switched off if the rise starting position confirmation sensor 23 turns on. As shown in Fig.7, the detection part 23a of the rise starting position confirmation sensor 23, If it is in the state where Battery Unit 1 was stored by the rise starting position of the battery mounting part 61, It is held at the state where it was pushed in in the supporter 23b regardless of that height position, the front face of the battery carrier 10 is relatively rolled in this state where it was pushed in, and, thereby, the rise starting position confirmation sensor 23 concerned is maintained by the ON state. For this reason, the rise starting position confirm lamp 24 will be switched off regardless of that height position, if Battery Unit 1 is stored by the rise starting position of the battery mounting part 61, Conversely, the light is switched on where Battery Unit 1 is taken out from the state or the battery mounting part 61 which is not placed in the battery mounting part 61 in a rise starting position. In this way, after Battery Unit 1 being stored by the rise starting position and checking putting out lights of the rise starting position confirm lamp 24, tilting operation of the wheel 53 of the carrying truck 50 is carried out up and down, the lift of the base plate 51 is carried out, and, thereby, Battery Unit 1 is raised.

[0016] As shown in Fig.2, before and behind the approach direction, a fixed interval is set and two pieces of the main lock equipment 30 and 30 are attached at the right and left guide wall parts 20 and 21, respectively. The thing of the respectively same composition is used and a total of four pieces of these main lock equipment 30-30 are arranged corresponding to the strikers 11-11 of above-mentioned Battery Unit 1. According to this embodiment, these main lock equipment 30-30 is equivalent to the locking device described in Claims. What is conventionally used as door lock devices for slide doors, such as a one-box car, is used for this main lock equipment 30. Hereafter, it describes simply about the composition. This main lock equipment

30 is shown to Fig.11 by the simple substance. The electric motor 32 with which this main lock equipment 30 was attached to the end of the base 36 of L form, and this base 36, The pinion gear 32a rotated with this electric motor 32, and the driving lever 33 which has the sector-gear part 33a clenched by this pinion gear 32a, The lock direction (the graphic display counter clockwise direction) which engaged with the shift lever 34 supported by this driving lever 33 pivotable focusing on the pivot 34a and the engagement part 34b provided to the rotation end side of this shift lever 34, and was shown by a figure Nakaya seal is equipped with the latch 35 who rotates forcibly. The driving lever 33 is supported by the base 36 rotatable focusing on the pivot 33b, and the latch 35 is supported by the base 36 pivotable focusing on the pivot 35a. The lock groove 35b of U type is formed in the latch 35, and the opening side of this lock groove 35b will be in the state where it was turned to the window part 36a provided at the base 36, in the state where this latch 35 is placed at an unlocked position. The striker 11 enters the latch's 35 lock groove 35b through this window part 36a so that it may describe below.

[0017]In the rise starting position of the battery mounting part 61, if Battery Unit 1 goes up with the lift function of the carrying truck 50, The lock groove 35b of the latch 35 of the main lock equipment 30 with which each striker 11 provided to the battery carrier 10 corresponds enters, the appropriate back this striker 11 abuts the side part of the lock groove 35b, and this latch 35 is pushed on a lock direction. As described above, each striker 11 enters the latch's 35 lock groove 35b through the window part 36a of the base 36. The striker 11 which entered the lock groove 35b rotates the latch 35 to a lock direction by moving further with a rise of Battery Unit 1 concerned, after abutting the side part of this lock groove 35b. The latch sensor (not shown) which detects this latch's 35 angle of rotation is included in the latch's 35 rotation center (pivot 35a). This latch 35 is energized by the twist spring which carried out figures omitted abbreviated in the unlocking direction (direction which is clockwise direction in Fig.11 and makes the opening side of the lock groove 35b approach the window part 36a). For this reason, by pushing the edge of the lock groove 35b by the striker 11, the latch 35 resists the above-mentioned energization force, and rotates towards an imperfect locking position and also a complete lock position from an unlocked position. If the latch 35 does definite angle rotation from an unlocked position and reaches an imperfect locking position, this will be detected by a latch sensor and the electric motor 32 will start in this stage.

[0018]If the electric motor 32 starts, the driving lever 33 will rotate to clockwise direction in Fig.11 through engagement with the pinion gear 32a and the sector-gear part 33a, and, thereby, the pivot 34a of the shift lever 34 will be displaced in a graphic display lower part. Since the relative rotating to the driving lever 33 of the shift lever 34 is restricted in this stage by the cancel lever which carried out figures omitted abbreviated, The engagement part 34b of the shift lever 34 is displaced in a graphic display lower part by rotation of the graphic display clockwise direction of the driving lever 33, and thereby, the latch 35 rotates from an imperfect locking position forcibly to a lock direction, and reaches a complete lock position. Battery Unit 1 and the striker 11 which went up with the lift function of the carrying truck 50 are made for a motion of the striker 11 and Battery Unit 1 to be moved in the direction further pulled up upward to the

main lock equipment 30 at this time by the latch 35 forcible rotation. that it is forcible about movement from the latch's 35 imperfect locking position to a complete lock position, It says that the latch 35 moves positively the electric motor 32 which is an original transportation device as a driving source rather than moves by movement of the striker 11 (pushed on the striker 11), and moves the striker 11 to a complete lock position as a result. In this embodiment, the electric circuit of the main lock equipment 30-30 is connected, and after all four latches 35 arrive at an imperfect locking position, the electric motor 32 starts it. In this way, by rotating the latch 35 from an imperfect locking position to a complete lock position forcibly, It hangs to the battery fixing position where each striker 11 was locked by secession impossible from the latch's 35 lock groove 35b, and Battery Unit 1 was along the floor line of the vehicles 60 by extension, and is held in the state.

[0019]The latch lock lever 37 is attached to the latch's 35 graphic display bottom rotatable. Spring energization of this latch lock lever 37 is carried out in the direction close to the latch 35. The imperfect lock claw part 35c and the perfect lock claw part 35d are formed in the latch's 35 lower part, If the above-mentioned latch lock lever 37 engages with the imperfect lock claw part 35c, the latch 35 will be held in an imperfect locking position, and if the latch lock lever 37 engages with the perfect lock claw part 35d, the latch 35 will be held in a complete lock position. By holding the latch 35 by the latch lock lever 37 in a complete lock position, as described above, Battery Unit 1 is firmly attached to the battery fixing position along the floor line of the vehicles 60. If the latch 35 is locked by the complete lock position, this will be detected by a latch sensor, The electric motor 32 is reversed based on this, the driving lever 33 rotates in the counter clockwise direction in Fig.11, the engagement part 34b of the shift lever 34 is displaced by this in the direction which keeps away from a latch, and the engagement state of this shift lever 34 and the latch 35 is released. The driving lever 33 and the shift lever 34 return to an initial position in this stage.

[0020]On the other hand, the latch lock lever 37 is rotated in the direction which secedes from the latch 35 by rotation to the unlocking direction of the lock release lever 38 supported rotatable at the base 36, and, thereby, a locked state is released in the latch's 35 complete lock position. In this way, as the locked state by the latch lock lever 37 was released and being described above, when the driving lever 33 and the shift lever 34 have returned to the initial position, The latch 35 will be in a rotatable state from a complete lock position towards an unlocked position, and, thereby, will be in a dismountable state about Battery Unit 1. The rotation to the unlocking direction of the above-mentioned lock release lever 38 is made by operating the Locke canceling switch 39 (refer to Fig.2) arranged on the vehicles 60. The wire (not shown) for release operation is connected to the lock release lever 38 of each main lock equipment 30, and each wire moves with the actuator which carried out figures omitted abbreviated. Each actuator operates simultaneously by operating the above-mentioned Locke canceling switch 39, the lock release lever 38 of four pieces of the main lock equipment 30-30 moves in the unlocking direction simultaneously by this, and lock release of these main lock equipment 30-30 is carried out. Since Battery Unit 1 (and carrying truck 50) leans to the vehicles 60, for example by the inclination of

the road surface G according to these main lock equipment 30-30, Even if it is a case where Battery Unit 1 inclines and goes up to a fixing position, and the position of the strikers 11-11 to the main lock equipment 30-30 varies as a result, Since this latch 35 will rotate forcibly to a complete lock position if each striker 11 contacts the latch 35 and this latch 35 rotates to an imperfect locking position at least, Locke is reliably made about four pieces of all the main lock equipment 30-30.

[0021]Next, while Battery Unit 1 is locked by this battery fixing position with the main lock equipment 30-30 as described above when Battery Unit 1 reaches a battery fixing position, It attaches that this Battery Unit 1 went up to this battery fixing position, and it is detected by the localization sensor 25. method ** of penetration of both the aforementioned guide wall parts 20 and 21 -- the above-mentioned fixing position confirmation sensor 25 is substantially attached to the position of middle via the bracket 26, respectively. The same sensor as the aforementioned rise starting position confirmation sensor 23 is used also for this fixing position confirmation sensor 25, and it has the detection part 25a which makes the cylinder-shaped supporter 25b and the sphere held at the tip of this supporter 25b so that frequent appearance was pivotable and possible.

[0022]On the other hand, the detection plates 18 and 18 are attached to the side part of the battery carrier 10 of Battery Unit 1. For this reason, if Battery Unit 1 goes up to a battery fixing position as shown in Fig.9, The detection plate 18 abuts the detection parts 25a and 25a of both the fixing position confirmation sensors 25 and 25, respectively, these detection parts 25a and 25a are pushed in in the supporter 25b, respectively, and, thereby, both the fixing position confirmation sensors 25 and 25 turn on. It attaches to both the fixing position confirmation sensors 25 and 25, and the localization lamp 27 is connected. If both the fixing position confirmation sensors 25 and 25 turn on, this fixing position confirm lamp 27 will be switched off. on the other hand -- or attaching in the state of OFF of both fixing position confirmation sensors 25 and 25, the localization lamp 27 lighting up, and Battery Unit 1 carrying out a position shift to a fixing position, or being removed from a fixing position is reported. Each electric motor 32 of the above-mentioned fixing position confirmation sensors 25 and 25, the fixing position confirm lamp 27 and the aforementioned rise starting position confirmation sensors 23 and 23, the rise starting position confirm lamp 24, and also the aforementioned main lock equipment 30-30, It operates as a power supply and the auxiliary battery 64 carried in the vehicles 60 separately from Battery Unit 1 concerned is turned on.

[0023]The receptacle components 72 and 72 which constitute the shakiness prevention means 70 for preventing shakiness of Battery Unit 1 in an attachment state are attached to both the guide wall parts 20 and 21. both the receptacle components 72 and 72 -- respectively -- the approach direction (cross direction) of the guide wall parts 20 and 21 -- it is a center substantially, and via the bracket 74, it opposes mutually and is attached to the position corresponding to the aforementioned reliance components 71 and 71. Both the receptacle components 72 and 72 are attached so that it may project over the inner surface side of the guide wall parts 20 and 21. Both these receptacle components 72 and 72 are manufactured considering the urethane rubber which

has respectively appropriate elasticity as a material. The inclined plane 72a which inclines to the attaching direction (direction which goes upwards) of Battery Unit 1 in the direction of an acute angle (direction which goes up toward an inner direction) is formed in the lower surface side of both the receptacle components 72 and 72, respectively (refer to Fig.14). As described above, this receptacle component 72 and the reliance component 71 provided to the battery carrier 10 constitute the shakiness prevention means described in Claims. Shakiness of Battery Unit 1 of an attachment state is prevented or inhibited by this shakiness prevention means.

[0024]In this embodiment, a shakiness prevention means acts as follows. If it is made to go up after making Battery Unit 1 advance into the under floor of the vehicles 60 using the carrying truck 50, both the reliance components 71 and 71 will approach the receptacle components 72 and 72 gradually with a rise of Battery Unit 1. On the other hand, it advances into the lock groove 35b of the main lock equipment 30 with which each striker 11 corresponds with a rise of Battery Unit 1, and, thereby, each latch 35 begins to rotate from an unlocked position to an imperfect locking position. If the electric motor 32 starts in each main lock equipment 30 and the latch 35 begins to rotate to a complete lock position, Battery Unit 1 will go up and touch with the base plate 51 of the carrying truck 50 will be lost. In this stage, the reliance surfaces 71a and 71a of both the reliance components 71 and 71 are pressed against the receptacle surfaces 72a and 72a of the receptacle components 72 and 72 which oppose, respectively. If the reliance component 71 wins popularity and it is pressed against the component 72, both will do elastic deformation. Thus, where Battery Unit 1 is completely attached to the battery mounting part 61, The reliance surfaces 71a and 71a of both the reliance components 71 and 71 by the side of Battery Unit 1 are pressed against the receptacle surface 72a of the receptacle component 72 by the side of the battery mounting part 61, respectively, and, thereby, shakiness of Battery Unit 1 is prevented or inhibited.

[0025]Next, in the state where it was attached to the battery fixing position, Battery Unit 1 has a fail safe function so that it may not fall, even if the main lock equipment 30-30 unlocks by malfunction etc. As shown in Fig.3 and Fig.12, the fail-safe locking devices 40 and 40 are attached to two places, the front face of an approach direction of the battery carrier 10, and a rear face. Below both these fail-safe locking devices 40 and 40, the lock release stick 41 for releasing that locked state is arranged. The details of this fail-safe locking device 40 and the lock release stick 41 are shown in Fig.14 and Fig.15. It is attached to the approach direction longitudinal dimension of the battery carrier 10 so that the bases 42 and 43 of two steps of upper and lower sides may project to the side, respectively. The fail-safe locking device 40 is attached on the upper upper bases 42, and the lock release stick 41 is supported by the lower lower base 43 so that up-and-down motion is possible.

[0026]First, the fail-safe locking device 40 is provided with the base 44 and the lock body 46 supported up and down focusing on the pivot 45 to this so that tilting was possible. The lock body 46 is energized by the lock direction (in a figure, it is the counter clockwise direction) with the spring (for example, twist spring (not shown)) with which the surroundings of the pivot 45 were equipped. The two lock pins 47 and 47 are provided movable by the base 44 in the plane

direction (graphic display right and left directions) of this base 44. While retreating to the lock release position of the method of the graphic display right if the insertion amount of the lock release stick 41 to the lock release hole 44a provided on the lower surface of the base 44 is largely carried out as shown in [Fig.15](#) (if it is made to move upwards to the base 44 in [Fig.15](#)), these lock pins 47 and 47, If the insertion amount to the lock release hole 44a of the lock release stick 41 is made small as shown in [Fig.14](#), it will move to the locking position of a graphic display left according to spring energization force (if it is made to move below to the base 14 in [Fig.14](#)). About the composition which makes the lock pins 47 and 47 move by the size of the insertion amount of the lock release stick 41, Since it is technology this kind of not only locking device but publicly known, do not explain in full detail, but the tip of the lock release stick 41 is formed in the shape of semi-spherical, It has composition which converts up-and-down motion of the lock release stick 41 to movement to the right and left directions of both the lock pins 47 and 47 by slide contact operation with this semi-spherical shaped part 41a and the inclined plane provided to both the lock pin 47 and 47 side.

[0027]On the other hand, the lock holes 46a and 46a where both the above-mentioned lock pins 47 and 47 are inserted are formed in the lower part by the side of the rotation tip of the lock body 46 (graphic display left end surface side). As shown in [Fig.14](#), where the lock pin 47 is fitted over both the lock holes 46a and 46a, respectively, The lock body 46 will be in the state where it was locked by rotation impossible, in the unlocking direction (in a figure, it is clockwise direction), If the insertion amount to the lock release hole 44a of the lock release stick 41 is carried out largely and both (inserting deeply) the lock pins 47 and 47 are retreated as described above, this lock body 46 will become rotatable in the unlocking direction focusing on the pivot 45.

[0028]Next, the lock release stick 41 is supported up and down by the insertion hole 43a and the above-mentioned lock release hole 44a of the lower base 43 movable. Between the insertion hole 43a and the lock release hole 44a, the snap ring 41b is attached at this lock release stick 41, and, thereby, the downward slip off stop of this lock release stick 41 is made. The sleeve 42a is attached between the upper bases 42 and the lower base 43, and the lock release stick 41 is inserted in the inner circumference side of this sleeve 42a. The head 48 of the disc shape projected largely is attached to the side rather than the lock release stick 41 at the lower end part of the lock release stick 41. The compression spring 49 is interposed between this head 48 and lower base 43. The lock release stick 41 is energized by this compression spring 49 in the direction (graphic display lower part) which makes small the insertion amount to the lock release hole 44a. As shown in [Fig.14](#), when the plug to the lock release hole 44a of the lock release stick 41 is in a shallow state, length, a position, etc. of this lock release stick 41 are set up so that the head 48 may project caudad rather than the lower surface of the battery carrier 10. The locking roller 46b is attached to the upper part by the side of the rotation tip of the lock body 46 pivotable. Axis of rotation of this locking roller 46b is set up in parallel with the rotating shaft line (axis line of the pivot 45) of the lock body 46. On the other hand, corresponding to both the above-mentioned fail-safe locking devices 40 and 40, the lock brackets 66 and 66 (pulling credit

part) of U type are attached to the lower surface side of the floor line 65 of the vehicles 60.

[0029]According to the fail-safe locking devices 40 and 40 and the Locke release rods 41 and 41 which were constituted in this way. As shown in Fig.15, where Battery Unit 1 is placed on the base plate 51 of the carrying truck 50, By the head 48 of the Locke release rod 41 abutting the upper surface of the base plate 51 in each fail-safe locking device 40, and this lock release stick 41 resisting the compression spring 49, respectively, and pushing it on the upper part, the plug to the lock release hole 44a of this lock release stick 41 is deeper. As described above in this state, while both the lock pins 47 and 47 resist spring energization force, retreat in the unlocking direction and are extracted from the lock holes 46a and 46a, The point (semi-spherical shaped part 41a) of the Locke release rod 41 is dashed against the lower surface of the lock body 46, and thereby, as the lock body 46 is thrust up by the Locke release rod 41 focusing on the pivot 45, it rotates to an unlocked position. This rotational operation resists spring energization force, and is made. If the lock body 46 rotates to an unlocked position, the locking roller 46b will move and will separate from a centering on pivot 45 circular arc top from the upper part of the lock bracket 66. In this state, the lock function of the fail-safe locking device 40 concerned is not exhibited.

[0030]On the other hand, as shown in Fig.14, Battery Unit 1 is attached to a battery fixing position by the aforementioned main lock equipment 30-30, and in the appropriate back, if the base plate 51 of the carrying truck 50 is dropped, this base plate 51 will separate from the lower surface of the battery carrier 10. For this reason, in each fail-safe locking device 40, the Locke release rod 41 moves below with the compression spring 49, and, thereby, the plug to the lock release hole 44a of this lock release stick 41 becomes shallow. For this reason, the lock body 46 rotates in the graphic display counter clockwise direction focusing on the pivot 45 according to spring energization force, and is returned to a locking position, And both the lock pins 47 and 47 are projected by spring energization force, it is inserted in the lock holes 46a and 46a of the lock body 46, and, thereby, the lock body 46 is held in a locking position. If the lock body 46 is held in a locking position, it will fix to the state where engagement of the locking roller 46b was carried out to the upper surface side of the lock bracket 66, and, thereby, downward displacement (omission) of the battery carrier 10 and by extension, Battery Unit 1 concerned will be prevented. Unless it makes the lower surface of the battery carrier 10 abut the base plate 51 of the carrying truck 50 and the Locke release rods 41 and 41 are moved to it upwards from this, even if the main lock equipment 30-30 is unlocked by malfunction or operation mistake, Battery Unit 1 is still fixed to a battery fixing position via these fail-safe locking devices 40 and 40, and, thereby, troubles, such as unprepared omission, are avoided beforehand.

[0031]When removing Battery Unit 1 attached to the battery fixing position for charge etc., If the base plate 51 of the carrying truck 50 is raised and the lower surface of the battery carrier 10 is made to abut, just before abutting, with the base plate 51, the head 48 of the lock release stick 41 will be pushed upwards, and this lock release stick 41 will move upwards (the unlocking direction). If the lock release stick 41 moves upwards, while the insertion amount to the lock release hole 44a of this lock release stick 41 becomes largely, the lock pins 47 and 47 will retreat and the lock body 46 will become rotatable to an unlocked position by this, Since the lower

surface of the lock body 46 is pushed up upwards by the tip (semi-spherical shaped part 41a) of the lock release stick 41, the lock body 46 rotates forcibly to an unlocked position. If the lock body 46 rotates to an unlocked position, the locking roller 46b will separate from the lock bracket 66 by the side of the vehicles floor line 65, and the locked state by the fail-safe locking devices 40 and 40 concerned will be released. According to the fail-safe locking devices 40 and 40 of the above thing to this embodiment. While a locked state is automatically released by the act (usual act which removes Battery Unit 1 and which is performed for accumulating) which makes the lower surface of the battery carrier 10 abut, the base plate 51 of the carrying truck 50, Since it will be in a locked state automatically by the act (usual act which attaches Battery Unit 1 to a battery fixing position and which is performed for accumulating) which the base plate 51 of the carrying truck 50 is dropped, and is made to separate from the lower surface of the battery carrier 10, the lock unlocking operation by a worker is unnecessary at all.

[0032]According to the fitting structure of Battery Unit 1 of this embodiment constituted as mentioned above, shakiness of Battery Unit 1 of an attachment state is prevented or inhibited by the shakiness prevention means provided separately from the Battery Unit attaching means which makes a subject the main lock equipment 30-30. Therefore, for example in the main lock equipment 30, make small clearance over the striker 11 of the lock groove 35a, or the latch's 35 exaggerated stroke is made small, Shakiness of Battery Unit 1 can be prevented or inhibited, without inhibiting positive holding of the striker 11, or the smooth penetration operation to the lock groove 35a of the striker 11. Shakiness of Battery Unit 1 can be prevented with the easy and inexpensive composition which makes the receptacle component 72 provided to the battery mounting part 61 side abut the reliance component 71 provided to the Battery Unit 1 side. Since the reliance surface 71a of the reliance component 71 and the receptacle surface 72a of the receptacle component 72 incline to the attaching direction of Battery Unit 1, respectively, not only shakiness of the attaching direction of Battery Unit 1 but shakiness of the direction which intersects perpendicularly with an attaching direction can be prevented. And the reliance surface 71a and the receptacle surface 72a incline in the direction of an acute angle to the attaching direction of Battery Unit 1. According to this, in the stage where the latches 35-35 rotate from an imperfect locking position forcibly to a complete lock position, and Battery Unit 1 is lifted, Since popularity is won with the reliance surface 71a and Battery Unit 1 is guided by slide contact operation of the surface 72a at a fixed position, the variation in the fixing position of Battery Unit 1 can be inhibited (positioning function of Battery Unit 1).

[0033]Change can be variously added to the embodiment described above. For example, although the composition which forms the inclined plane (the reliance surface 71a, the receptacle surface 72a) which wins popularity with the reliance component 71 and inclines to the attaching direction of Battery Unit 1 to the both sides of the component 72 was illustrated, an inclined plane is good also as composition formed only in either. It is good also as the level surface or the parallel vertical plane which wins popularity with the reliance surface 71a of the reliance component 71, and intersects perpendicularly the both sides of the receptacle surface 72a of the component 72 not to an inclined plane but to the attaching direction of Battery Unit 1. If a

reliance surface and a receptacle surface are the level surface, shakiness of the vertical direction of Battery Unit 1 will be prevented, and if it is a vertical plane, shakiness of the forward/rearward direction of Battery Unit 1 will be prevented. The position which provides a reliance component and a receptacle component can be changed, for example before and behind the approach direction of the battery carrier 10 and the battery mounting part 61, and may be provided to approach direction right and left and order. Therefore, the shakiness prevention means 70 (the one reliance component 71 and the one receptacle component 72 should put together) is good also as composition which can be arranged with balance sufficient to two or more places, and is provided only to one place depending on the case. However, as for a shakiness prevention means, it is preferable to arrange in a symmetrical position to the center of Battery Unit 1 in the state where it attached from a viewpoint attached with sufficient balance, without inclining Battery Unit 1. It is good also as a product made of urethane rubber which has elasticity for either the reliance component 71 or the receptacle component 72. A damper may be used for either the reliance component 71 or the receptacle component 72. although it guessed as a reliance part and the surface 71a was illustrated, it is not necessary to be necessarily a surface for example, the corner of the reliance component 71 is received, and a surface is made to abut -- it may constitute.

[0034]Although the case where Battery Unit 1 was attached to the under floor of the vehicles 60 was illustrated, it can apply, also when storing a battery to the inside of the suitcase of the vehicles 60, the bottom of an indoor sheet, or a loading platform and a roof. While providing the locking devices 31 and 32 to the battery mounting part 61, the composition which provides the strikers 11-11 on the carrier 10 of Battery Unit 1 was illustrated, but it is good also as composition which provides a striker to the battery mounting part 61 conversely, and attaches a locking device to the Battery Unit 1 side. Although the case where Battery Unit 1 was made to advance from the side of vehicles was illustrated, it is applicable to the case where Battery Unit 1 is made to advance from the rear part or front part of vehicles to a vehicles under floor, similarly. After making Battery Unit 1 advance horizontally, the composition attached by making it go up was illustrated, but it is also applicable to the fitting structure of the pullout-type type which attachment completes only by horizontal slide operation. Although Battery Unit 1 attached to vehicles was illustrated, when attaching Battery Unit to the battery mounting object thing of others, such as a machine, for example, it can apply widely. After all four latches 35 arrived at the imperfect locking position, made it the electric motor 32 start about the case where Battery Unit 1 is attached, but. It is good also as composition which makes four latches 35 electrically independent respectively, and makes the order which arrived at the imperfect locking position start the electric motor 32 sequentially.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a figure showing the embodiment of the present invention, and is a figure

showing stored signs which act as Noboru Gokami that Battery Unit was made to advance into an under floor from the vehicles side using a carrying truck. This figure is a figure seen from the front of vehicles.

[Drawing 2]It is a perspective view showing signs that place Battery Unit on a carrying truck and it is made to advance into the battery mounting part of a vehicles under floor.

[Drawing 3]It is a perspective view showing alone Battery Unit which carries two or more batteries in a carrier.

[Drawing 4]A guide roller is a figure showing the state where abutted the guide wall part and the position of Battery Unit was restricted.

[Drawing 5]After making Battery Unit placed on the carrying truck advance into a battery mounting part, it is a side view showing the state where it was made to go up to a fixing position. This figure is a figure seen from the front of vehicles.

[Drawing 6]It is a figure showing a situation just before Battery Unit advances into a battery mounting part and reaches a rise starting position. This figure is a figure seen from the vehicle front.

[Drawing 7]Battery Unit is a figure showing the stage which advanced into the battery mounting part and reached the rise starting position. This figure is a figure seen from the vehicle front.

[Drawing 8]Battery Unit is a figure showing the condition of Saki who goes up in the rise starting position of a battery mounting part. This figure is a figure seen from the side of vehicles.

[Drawing 9]It is a figure showing the state where Battery Unit went up to the fixing position. This figure is a figure seen from the side of vehicles.

[Drawing 10]It is a figure showing the state where the striker engaged with main lock equipment and it acted to the fixing position as Locke of Battery Unit. This figure is a figure seen from the side of vehicles.

[Drawing 11]It is a perspective view of a main lock equipment simple substance.

[Drawing 12]It is a figure showing signs that the base plate of the carrying truck abutted the lower surface of Battery Unit attached to the fixing position, and the fail-safe locking device was released by this. This figure is a figure seen from the front of vehicles.

[Drawing 13]It is a side view of a shakiness prevention means, and is a side view showing the state where the reliance component won popularity and it was pressed against the component.

[Drawing 14]It is a side view showing the locked state of a fail-safe locking device.

[Drawing 15]It is a side view showing the unlocked state of a fail-safe locking device.

[Explanations of letters or numerals]

1 -- Battery Unit

10 -- A battery carrier, B -- Battery

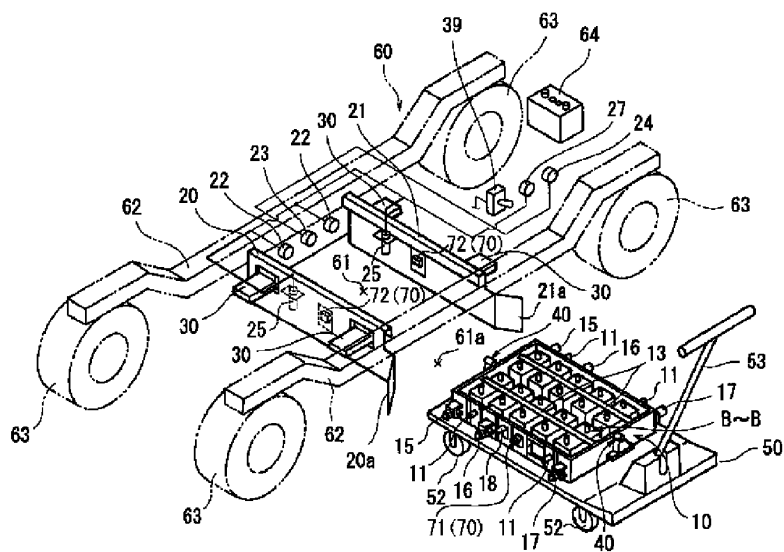
15-17 -- Guide roller

20, 21 -- A guide wall part, 20a, 21a -- Guidance taper part

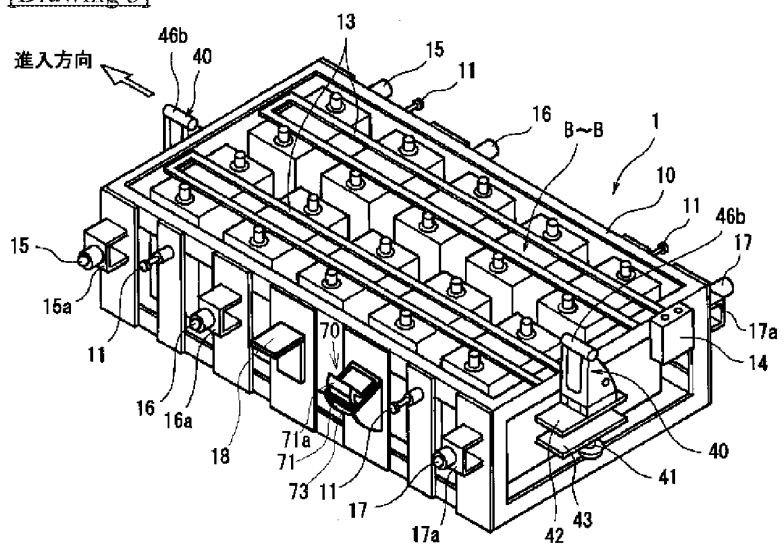
22 -- Stopper

23 -- Rise starting position confirmation sensor

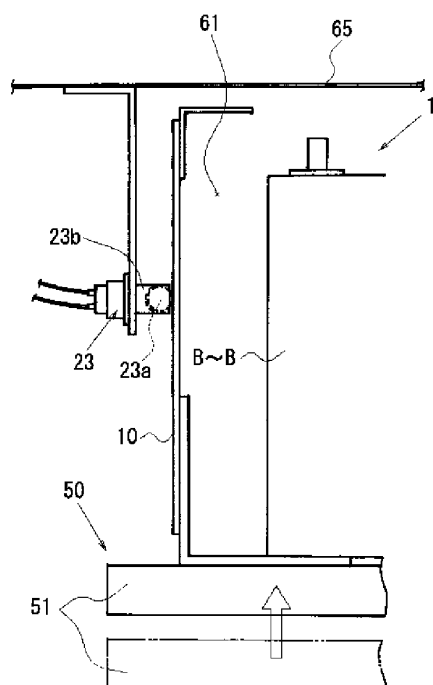
24 -- Rise starting position confirm lamp



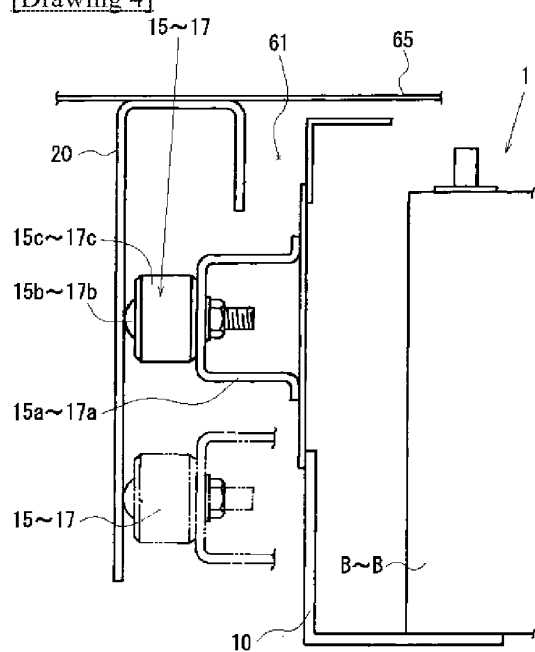
[Drawing 3]



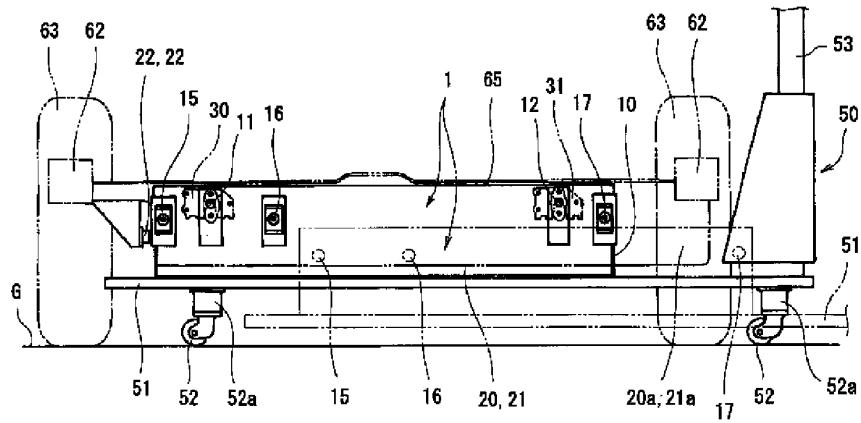
[Drawing 7]



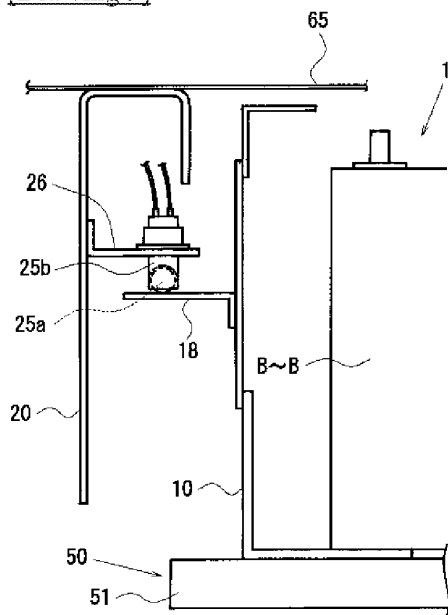
[Drawing 4]



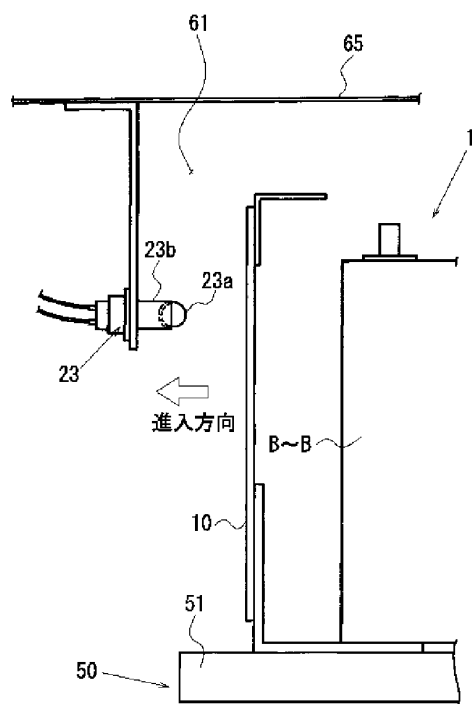
[Drawing 5]



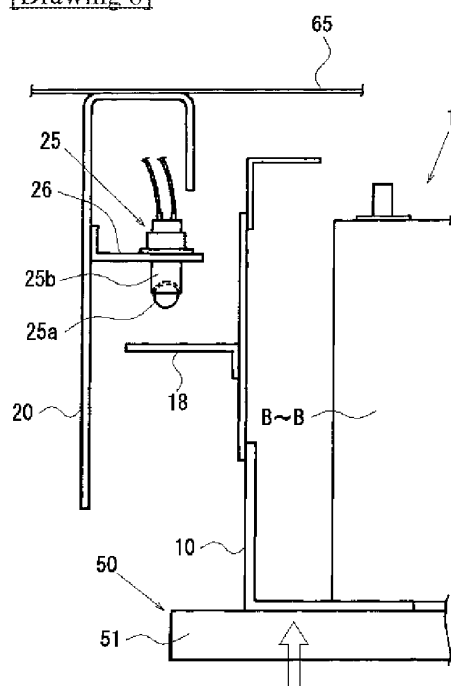
[Drawing 9]



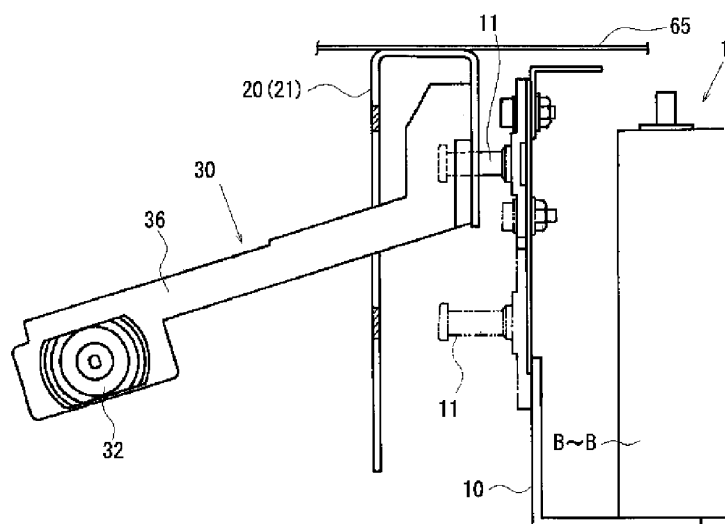
[Drawing 6]



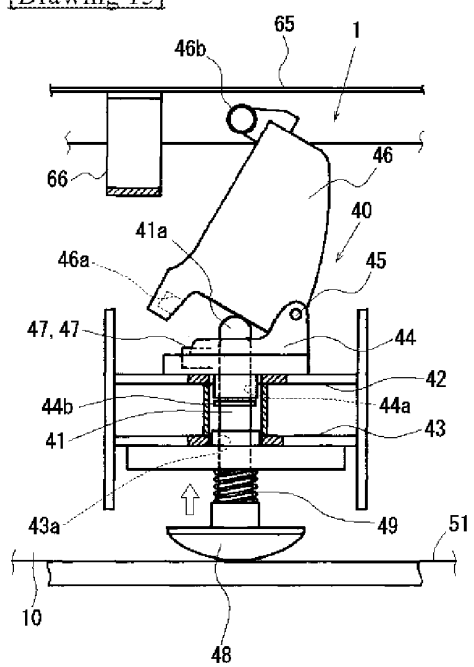
[Drawing 8]



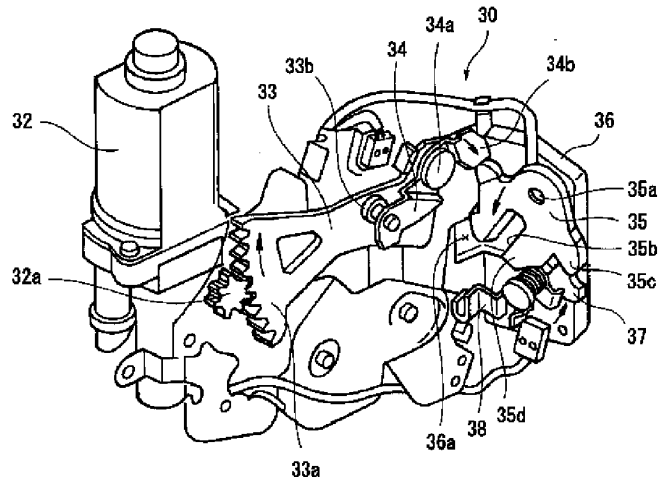
[Drawing 10]



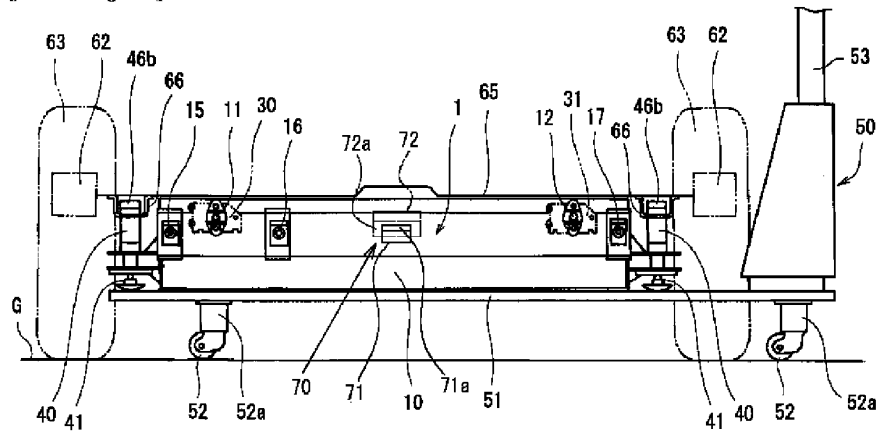
[Drawing 15]



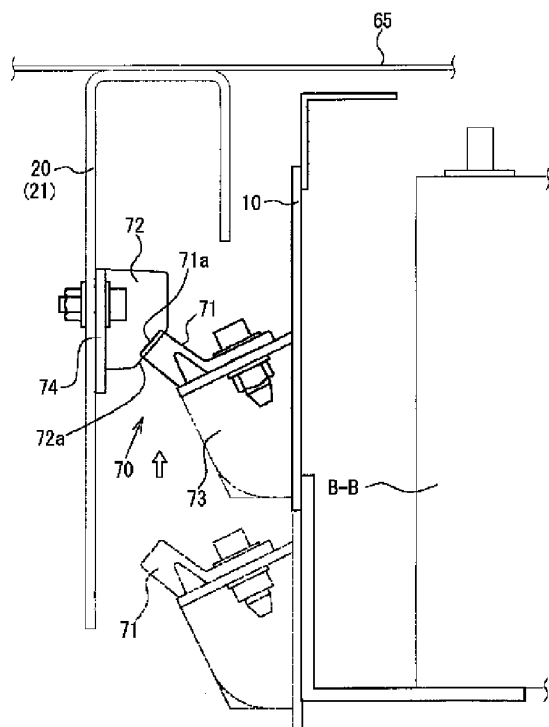
[Drawing 11]



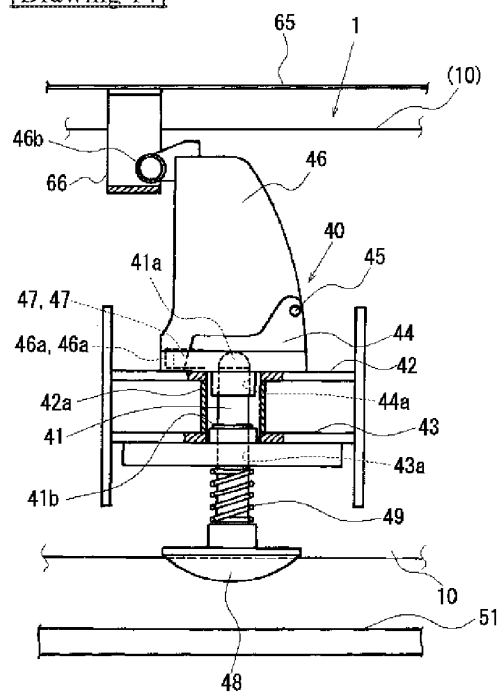
[Drawing 12]



[Drawing 13]



[Drawing 14]



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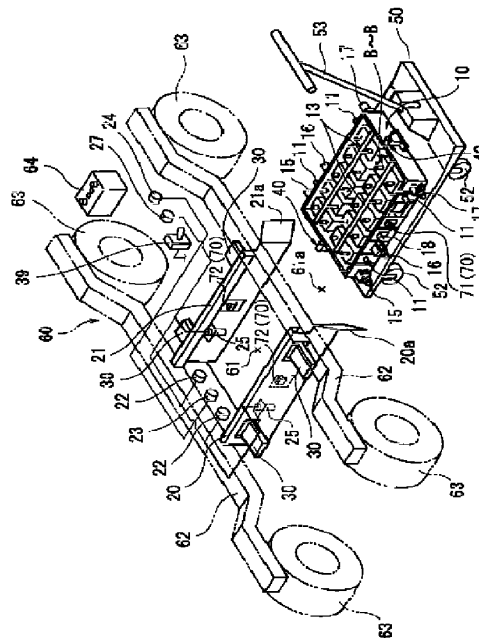
Fターム(参考) 3D035 AA02 AA06 BA01

(54) 【発明の名称】 バッテリー装置の取り付け構造

(57) 【要約】

【課題】 電気自動車の床下に、ロック装置を用いてバッテリー装置を取り付ける構造において、従来ロック装置のオーバーストローク等によりバッテリー装置ががたつく問題があった。本発明では、ロック装置によりバッテリー装置を床下に楽に取り付けることができるとともに、取り付けたバッテリー装置が走行時等になたつかないようにするための取り付け構造を提供することを目的とする。

【解決手段】 バッテリー装置1側に弾性を有する当て部材71、71を設け、バッテリー取り付け部61側に弾性を有する受け部材72、72を取り付けて、バッテリー装置1をバッテリー取り付け部61に取り付けると、当て部材71が受け部材72に押し当てられて、バッテリー装置1のがたつきが防止される構成とする。



【特許請求の範囲】

【請求項1】 バッテリー取り付け部またはバッテリー装置の一方に取り付けられたロック装置と、他方に取り付けられ、前記ロック装置に保持されるストライカを備えた取り付け手段を介して前記バッテリー装置を前記バッテリー取り付け部に取り付けるための構造であって、前記取り付け手段とは別に、取り付け状態におけるバッテリー装置のがたつきを防止するためのがたつき防止手段を備えたバッテリー装置の取り付け構造。

【請求項2】 請求項1記載のバッテリー装置の取り付け構造であって、
がたつき防止手段は、前記バッテリー取り付け部に設けられ、前記バッテリー装置の取り付け方向に対して傾斜する受け面と、前記バッテリー装置に設けられ、前記受け面に当接可能な当て部を備え、前記受け面または前記当て部の少なくとも一方は弾性部材を用いて、前記バッテリー装置の取り付け状態において前記受け面に前記当て部を当接させて前記バッテリー装置のがたつきを防止する構成としたバッテリー装置の取り付け構造。

【請求項3】 請求項2記載のバッテリー装置の取り付け構造であって、
当て部として、受け面とほぼ平行な当て面を設けた構成としたバッテリー装置の取り付け構造。

【請求項4】 請求項2または3記載のバッテリー装置の取り付け構造であって、受け面を、バッテリー装置の取り付け方向に対して鋭角方向に傾斜させたバッテリー装置の取り付け構造。

【請求項5】 請求項1～4のいずれかに記載したバッテリー装置の取り付け構造であって、ロック装置は、ストライカを離脱不能に保持するラッチを備え、該ラッチは、アンロック位置と不完全ロック位置と完全ロック位置との間を切り換え可能に設けられ、前記バッテリー装置の移動に伴い前記ストライカに押されて前記アンロック位置から前記不完全ロック位置へ切り換えられ、該不完全ロック位置に至ると前記完全ロック位置まで強制的に移動して前記ストライカを離脱不能に保持する構成としたバッテリー装置の取り付け構造。

【請求項6】 請求項5記載のバッテリー装置の取り付け構造であって、ラッチは不完全ロック位置に至ると電動モータを駆動源として完全ロック位置まで移動する構成としたバッテリー装置の取り付け構造。

【請求項7】 請求項1～6のいずれかに記載したバッテリー装置の取り付け構造であって、上方へ移動させて取り付けたバッテリー装置の取り付け構造。

【請求項8】 請求項1～7のいずれかに記載したバッテリー装置の取り付け構造であって、車両の床に沿って取り付けたバッテリー装置の取り付け構造。

【請求項9】 請求項1～8のいずれかに記載したバッテリー装置の取り付け構造を備えた車両。

【請求項10】 バッテリー取り付け部またはバッテリー装

置の一方に取り付けられたロック装置と、他方に取り付けられ、前記ロック装置に保持されるストライカを備えた取り付け手段を介して前記バッテリー装置を前記バッテリー取り付け部に取り付けるための方法であって、
前記バッテリー取り付け部に、前記バッテリー装置の取り付け方向に対して傾斜する受け面を設ける一方、前記バッテリー装置に、前記受け面に当接可能な当て部を設け、前記受け面または前記当て部の少なくとも一方は弾性部材を用いて、前記バッテリー装置の取り付け状態において前記受け面に前記当て部を当接させて前記バッテリー装置のがたつきを防止する構成としたバッテリー装置の取り付け方法。

【請求項11】 請求項11記載のバッテリー装置の取り付け方法であって、当て部として、前記受け面にほぼ平行な当て面を用いる構成としたバッテリー装置の取り付け方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、例えば電気自動車やいわゆるハイブリッドカー等の車両に好適なバッテリー装置の取り付け構造に関する。

【0002】

【従来の技術】従来、車両のバッテリー装置の取り付け構造に関する技術として、例えば特開平11-180164号公報に開示されているように、電気自動車の車体底部に沿ってバッテリー装置をボルト・ナットにより固定する形態のものが提供されていたが、この取り付け構造では、脱着作業にあたって床下にしゃがみ込む等の窮屈な姿勢を強いられるため作業が面倒になる問題があった。そこで、従来例えば特開昭47-36412号公報に開示されているように、バッテリー装置側にストライカを設ける一方、車両の床下に設けたバッテリー取り付け部にロック装置を設け、バッテリー装置を床下に進入させた後、上昇させて、各ストライカを対応するロック装置に保持させて該バッテリー装置をバッテリー取り付け部に取り付ける構成とした取り付け構造が開示されている。このロック装置を用いた取り付け構造によれば、ボルト・ナットを用いて取り付ける場合に比してより簡単な作業で確実にバッテリー装置を取り付けることができた。

【0003】

【発明が解決しようとする課題】しかしながら、上記従来のロック装置式の取り付け構造によれば、次のような問題があった。すなわち、ロック装置として、ストライカを進入させるロック溝を備えたラッチを回転させてストライカを離脱不能に保持する構成のものをを用いた場合、ラッチによりストライカを確実に保持させるため、ラッチの動きにはいわゆるオーバーストロークが設定されており、これが取り付け状態におけるバッテリー装置の僅かながたつき（振動）の原因となっていた。また、ロック時におけるラッチのスムーズな動きを確保し、また

ストライカのロック溝へのスムーズな進入動作を確保するため、ロック溝とストライカとの間には僅かなクリアランスが設定されており、これもバッテリー装置のがたつきの原因となっていた。そこで、本発明は、ボルト・ナットにより取り付ける場合のような手間を掛けることなく、ロック装置により確実に取り付けることができ、しかも取り付け状態におけるバッテリー装置のがたつき（振動、変位）が防止される取り付け構造を提供することを目的とする。

【0004】

【課題を解決するための手段】このため、本発明は、前記各請求項に記載した構成の取り付け構造とした。請求項1記載のバッテリー装置の取り付け構造によれば、ロック装置にストライカを保持させて、バッテリー装置をバッテリー取り付け部に取り付けた状態では、取り付け手段とは別に設けられたがたつき防止手段によりバッテリー装置のがたつきが抑制若しくは防止される。このように、取り付け手段とは別に設けたがたつき防止手段によりバッテリー装置のがたつきが防止されるので、ロック装置における適正なオーバーストロークあるいはクリアランスを確保しつつ、バッテリー装置のがたつきを防止することができる。請求項2または3記載のバッテリー装置の取り付け構造または請求項10または11記載のバッテリーの取り付け方法によれば、バッテリー装置をバッテリー取り付け部に取り付ける段階において、バッテリー取り付け部側の受け面にバッテリー装置側の当て部が当接され、バッテリー装置の取り付け状態においてこの当接状態が維持されてバッテリー装置のがたつきが防止される。このように簡単な構成によりバッテリー装置のがたつきを防止することができる。また、受け面はバッテリー装置の取り付け方向に対して傾斜しているため、バッテリー装置の取り付け方向のがたつきおよび同方向に直交する方向のがたつきを防止することができる。さらに、受け面または当て部の少なくとも一方には弾性部材が用いられているので、異音の発生等の問題を生ずることなく、より確実にバッテリー装置のがたつきを防止することができる。

【0005】請求項4記載のバッテリー装置の取り付け構造によれば、受け面に当て面を当接させることにより、当該がたつき防止手段にバッテリー装置の位置決め機能を持たせることができる。この明細書において、受け面の傾斜方向について、「鋭角方向」とは、バッテリー装置の取り付け方向について前方に至るほど、当該バッテリー装置側に接近する方向をいうものとする。請求項5記載のバッテリー装置の取り付け構造によれば、バッテリー装置をバッテリー取り付け部に接近させることによりストライカがロック装置に接近する。ラッチがアンロック位置に位置する状態のロック装置にストライカが接近し、さらに接近することによりラッチがストライカに押されてアンロック位置から不完全ロック位置まで移動する。ラッチは不完全ロック位置に至ると完全ロック位置まで強制的

に移動し、これによりストライカが当該ロック装置に離脱不能に保持されて、バッテリー装置がバッテリー取り付け部に取り付けられる。

【0006】このようにストライカを保持するラッチが不完全ロック位置から完全ロック位置へ強制的に切り換えられるので、バッテリー装置側の位置を手で調整等することなく、各ストライカが確実にロック装置に保持され、これによりバッテリー装置をバッテリー取り付け部に確実に取り付けることができる。このため、作業者はしゃがみ込んでロック状態を確認する必要なく、また手でバッテリー装置の位置を調整等する必要もないので、この種の作業を楽に行うことができる。また、ラッチが完全ロック位置へ強制的に移動するので、路面に多少の傾きがあり、あるいは凹凸があっても、バッテリー装置がロック装置により所定の位置に確実に取り付けられるので、従来のように車両を移動させる等して作業場所を変更する必要がなく、この点でも取り付け作業を効率よく楽に行うことができる。なお、ラッチの不完全ロック位置から完全ロック位置への切り換えについて、強制的とは、ラッチがストライカの移動により（ストライカに押されて）切り換えられるのではなく、例えば電動モータ等を駆動源とする独自の切り換え手段により積極的に切り換えられ、その結果ストライカを完全ロック位置に移動させることをいう。

【0007】請求項6記載のバッテリー装置の取り付け構造によれば、駆動源としての電動モータを制御することにより適切なタイミングでラッチを不完全ロック位置から完全ロック位置に移動させることができ、このタイミングは制御内容を変更することにより任意に設定することができる。請求項7記載のバッテリー装置の取り付け構造によれば、例えば自動車のボディ下面に沿ってバッテリー装置を取り付ける場合であって、バッテリー装置をハンドリフト等の搬送台車に載置して該搬送台車を移動させることによりバッテリー装置を自動車の床下に進入させた後、上昇させて取り付ける構成とした取り付け構造において、前記各請求項記載の構成による作用効果を得ることができる。請求項8記載のバッテリー装置の取り付け構造によれば、例えばバッテリー装置を自動車の床面に沿ってスライドさせることにより脱着する構成とした取り付け構造において、前記各請求項記載の構成による作用効果を得ることができる。請求項9記載の車両によれば、例えば電気自動車において、前記各請求項に記載した構成による作用効果を得ることができる。

【0008】

【発明の実施の形態】次に、本発明の好適な一実施形態を図1～図15に基づいて説明する。この実施形態では、バッテリー装置1を車両60に取り付ける場合を例示する。従って、本発明は、車両以外に取り付けるバッテリー装置に広く適用することができる。さて、図1および図2は、本実施形態のバッテリー装置1を搬送台車50を

用いて車両60の床下(車両床面65の下側)に取り付ける様子を示している。なお、図2では、車両60のうち、左右サイドメンバー62、62および前後の車輪63～63のみが示されている。このバッテリー装置1は、搬送台車50に載置して作業者がこの搬送台車50を移動させることにより、車両60の床下に設けたバッテリー取り付け部61に車両側方から進入させ、然る後、該バッテリー取り付け部61内において搬送台車50の昇降機能により一定距離だけ上昇させることにより車両60の床面に沿ったバッテリー取り付け位置に吊り下げ状態に取り付けられる。なお、以下の説明において、単に前後方向または左右方向というときは、車両60の方向に合わせていうものとする。まず、搬送台車50は、いわゆるハンドリフト装置であり、これは従来公知のものであって本実施形態において特に変更を要しないが以下簡単に説明する。この搬送台車50は、台板51と、該台板51の下面四隅に取り付けた車輪52～52と、台板51の後部中央に設けたハンドル53を備えている。この搬送台車50は、昇降機能を備えている。図5に示すように各車輪52は、油圧シリンダ52aのロッド先端に回転可能に支持されており、各油圧シリンダ52aが伸縮作動して台板51に対する車輪52～52の突き出し寸法を変更することにより台板51を昇降動させることができる。各油圧シリンダ52aの伸長作動は上記ハンドル53を傾動操作することによりなされる。このため、台板51上にバッテリー装置1を載置してハンドル53を上下に繰り返し傾動操作することにより該バッテリー装置1を昇降させることができる。

【0009】図3には、バッテリー装置1が単体で示されている。このバッテリー装置1は枠体をなすバッテリーキャリア10と該バッテリーキャリア10に保持した10個のバッテリーB～Bを有している。10個のバッテリーB～Bは横2列縦5列に配置されて電気的には直列に接続されており、バッテリーキャリア10の側部に取り付けたコネクタ14に図示省略した電気配線を経て接続されている。各バッテリーBは、押さえフレーム13、13によりこのバッテリーキャリア10内に固定されている。このバッテリー装置1は、図3において矢印で示すようにその左側部からバッテリー取り付け部61内に進入される。以下、バッテリー装置1の進入する方向をバッテリー進入方向という。本実施形態においてこのバッテリー進入方向は、車両前後方向に直交する方向(車幅方向)となっている。従って、本実施形態では、バッテリー装置1は車両60の左側部から進入する。

【0010】バッテリーキャリア10の、バッテリー進入方向に対して左右の側部には、それぞれ3個のガイドローラー15～17と、2本のストライカ11、11が取り付けられている。このガイドローラー15～17が、当該バッテリー装置1の進入方向左右側方の位置を案内するための横方向案内部材の一実施形態に相当する。ガイド

ローラー15～17およびストライカ11～11の働きについては後述する。また、バッテリーキャリア10の左右側部には、取り付け状態におけるバッテリー装置1のたつきを防止するための当て部材71、71がそれぞれブラケット73を介して取り付けられている。両当て部材71、71は、適度な弾性を有するウレタンゴムを素材として製作されており、それぞれ側方へ張り出すように取り付けられている。両当て部材71、71の上部には、それぞれバッテリー装置1の取り付け方向(上方へ向かう方向)に対して鋭角方向(側方に向かって下方向)に傾斜する当て面71aが形成されている。この当て部材71、71と後述する受け部材72、72が、特許請求の範囲に記載したたつき防止手段を構成する。バッテリーキャリア10の、バッテリー進入方向前後の側部には、フェールセーフロック装置40がそれぞれ取り付けられている。このフェールセーフロック装置40、40についても後述する。

【0011】次に、車両60の床下には、バッテリー装置1を収納するためのバッテリー取り付け部61が設けられている。このバッテリー取り付け部61の前側および後側(進入方向左右側方)には案内壁部20、21が設けられている。両案内壁部20、21は、相互に一定の間隔をおいて平行に配置されている。この両案内壁部20、21間の空間部が前記バッテリー取り付け部61となっている。このバッテリー取り付け部61の奥側上部であって車両床面に沿った位置がバッテリー取り付け位置に設定されている。両案内壁部20、21の間隔は、バッテリーキャリア10の左右ガイドローラー15、15(または16、16または17、17)の先端部間の間隔に合わせて設定されている。これにより、当該バッテリー装置1がバッテリー取り付け部61に進入した状態において、左右ガイドローラー15、15(または16、16または17、17)がガタツキなく両案内壁部20、21間に摺接されるようになっている。

【0012】図4に示すように各ガイドローラー15～17には、保持筒15c(16c、17c)の一端側に球体15b(16b、17b)を転動可能にはみ出して保持してなるいわゆる球体ローラーが用いられている。このため、各ガイドローラー15～17は、案内壁部20、21の内面側を任意の方向に転動可能となっている。また、各ガイドローラー15～17は、それぞれブラケット15a、16a、17aを介してバッテリーキャリア10の側部に側方へ突き出すように取り付けられている。両案内壁部20、21の一端側(図2において手前側の端部)には、該一端側がそれぞれ相互に開く方向に折り曲げられてなる案内テーパー部20a、21aが設けられており、この案内テーパー部20a、21a間がバッテリー取り付け部61の進入口61aとなっている。この進入口61aを経てバッテリー装置1をバッテリー取り付け部61に進入させると、まず進入方向前側のガイドロ

ローラー１５，１５が両案内テーパー部２０ａ，２１ａに摺接されることによりバッテリー取り付け部６１に対して当該バッテリー装置１が進入方向左右に案内され、さらに進入させることにより順次ガイドローラー１６，１７が案内壁部２０，２１の内面に摺接されていき、これによりバッテリー装置１の全体がその進入方向左右（車両前後方向）に案内される。このようにバッテリー取り付け部６１の進入口６１ａに案内テーパー部２０ａ，２１ａが設けられていることにより、バッテリー装置１がバッテリー取り付け部６１にスムーズに案内される。

【００１３】両案内壁部２０，２１の高さは、バッテリー装置１を載置した搬送台車５０の台板５１の昇降量に合わせて設定されている。このため、図５に示すように台板５１を最も低い高さ（搬送高さ）に位置させた状態でバッテリー装置１をバッテリー取り付け部６１に進入させた時のみならず、該バッテリー取り付け部６１内において台板５１を上昇させてバッテリー装置１を上昇させる過程においてもガイドローラー１５～１７が常時両案内壁部２０，２１に摺接され、これにより該バッテリー装置１の進入方向左右の位置が、水平方向進入時および上昇時の何れにおいても規制されるようになっている。なお、図示するように両案内壁部２０，２１の下端縁の路面Ｇからの高さは、搬送台車５０の台板５１に干渉しないよう該台板５１を上昇させた状態における該台板５１の上面よりも高い位置に設定されている。

【００１４】次に、図５に示すようにバッテリー取り付け部６１の奥部には、左右一対のストッパ２２，２２が取り付けられている。バッテリー装置１を載置した台板５１を搬送高さに位置させて搬送台車５０を移動させることにより、バッテリー装置１をバッテリー取り付け部６１に進入させると、バッテリーキャリア１０の進入方向前面が上記両ストッパ２２，２２に当接して、それ以上の進入が阻止される。また、図６および図７に示すようにバッテリー取り付け部６１の奥部には、上昇開始位置確認センサ２３が取り付けられている。この上昇開始位置確認センサ２３は、筒体をなす保持体２３ｂと、該保持体２３ｂに回転可能かつ出沒可能に支持された球体をなす検知部２３ａを備えている。搬送台車５０の移動によりバッテリー装置１がバッテリー取り付け部６１内に進入され、最終的に両ストッパ２２，２２にバッテリーキャリア１０の前面が当接すると、上昇開始位置確認センサ２３の検知部２３ａがバッテリーキャリア１０の前面に当接し、これにより該検知部２３ａが押されて保持体２３ｂ内に押し込まれる。この状態が図７に示されている。

【００１５】検知部２３ａが保持体２３ｂ内に押し込まれると、当該上昇開始位置確認センサ２３がオンし、これによりバッテリー装置１が、バッテリー取り付け部６１内に完全に収納され、上昇可能な位置（以下、「上昇開始位置」という）に至ったことが検知される。上昇開始位置確認センサ２３には上昇開始位置確認ランプ２４が接

続されている。この上昇開始位置確認ランプ２４は、上昇開始位置確認センサ２３がオンすると消灯する。また、図７に示すように上昇開始位置確認センサ２３の検知部２３ａは、バッテリー装置１がバッテリー取り付け部６１の上昇開始位置に収納された状態であれば、その高さ位置に関係なく保持体２３ｂ内に押し込まれた状態に保持され、この押し込まれた状態でバッテリーキャリア１０の前面を相対的に転動し、これにより当該上昇開始位置確認センサ２３はオン状態に維持される。このため、上昇開始位置確認ランプ２４は、バッテリー装置１がバッテリー取り付け部６１の上昇開始位置に収納されればその高さ位置に関係なく消灯し、逆にバッテリー装置１がバッテリー取り付け部６１内において上昇開始位置に位置していない状態またはバッテリー取り付け部６１から取り出された状態では点灯する。こうしてバッテリー装置１が上昇開始位置に収納されて上昇開始位置確認ランプ２４の消灯を確認した後、搬送台車５０のハンドル５３を上下に傾動操作して台板５１をリフトさせ、これによりバッテリー装置１を上昇させる。

【００１６】図２に示すように左右の案内壁部２０，２１には、それぞれ進入方向前後に一定の間隔をおいて２つのメインロック装置３０，３０が取り付けられている。この合計４箇所のメインロック装置３０～３０は、それぞれ同じ構成のものが用いられており、前記したバッテリー装置１のストライカ１１～１１に対応して配置されている。本実施形態では、このメインロック装置３０～３０が、特許請求の範囲に記載したロック装置に相当する。このメインロック装置３０には、従来より例えばワンボックスカー等のスライドドア用ドアロック装置として用いられているものが利用されている。以下、その構成について簡単に説明する。図１１にこのメインロック装置３０が単体で示されている。このメインロック装置３０は、Ｌ形のベース３６と、該ベース３６の端部に取り付けられた電動モータ３２と、該電動モータ３２により回転するピニオンギヤ３２ａと、該ピニオンギヤ３２ａに噛み合わされたセクタギヤ部３３ａを有する駆動レバー３３と、該駆動レバー３３に支軸３４ａを中心にして回転可能に支持された作動レバー３４と、該作動レバー３４の回動一端側に設けた係合部３４ｂに係合して図中矢印で示したロック方向（図示反時計回り方向）に強制的に回転するラッチ３５を備えている。駆動レバー３３は支軸３３ｂを中心にしてベース３６に回動可能に支持され、ラッチ３５は支軸３５ａを中心にしてベース３６に回転可能に支持されている。また、ラッチ３５にはＵ字形のロック溝３５ｂが形成されており、該ラッチ３５がアンロック位置に位置する状態ではこのロック溝３５ｂの開口側が、ベース３６に設けた窓部３６ａに向けられた状態となる。以下説明するようにこの窓部３６ａを経てストライカ１１がラッチ３５のロック溝３５ｂに入り込む。

【0017】バッテリー取り付け部61の上昇開始位置において、搬送台車50のリフト機能によりバッテリー装置1が上昇すると、バッテリーキャリア10に設けた各ストライカ11が対応するメインロック装置30のラッチ35のロック溝35bは入り込み、然る後該ストライカ11がロック溝35bの側部に当接して該ラッチ35がロック方向に押される。上記したように各ストライカ11は、ベース36の窓部36aを経てラッチ35のロック溝35bに入り込む。ロック溝35bに入り込んだストライカ11は、該ロック溝35bの側部に当接した後、当該バッテリー装置1の上昇に伴ってさらに移動することによりラッチ35をロック方向へ回転させる。ラッチ35の回転中心（支軸35a）には、該ラッチ35の回転角度を検知するラッチセンサ（図示省略）が組み込まれている。また、このラッチ35は、図示省略した振りばねによりアンロック方向（図11において時計回り方向であってロック溝35bの開口側を窓部36aに接近させる方向）へ付勢されている。このため、ストライカ11によりロック溝35bの縁部が押されることによって、ラッチ35が上記付勢力に抗してアンロック位置から不完全ロック位置さらには完全ロック位置に向けて回転する。ラッチ35がアンロック位置から一定角度回転して不完全ロック位置に至ると、これがラッチセンサにより検知され、この段階で電動モータ32が起動する。

【0018】電動モータ32が起動すると、ヒニオンギヤ32aとセクタギヤ部33aとの噛み合いを通じて駆動レバー33が図11において時計回り方向に回転し、これにより作動レバー34の支軸34aが図示下方に変位する。この段階では作動レバー34の駆動レバー33に対する相対回転が図示省略したキャンセルレバーによって規制されているため、駆動レバー33の図示時計回り方向の回転により作動レバー34の係合部34bが図示下方に変位し、これによりラッチ35が不完全ロック位置からロック方向に強制的に回転して完全ロック位置に至る。この時、ストライカ11およびバッテリー装置1の動きは、搬送台車50のリフト機能により上昇したバッテリー装置1およびストライカ11が、ラッチ35の強制的な回転により、さらにメインロック装置30に対し上方向に引き上げる方向に移動させられることになる。なお、ラッチ35の不完全ロック位置から完全ロック位置までの移動について、強制的とは、ラッチ35がストライカ11の移動により（ストライカ11に押されて）移動するのではなく、独自の移動手段である電動モータ32を駆動源として積極的に移動し、その結果ストライカ11を完全ロック位置に移動させることをいう。また、本実施形態においては、メインロック装置30～30の電気回路はつながっており、4箇所のラッチ35の全てが、不完全ロック位置に達した後、電動モータ32が起動するようになっている。こうしてラッチ35が不完全ロック位置から強制的に完全ロック位置まで回転さ

せられることにより、各ストライカ11がラッチ35のロック溝35bから離脱不能にロックされ、ひいてはバッテリー装置1が車両60の床面に沿ったバッテリー取り付け位置に吊り下げ状態で保持される。

【0019】ラッチ35の図示下側には、ラッチロックレバー37が回転可能に取り付けられている。このラッチロックレバー37はラッチ35に接近する方向にばね付勢されている。ラッチ35の下側には不完全ロック爪部35cと完全ロック爪部35dが形成されており、不完全ロック爪部35cに上記ラッチロックレバー37が係合するとラッチ35は不完全ロック位置に保持され、完全ロック爪部35dにラッチロックレバー37が係合するとラッチ35は完全ロック位置に保持される。ラッチ35がラッチロックレバー37によって完全ロック位置に保持されることにより、上記したようにバッテリー装置1が車両60の床面に沿ったバッテリー取り付け位置に強固に取り付けられる。ラッチ35が完全ロック位置にロックされると、これがラッチセンサにより検知され、これに基づいて電動モータ32が逆転して駆動レバー33が図11において反時計回り方向に回転し、これにより作動レバー34の係合部34bがラッチから遠ざかる方向に変位して該作動レバー34とラッチ35の係合状態が解除される。この段階で駆動レバー33および作動レバー34が初期位置に復帰する。

【0020】一方、ラッチロックレバー37は、ベース36に回転可能に支持したロック解除レバー38のアンロック方向への回転によりラッチ35から離脱する方向に回転し、これによりラッチ35の完全ロック位置でロック状態が解除される。こうして、ラッチロックレバー37によるロック状態が解除され、かつ上記したように駆動レバー33および作動レバー34が初期位置に復帰していることにより、ラッチ35は完全ロック位置からアンロック位置に向けて回転可能な状態となり、これによりバッテリー装置1を取り外し可能な状態となる。上記ロック解除レバー38のアンロック方向への回転は、車両60に配置したロック解除スイッチ39（図2参照）を操作することによりなされる。各メインロック装置30のロック解除レバー38には解除操作用のワイヤ（図示省略）が接続されており、各ワイヤは図示省略したアクチュエータにより移動する。各アクチュエータは上記ロック解除スイッチ39を操作することにより同時に作動し、これにより4箇所のメインロック装置30～30のロック解除レバー38が同時にアンロック方向に移動して該メインロック装置30～30がロック解除される。このメインロック装置30～30によれば、例えば路面Gの傾斜により車両60に対してバッテリー装置1（および搬送台車50）が傾いているために、バッテリー装置1が取り付け位置に対して傾いて上昇し、その結果メインロック装置30～30に対するストライカ11～11の位置がばらついている場合であっても、各スト

イカ11がラッチ35に接触して、該ラッチ35が少なくとも不完全ロック位置まで回転すれば、該ラッチ35が完全ロック位置まで強制的に回転するので、4箇所のメインロック装置30～30の全てについて確実にロックがなされる。

【0021】次に、バッテリー装置1がバッテリー取り付け位置に至ると、上記したようにメインロック装置30～30によりバッテリー装置1が該バッテリー取り付け位置にロックされるとともに、該バッテリー装置1が該バッテリー取り付け位置まで上昇したことが取り付け位置確認センサ25により検知される。前記両案内壁部20、21の進入方向ほぼ中程の位置には、それぞれブラケット26を介して上記取り付け位置確認センサ25が取り付けられている。この取り付け位置確認センサ25にも、前記上昇開始位置確認センサ23と同じセンサが用いられており、筒体形状の保持体25bと、該保持体25bの先端に回転可能かつ出沒可能に保持した球体をなす検知部25aを有している。

【0022】一方、バッテリー装置1のバッテリーキャリア10の両側面には検知板18、18が取り付けられている。このため、図9に示すようにバッテリー装置1がバッテリー取り付け位置まで上昇すると、両取り付け位置確認センサ25、25の検知部25a、25aにそれぞれ検知板18が当接して該検知部25a、25aがそれぞれ保持体25b内に押し込まれ、これにより両取り付け位置確認センサ25、25がオンする。両取り付け位置確認センサ25、25には取り付け位置確認ランプ27が接続されている。両取り付け位置確認センサ25、25がオンすると、この取り付け位置確認ランプ27は点灯する。一方または双方の取り付け位置確認センサ25、25がオフの状態では取り付け位置確認ランプ27が点灯して、バッテリー装置1が取り付け位置に対して位置ズレし、あるいは取り付け位置から外されていることが報知される。上記取り付け位置確認センサ25、25、取り付け位置確認ランプ27および前記上昇開始位置確認センサ23、23、上昇開始位置確認ランプ24、さらには前記メインロック装置30～30の各電動モータ32等は、当該バッテリー装置1とは別に車両60に搭載した補助バッテリー64を電源として作動し、また点灯する。

【0023】また、両案内壁部20、21には、取り付け状態におけるバッテリー装置1のがたつきを防止するためのがたつき防止手段70を構成する受け部材72、72が取り付けられている。両受け部材72、72は、それぞれ案内壁部20、21の進入方向（車幅方向）ほぼ中央であって、前記当て部材71、71に対応した位置にブラケット74を介して相互に対向して取り付けられている。両受け部材72、72は、案内壁部20、21の内面側に張り出すように取り付けられている。この両受け部材72、72は、それぞれ適度な弾性を有するウ

レタンゴムを素材として製作されている。また、両受け部材72、72の下面側には、バッテリー装置1の取り付け方向（上方へ向かう方向）に対して鋭角方向（内方に向かって上る方向）に傾斜する傾斜面72aがそれぞれ形成されている（図14参照）。前記したようにこの受け部材72と、バッテリーキャリア10に設けた当て部材71が、特許請求の範囲に記載したがたつき防止手段を構成している。このがたつき防止手段によって、取り付け状態のバッテリー装置1のがたつきが防止若しくは抑制される。

【0024】本実施形態において、がたつき防止手段は以下のように作用する。搬送台車50を用いてバッテリー装置1を車両60の床下に進入させた後、上昇させると、バッテリー装置1の上昇に伴って両当て部材71、71が徐々に受け部材72、72に接近する。一方、バッテリー装置1の上昇に伴って各ストライカ11が対応するメインロック装置30のロック溝35bに進入し、これにより各ラッチ35がアンロック位置から不完全ロック位置に回転し始める。各メインロック装置30において電動モータ32が起動してラッチ35が完全ロック位置に回転し始めると、バッテリー装置1が上昇して搬送台車50の台板51から浮き上がる。この段階で、両当て部材71、71の当て面71a、71aがそれぞれ対向する受け部材72、72の受け面72a、72aに押し当てられる。当て部材71が受け部材72に押し当てられると両者が弾性変形する。このようにバッテリー装置1がバッテリー取り付け部61に完全に取り付けられた状態では、バッテリー装置1側の両当て部材71、71の当て面71a、71aがそれぞれバッテリー取り付け部61側の受け部材72の受け面72aに押し当てられ、これによりバッテリー装置1のがたつきが防止若しくは抑制される。

【0025】次に、バッテリー装置1は、バッテリー取り付け位置に取り付けられた状態において、メインロック装置30～30が誤作動等によりアンロックしても落下しないようフェールセーフ機能を有している。図3および図12に示すようにバッテリーキャリア10の進入方向前面と後面の2箇所にはフェールセーフロック装置40、40が取り付けられている。また、この両フェールセーフロック装置40、40の下側には、そのロック状態を解除するためのロック解除棒41が配置されている。図14および図15には、このフェールセーフロック装置40およびロック解除棒41の詳細が示されている。バッテリーキャリア10の進入方向前面には、それぞれ上下2段のベース42、43が側方へ張り出すように取り付けられている。上側の上ベース42上にフェールセーフロック装置40が取り付けられ、下側の下ベース43にロック解除棒41が上下動可能に支持されている。

【0026】先ず、フェールセーフロック装置40は、基台44と、これに対して支軸45を中心にして上下に

傾動可能に支持されたロック本体46を備えている。ロック本体46は、支軸45の回りに装着されたばね（例えば振りばね（図示省略））によりロック方向（図において反時計回り方向）に付勢されている。基台44には、2本のロックピン47、47が該基台44の面方向（図示左右方向）に移動可能に設けられている。このロックピン47、47は、図15に示すように基台44の下面に設けたロック解除孔44aへのロック解除棒41の差し込み量を大きくすると（図15において基台44に対して上方へ移動させると）図示右方のロック解除位置へ後退する一方、図14に示すようにロック解除棒41のロック解除孔44aへの差し込み量を小さくすると（図14において、基台44に対して下方へ移動させると）、ばね付勢力により図示左方のロック位置に移動する。ロック解除棒41の差し込み量の大小によってロックピン47、47を進退させる構成については、この種のロック装置に限らず公知の技術であるので詳述しないが、ロック解除棒41の先端が半球形状に形成されており、この半球形状部41aと両ロックピン47、47側に設けた傾斜面との摺接作用によりロック解除棒41の上下動を両ロックピン47、47の左右方向への移動に変換する構成となっている。

【0027】これに対してロック本体46の回動先端側（図示左端面側）の下部には、上記両ロックピン47、47が差し込まれるロック孔46a、46aが形成されている。図14に示すように両ロック孔46a、46aにそれぞれロックピン47が差し込まれた状態では、ロック本体46はアンロック方向（図において時計回り方向）へ回動不能にロックされた状態となり、上記したようにロック解除棒41のロック解除孔44aへの差し込み量を大きくして（より深く差し込んで）両ロックピン47、47を後退させると、該ロック本体46が支軸45を中心にしてアンロック方向へ回動可能となる。

【0028】次に、ロック解除棒41は、下ベース43の挿通孔43aおよび上記ロック解除孔44aにより上下に移動可能に支持されている。挿通孔43aとロック解除孔44aとの間において、このロック解除棒41には止め輪41bが取り付けられており、これにより該ロック解除棒41の下方への抜け止めがなされている。上ベース42と下ベース43との間には、スリーブ42aが取り付けられており、このスリーブ42aの内周側にロック解除棒41が挿通されている。ロック解除棒41の下端部には、ロック解除棒41よりも側方へ大きく張り出す円板形状の頭部48が取り付けられている。この頭部48と下ベース43との間には、圧縮ばね49が介装されている。この圧縮ばね49によりロック解除棒41は、ロック解除孔44aへの差し込み量を小さくする方向（図示下方）へ付勢されている。図14に示すようにロック解除棒41のロック解除孔44aへの差し込みが浅い状態の時に、その頭部48がバッテリーキャリア1

0の下面よりも下方に突き出すよう該ロック解除棒41の長さおよび位置等が設定されている。ロック本体46の回動先端側の上部には、ロックローラー46bが回転可能に取り付けられている。このロックローラー46bの回転軸線は、ロック本体46の回動軸線（支軸45の軸線）に平行に設定されている。一方、上記両フェールセーフロック装置40、40に対応して車両60の床面65の下面側には、U字形のロックブラケット66、66（引き掛け部）が取り付けられている。

【0029】このように構成されたフェールセーフロック装置40、40とロック解除棒41、41によれば、図15に示すようにバッテリー装置1が搬送台車50の台板51上に載置された状態では、各フェールセーフロック装置40においてロック解除棒41の頭部48が台板51の上面に当接して該ロック解除棒41がそれぞれ圧縮ばね49に抗して上側に押されることにより、該ロック解除棒41のロック解除孔44aへの差し込みがより深くなっている。この状態では前記したように両ロックピン47、47がばね付勢力に抗してアンロック方向に後退してロック孔46a、46aから抜き出されるとともに、ロック解除棒41の先端部（半球形状部41a）がロック本体46の下面に突き当てられ、これによりロック本体46が支軸45を中心にしてロック解除棒41により突き上げられるようにしてアンロック位置へ回動する。この回動動作はばね付勢力に抗してなされる。ロック本体46がアンロック位置へ回動すると、ロックローラー46bが支軸45を中心とする円弧上を移動して、ロックブラケット66の上方から外れる。この状態では当該フェールセーフロック装置40のロック機能は発揮されない。

【0030】これに対して、図14に示すようにバッテリー装置1が前記メインロック装置30～30によりバッテリー取り付け位置に取り付けられ、然る後、搬送台車50の台板51を下降させると、該台板51がバッテリーキャリア10の下面から離間する。このため、各フェールセーフロック装置40においてロック解除棒41が圧縮ばね49により下方へ移動し、これにより該ロック解除棒41のロック解除孔44aへの差し込みが浅くなる。このため、ロック本体46はばね付勢力により支軸45を中心にして図示反時計回り方向に回動してロック位置へ戻され、かつ両ロックピン47、47がばね付勢力により突き出されて、ロック本体46のロック孔46a、46aに差し込まれ、これによりロック本体46がロック位置に保持される。ロック本体46がロック位置に保持されると、ロックローラー46bがロックブラケット66の上面側に係合された状態に固定され、これによりバッテリーキャリア10ひいては当該バッテリー装置1の下方への変位（脱落）が防止される。このことから、バッテリーキャリア10の下面に搬送台車50の台板51を当接させてロック解除棒41、41を上方へ移動させない

限り、メインロック装置30～30が誤作動あるいは誤操作等によりアンロックされても、バッテリー装置1は該フェールセーフロック装置40、40を介して依然としてバッテリー取り付け位置に固定され、これにより不意な脱落等のトラブルが未然に回避される。

【0031】バッテリー取り付け位置に取り付けられたバッテリー装置1を充電等のために取り外す際には、搬送台車50の台板51を上昇させてバッテリーキャリア10の下面に当接させると、当接する直前に台板51によってロック解除棒41の頭部48が上方へ押されて該ロック解除棒41が上方（アンロック方向）へ移動する。ロック解除棒41が上方へ移動すると、該ロック解除棒41のロック解除孔44aへの差し込み量が大きくなってロックピン47、47が後退し、これによりロック本体46がアンロック位置へ回動可能になるとともに、ロック解除棒41の先端（半球形状部41a）によってロック本体46の下面が上方へ押し上げられるため、ロック本体46がアンロック位置へ強制的に回動する。ロック本体46がアンロック位置へ回動すると、ロックローラー46bが車両床面65側のロックブラケット66から外れて、当該フェールセーフロック装置40、40によるロック状態が解除される。以上のことから、本実施形態のフェールセーフロック装置40、40によれば、搬送台車50の台板51をバッテリーキャリア10の下面に当接させる行為（バッテリー装置1を取り外すために行う通常の行為）によって自動的にロック状態が解除される一方、搬送台車50の台板51を下降させてバッテリーキャリア10の下面から離間させる行為（バッテリー装置1をバッテリー取り付け位置に取り付けるために行う通常の行為）によって自動的にロック状態となるため、作業者によるロック・アンロック操作は全く必要ない。

【0032】以上のように構成した本実施形態のバッテリー装置1の取り付け構造によれば、メインロック装置30～30を主体とするバッテリー装置取り付け手段とは別に設けたがたつき防止手段により、取り付け状態のバッテリー装置1のがたつきが防止若しくは抑制される。従って、例えばメインロック装置30においてロック溝35aのストライカ11に対するクリアランスを小さくしたり、ラッチ35のオーバーストロークを小さくする等して、ストライカ11の確実な保持あるいはストライカ11のロック溝35aへのスムーズな進入動作を阻害することなく、バッテリー装置1のがたつきを防止若しくは抑制することができる。また、バッテリー取り付け部61側に設けた受け部材72に、バッテリー装置1側に設けた当て部材71を当接させるだけの簡単かつ安価な構成でバッテリー装置1のがたつきを防止することができる。さらに、当て部材71の当て面71aおよび受け部材72の受け面72aが、それぞれバッテリー装置1の取り付け方向に対して傾斜しているため、バッテリー装置1の取り付け方向のがたつきのみならず、取り付け方向に直交する

方向のがたつきをも防止することができる。しかも、当て面71aおよび受け面72aが、バッテリー装置1の取り付け方向に対して鋭角方向に傾斜している。これによれば、ラッチ35～35が不完全ロック位置から完全ロック位置に強制的に回転してバッテリー装置1が持ち上げられる段階で、当て面71aと受け面72aの摺接作用によりバッテリー装置1が一定の位置に案内されるので、バッテリー装置1の取り付け位置のバラツキを抑制することができる（バッテリー装置1の位置決め機能）。

【0033】以上説明した実施形態には種々変更を加えることができる。例えば、当て部材71と受け部材72の双方に、バッテリー装置1の取り付け方向に対して傾斜する傾斜面（当て面71a、受け面72a）を形成する構成を例示したが、傾斜面はいずれか一方にのみ形成する構成としてもよい。また、当て部材71の当て面71aと受け部材72の受け面72aの双方を傾斜面ではなく、バッテリー装置1の取り付け方向に対して直交する水平面あるいは平行な垂直面としてもよい。当て面および受け面が水平面であれば、バッテリー装置1の上下方向のがたつきが防止され、垂直面であればバッテリー装置1の前後方向のがたつきが防止される。さらに、当て部材および受け部材を設ける位置は、例えばバッテリーキャリア10およびバッテリー取り付け部61の進入方向前後に変更することができ、また進入方向左右および前後に設けてもよい。従って、がたつき防止手段70（1個の当て部材71と1個の受け部材72の組み合わせ）は、2箇所以上にバランス良く配置することができ、場合によっては1箇所のみに設ける構成としてもよい。但し、がたつき防止手段は、取り付け状態のバッテリー装置1の中心に対して対称の位置に配置することが、バッテリー装置1を傾かせることなくバランス良く取り付けの観点から好ましい。また、当て部材71または受け部材72の一方のみを弾性を有するウレタンゴム製としてもよい。さらに、当て部材71または受け部材72の一方にダンパーを用いてもよい。また、当て部材として当て面71aを例示したが、かならずしも面である必要はなく、例えば当て部材71の角部を受け面に当接させる構成としてもよい。

【0034】さらに、車両60の床下にバッテリー装置1を取り付ける場合を例示したが、車両60のトランク内、室内のシート下、あるいは荷台、ルーフにバッテリーを収納する場合にも適用することができる。また、バッテリー取り付け部61にロック装置31、32を設ける一方、バッテリー装置1のキャリア10にストライカ11～11を設ける構成を例示したが、逆にバッテリー取り付け部61にストライカを設け、バッテリー装置1側にロック装置を取り付ける構成としてもよい。さらに、車両の側方からバッテリー装置1を進入させる場合を例示したが、車両の後部または前部からバッテリー装置1を車両床下へ進入させる場合についても同様に適用することができる。

る。また、バッテリー装置1を水平方向に進入させた後、上昇させることにより取り付ける構成を例示したが、水平方向のスライド動作のみで取り付けが完了する引き出し形式の取り付け構造に適用することもできる。また、車両に取り付けるバッテリー装置1を例示したが、例えば機械設備等その他のバッテリー取り付け対象物にバッテリー装置を取り付ける場合に広く適用することができる。また、バッテリー装置1を取り付ける場合について、4箇所のラッチ35の全てが不完全ロック位置に達した後、電動モータ32が起動するようにしたが、4箇所のラッチ35を各々電氣的に独立させ、不完全ロック位置に達した順に、順次電動モータ32を起動させる構成としてもよい。

【図面の簡単な説明】

【図1】本発明の実施形態を示す図であり、搬送台車を用いてバッテリー装置を車両側方から床下に進入させた後上昇させて収納する様子を示す図である。本図は、車両の前方から見た図である。

【図2】搬送台車にバッテリー装置を載置して車両床下のバッテリー取り付け部に進入させる様子を示す斜視図である。

【図3】複数のバッテリーをキャリアに搭載したバッテリー装置を単体で示した斜視図である。

【図4】ガイドローラーが案内壁部に当接してバッテリー装置の位置が規制された状態を示す図である。

【図5】搬送台車に載置したバッテリー装置をバッテリー取り付け部に進入させた後、取り付け位置まで上昇させた状態を示す側面図である。本図は、車両の前方から見た図である。

【図6】バッテリー装置がバッテリー取り付け部に進入して上昇開始位置に至る直前の様子を示す図である。本図は車両前方から見た図である。

【図7】バッテリー装置がバッテリー取り付け部に進入して上昇開始位置に至った段階を示す図である。本図は車両前方から見た図である。

【図8】バッテリー装置がバッテリー取り付け部の上昇開始位置において上昇する前の状態を示す図である。本図は車両の側方から見た図である。

【図9】バッテリー装置が取り付け位置まで上昇された状態を示す図である。本図は車両の側方から見た図であ

る。

【図10】メインロック装置にストライカに係合して、バッテリー装置が取り付け位置にロックされた状態を示す図である。本図は車両の側方から見た図である。

【図11】メインロック装置単体の斜視図である。

【図12】取り付け位置に取り付けられたバッテリー装置の下面に搬送台車の台板が当接し、これによりフェールセーフロック装置が解除された様子を示す図である。本図は、車両の前方から見た図である。

【図13】がたつき防止手段の側面図であって、当て部材が受け部材に押し当てられた状態を示す側面図である。

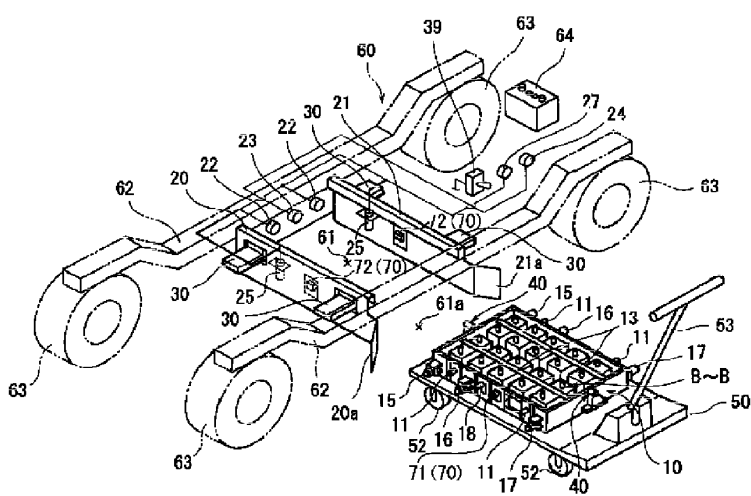
【図14】フェールセーフロック装置のロック状態を示す側面図である。

【図15】フェールセーフロック装置のアンロック状態を示す側面図である。

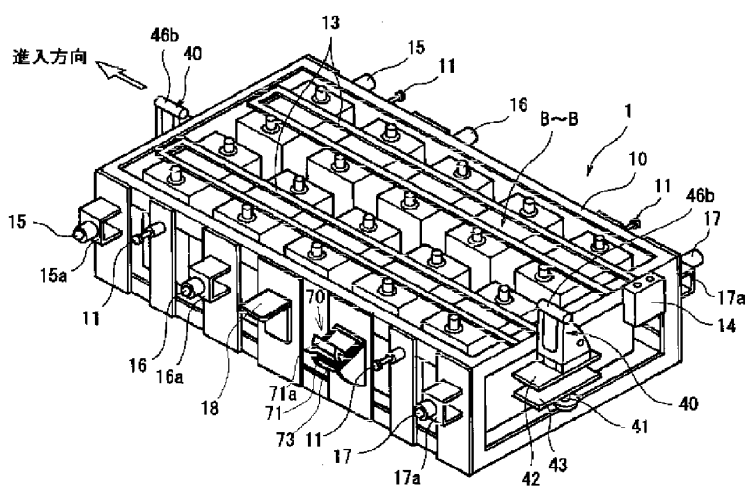
【符号の説明】

- 1…バッテリー装置
- 10…バッテリーキャリア、B…バッテリー
- 15～17…ガイドローラー
- 20, 21…案内壁部、20a, 21a…案内テーパー部
- 22…ストッパ
- 23…上昇開始位置確認センサ
- 24…上昇開始位置確認ランプ
- 25…取り付け位置確認センサ
- 27…取り付け位置確認ランプ
- 30…メインロック装置
- 40…フェールセーフロック装置
- 41…ロック解除棒
- 50…搬送台車
- 51…台板
- 60…車両（車両）
- 61…バッテリー取り付け部
- 64…補助バッテリー
- 65…車両の床面
- 70…がたつき防止手段
- 71…当て部材、71a…当て面（当て部）
- 72…受け部材、72a…受け面
- G…路面

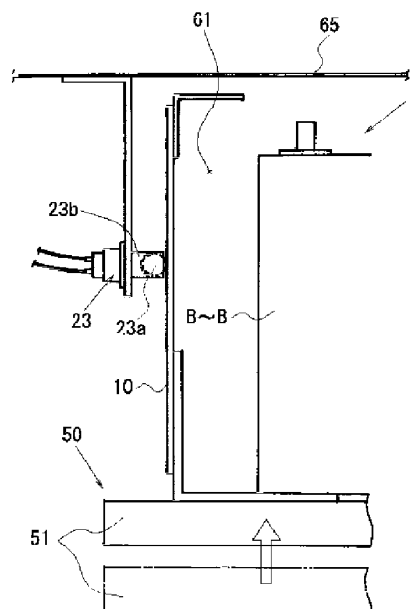
【图2】



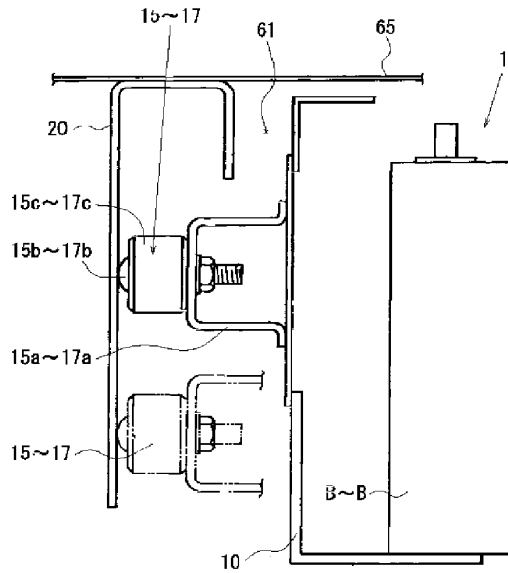
【図3】



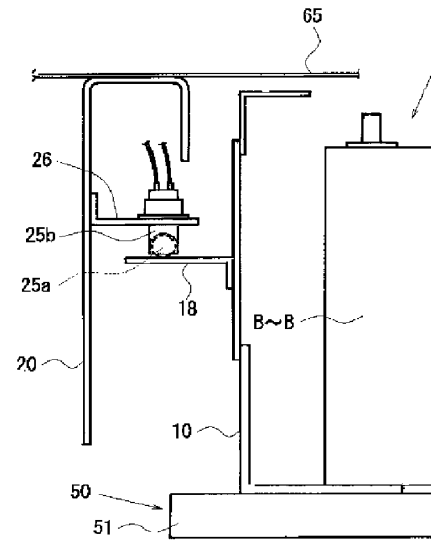
【図7】



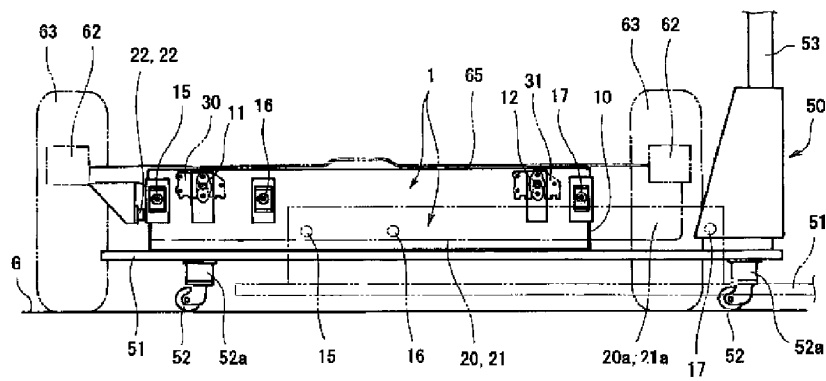
【図4】



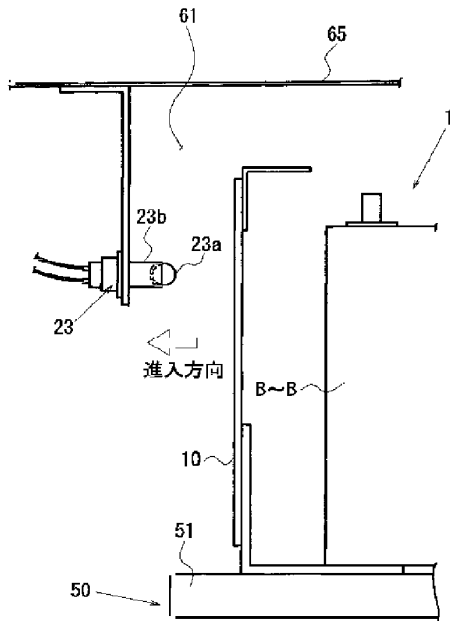
【図9】



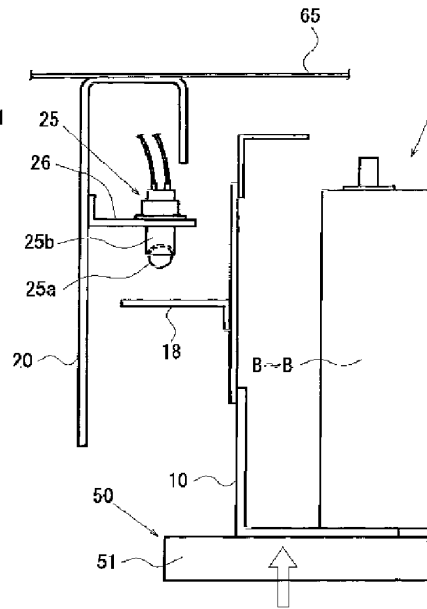
【図5】



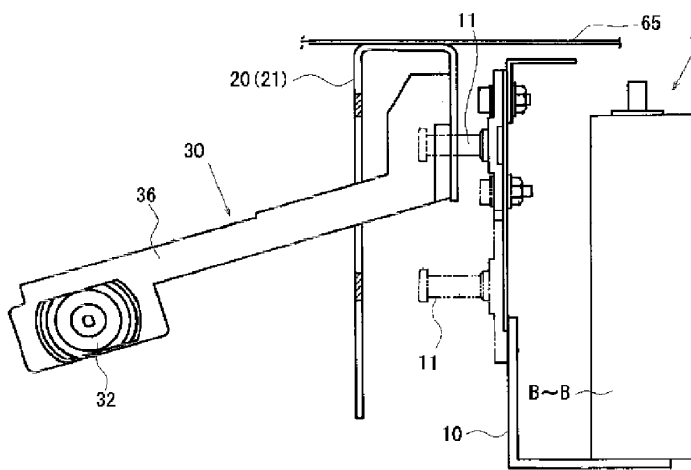
【図6】



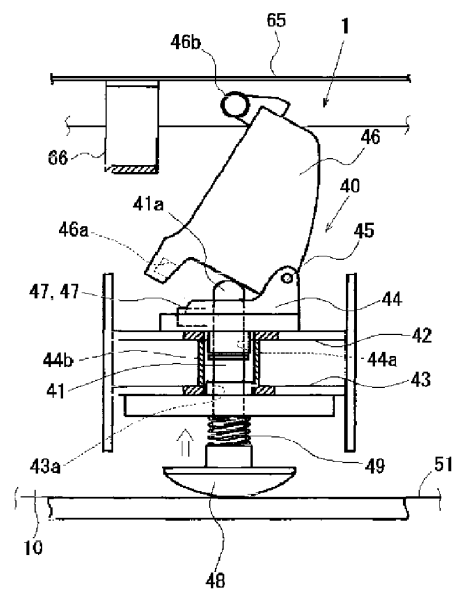
【図8】



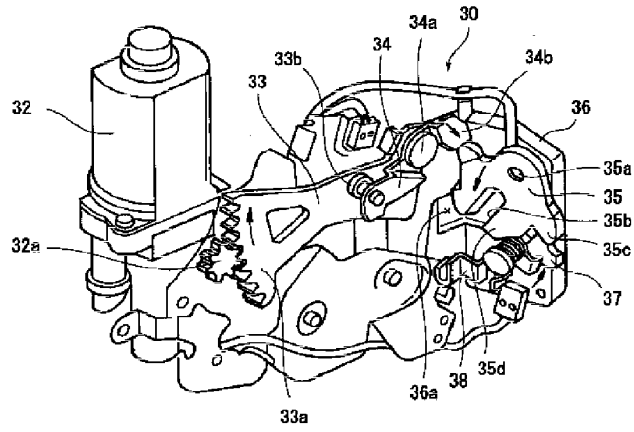
【図10】



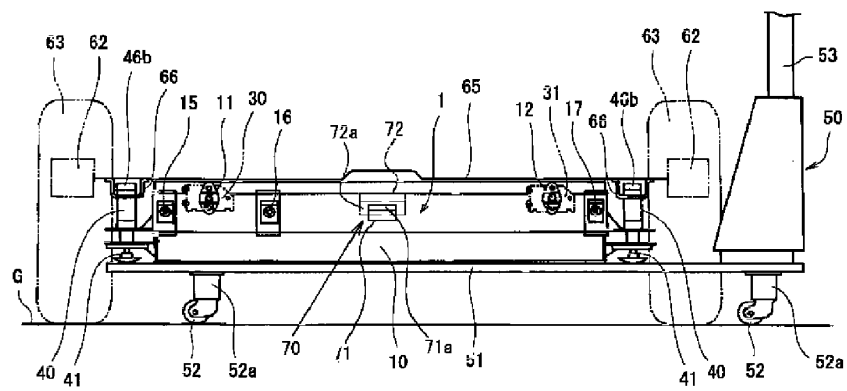
【図15】



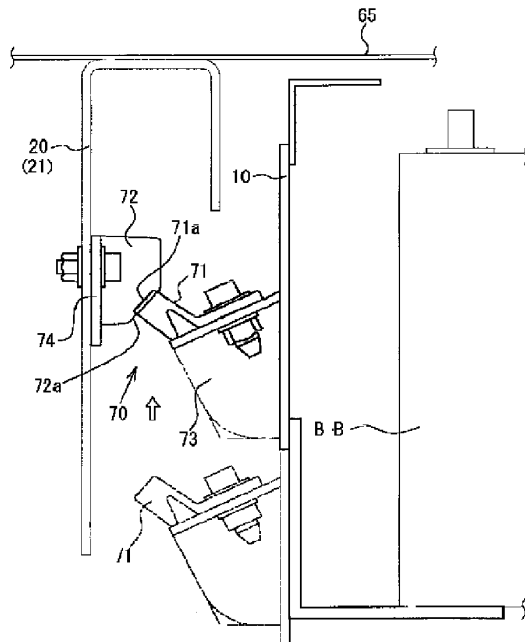
【圖 11】



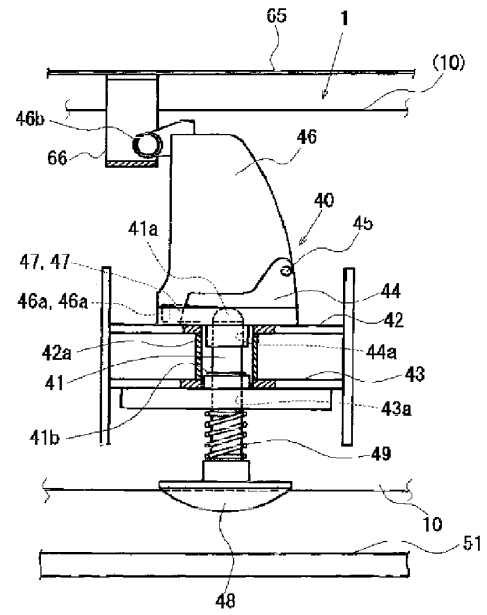
【圖 12】



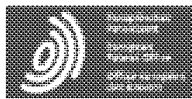
【圖13】



【圖14】



No documents available for this priority number.



Espacenet

Bibliographic data: JP2005067453 (A) — 2005-03-17

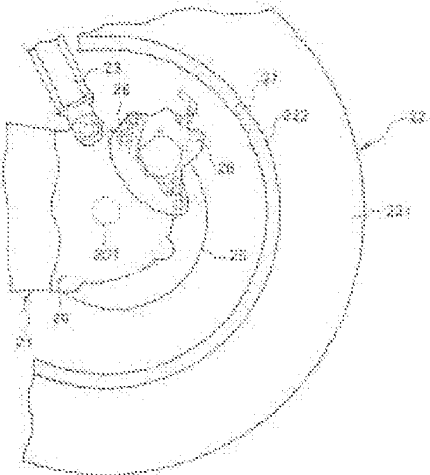
VEHICLE EQUIPPED WITH MOVEMENT DETECTION DEVICE

Inventor(s): YAMAGIWA TOSHIO ± (YAMAGIWA TOSHIO)
Applicant(s): HONDA MOTOR CO LTD ± (HONDA MOTOR CO LTD)
Classification: - **international:** *B60R25/10; B62H5/00; B62H5/20; G01V15/00; G01V3/00*; (IPC1-7): B60R25/10; B62H5/00; B62H5/20; G01V15/00
- **cooperative:**
Application number: JP20030301214 20030826
Priority number (s): JP20030301214 20030826

Abstract of JP2005067453 (A)

PROBLEM TO BE SOLVED: To provide a vehicle equipped with a movement detection device capable of easily determining any unexpected movement of a vehicle, miniaturizing a detection sensor, and enhancing the versatility of placement, and making hard to recognize from the outside. ; **SOLUTION:** A magnetic sensor unit 27 with a communication device is embedded in a tire rim 27. The sensor unit 27 generates the detection output according to the magnetic environment by the operation of a magnet 28 or the like provided on a caliper 26, a swing arm 60, etc. The detection output is transmitted to a vehicle body side warning unit 50 by the communication device. The warning unit stores the magnetic environment when a main switch is turned off, and outputs the determination signal to indicate any unexpected movement when the change in the magnetic environment recognized by the subsequently inputted detection output of the magnetic sensor exceeds an expected value. ; **COPYRIGHT:** (C)2005,JPO&NCIP

Last updated: 13.03.2013 Worldwide Database 5.8.6.6, 93p



(19) 日本国特許庁(JP)

(12) 公開特許公報(A)

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特開2005-67453

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G 0 1 V 15/00

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B 6 2 H 5/20

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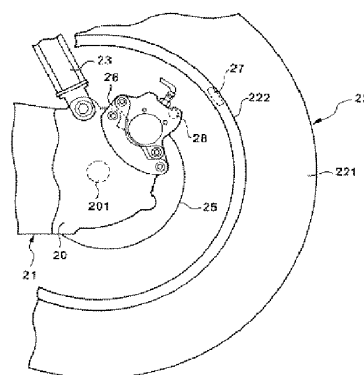
(54) 【発明の名称】 移動検出装置を備えた車両

(57) 【要約】

【課題】車両の不意の移動を容易に判定できるようにするとともに、検知用センサを小型化し配置の自由度を高くして外部から認識しにくくする。

【解決手段】タイヤリム27に通信装置付き磁気センサユニット27を埋め込む。センサユニット27は、キャリパ26やスイングアーム60等に設けられた磁石28の作用等による磁気環境に応じた検出出力を生じる。検出出力は通信装置によって車体側の警報ユニット50に通信される。警報ユニットは、メインスイッチをオフにしたときの磁気環境を記憶しておき、その後に入力された磁気センサの検出出力に基づいて認識される磁気環境の変化が予定以上であったときに不意の移動を示す判定信号を出力する。

【選択図】図1



【特許請求の範囲】

【請求項1】

車両に電源を投入するためのメインスイッチと、
車輪のタイヤリムに装着された磁気センサと、
前記メインスイッチがオフになっていて、かつ前記磁気センサによって検出された磁気環境が予め設定された状態から予定量変化したときに所有者の意思によらない車両の移動があったことを示す判定信号を出力する制御手段とからなる移動検出装置を備えた車両。

【請求項2】

前記磁気センサに磁気を作用させるための磁石を備えたことを特徴とする請求項1記載の車両。

【請求項3】

車両に電源を投入するためのメインスイッチと、
車輪のタイヤリムに装着された磁石と、
前記車輪に隣接する部材に装着された磁気センサと、
前記メインスイッチがオフになっていて、かつ周囲の磁気環境が予め設定された状態から予定量変化したときに所有者の意思によらない車両の移動があったことを示す判定信号を出力する制御手段とからなることを特徴とする移動検出装置を備えた車両。

【請求項4】

前記予め設定された状態として当該車両のメインスイッチをオフにしたときの前記磁気センサの検出磁力を記憶する手段を備えたことを特徴とする請求項1または3記載の車両。

【請求項5】

前記予め設定された状態として当該車両のメインスイッチをオフにしたときの前記磁気センサの検出磁力をゼロとして記憶する手段を備えたことを特徴とする請求項1または3記載の車両。

【請求項6】

前記磁気センサの検出出力を前記制御手段に入力するための通信手段を備えたことを特徴とする請求項1～5いずれかに記載の車両。

【請求項7】

前記磁気センサおよび通信手段、ならびに該磁気センサおよび通信手段を駆動するための電池が、一体に形成されたセンサユニットを構成していることを特徴とする請求項1～6のいずれかに記載の車両。

【請求項8】

前記センサユニットには、該センサユニットを特定するための個体情報を送信することができるラジオ周波数識別手段が含まれていることを特徴とする請求項1～8のいずれかに記載の車両。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、移動検出装置を備えた車両に関し、特に、小型で配置の自由度が高いセンサによって車両に所有者の認知していない移動があったことを検知することができる移動検出装置付き車両に関する。

【背景技術】

【0002】

車両の移動検出装置において、振動が与えられるなど、車両が移動されようとしたことを加速度センサ等のセンサで検知するものが知られる（例えば、特開2003-182526号公報）。また、加速度センサで振動を検出した時に、予め登録されている電話等に通知することができる移動検出装置も知られている（特開2001-315619号公報）。

【特許文献1】特開2003-182526号公報。

【特許文献2】特開2001-315619号公報。

【発明の開示】

【発明が解決しようとする課題】

【0003】

従来の加速度センサを用いた移動検出装置では、加速度センサの寸法が比較的大きいため、装置が大型化したり取り付け位置が制限され、その配置に苦労することが多かった。

【0004】

本発明は、上記従来技術の問題点に鑑み、センサを小型化し、配置の自由度を高くして、外部から見えにくく、かつ取り外しにくい位置に取り付けた移動検出装置を備えた車両を提供することを目的とする。

【0005】

また、従来の移動検出装置では、センサの取り外しが比較的容易であった。よって、本発明はセンサの取り外しや破壊を困難にして移動検出装置の信頼性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】

【0006】

本発明は、車両に電源を投入するためのメインスイッチと、車輪のタイヤリムに装着された磁気センサと、前記メインスイッチがオフになっていて、かつ前記磁気センサによって検出された磁気環境が予め設定された状態から予定量変化したときに所有者の意思によらない移動に遭遇したことを示す判定信号を出力する制御手段とからなる点に第1の特徴がある。

【0007】

また、本発明は、前記磁気センサに磁気を作用させるための磁石を備えた点に第2の特徴がある。

【0008】

また、本発明は、車両に電源を投入するためのメインスイッチと、車輪のタイヤリムに装着された磁石と、前記車輪に隣接する部材に装着された磁気センサと、前記メインスイッチがオフになっていて、かつ周囲の磁気環境が予め設定された状態から予定量変化したときに所有者の意思によらない移動に遭遇したことを示す判定信号を出力する制御手段とからなる点に第3の特徴がある。

【0009】

また、本発明は、前記予め設定された状態として当該車両のメインスイッチをオフにしたときの前記磁気センサの検出磁力を記憶する手段を備えた点に第4の特徴がある。また、本発明は、前記予め設定された状態として当該車両のメインスイッチをオフにしたときの前記磁気センサの検出磁力をゼロとして記憶する手段を備えた点に第5の特徴がある。

【0010】

また、本発明は、前記磁気センサの検出出力を前記制御手段に入力するための通信手段を備えた点に第7の特徴がある。

【0011】

また、本発明は、前記磁気センサおよび通信手段、ならびに該磁気センサおよび通信手段を駆動するための電池が、一体に形成されたセンサユニットを構成している点に第7の特徴がある。

【0012】

さらに、本発明は、前記センサユニットには、該センサユニットを特定するための個体情報を送信することができるラジオ周波数識別手段が含まれている点に第8の特徴がある。

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【発明の効果】

【0013】

上記特徴を有する本発明によれば、車輪が回転すると磁気センサで検出される磁気環境

に変化が生じる。そして、メインスイッチがオフになっているにもかかわらず、この磁気環境が予め設定した状態から変化したときに車両の不意の移動と判断することができる。

【0014】

特に、磁気センサに作用する磁石を設けることにより、磁気センサによる磁気環境の変化を容易に検出することができる。磁気センサの検出力は通信手段によって制御手段に送信することができる。したがって、制御手段の配置位置の選択幅が広がる。

【0015】

また、タイヤリムに磁気センサを設けたことにより、外部から見えにくくするとともに、磁気センサ自体も保護して信頼性を向上させることができる。

【0016】

また、磁気センサと通信手段と電池とを一体化したセンサユニットとしたので、タイヤリム等への装着が容易である。例えば、タイヤリム内に埋め込むこともできる。その結果、外部からの認識が困難であり、このセンサユニットを排除するためには車輪を外し、タイヤを分解しなくてはならないので、装置の取り外しは極めて困難である。

【0017】

さらに、ラジオ周波数識別手段の識別情報をもとに車両を特定することが可能である。したがって、車両の移動後も当該車両の発見が容易である。

【発明を実施するための最良の形態】

【0018】

以下、図面を参照して本発明の一実施形態を説明する。図2は、本発明の一実施形態に係る移動検出装置を含むスクータ型自動二輪車の外観側面図である。同図において、車体前部1と車体後部2とは低いフロア部3を介して連結されており、それらの部分の骨格は、ヘッドパイプ4から下方に延びるダウンチューブ5およびダウンチューブ5から後方に延びるメインチューブ6、並びにメインチューブ6に接続されて更に後上方に延びるリアチューブ7とを備えた車体フレームにより形成される。

【0019】

車体前部1、車体後部2およびフロア部3は、それぞれフロントカバー8、ボディーカバー9およびセンタカバー10で覆われている。車体前部1には、ヘッドパイプ4に回動自在に軸支されたハンドル11が設けられる。ハンドル11の軸はヘッドパイプ4を貫通して下方に延び、前輪12を軸支するフロントフォーク13に連結される。ハンドル11の上部は計器板を兼ねたハンドルカバー14で覆われる。自動二輪車の動作電源を投入するためのメインスイッチ（図示しない）が計器板上に設けられる。ハンドルカバー14から車体左右に向けてハンドル11のグリップ部分が突き出し、上方にサイドミラー15L（15R）が突き出している。

【0020】

ボディーカバー9内には燃料タンク16および収納ボックス17が、リアチューブ7上に支持されて設けられる。メインチューブ6には、ブラケット18が溶接されていて、そのブラケット18には、単気筒のエンジンE、無段変速機19、および減速機20を含むスイングユニット21が上下に揺動自在に設けられる。減速機20の出力軸201には、後輪22が結合される。スイングユニット21とリアチューブ7との間にはリアサスペンション23が設けられる。

【0021】

ボディーカバー9の上方には、収納ボックスを覆うようにシート24が設けられる。シート24は開閉可能であり、収納ボックス17の蓋を兼ねる。

【0022】

後輪22には、ディスクブレーキ用の円板（後述する）が設けられ、スイングユニット21には、円板に作用して車両にブレーキをかけるためのキャリアが設けられる。前記円板等を含めた車体後部2には、移動検出装置の検出部が組み込まれる。

【0023】

図1は、移動検出装置の検出部を示す上記自動二輪車の後部側面図である。同図におい

て、後輪22は、タイヤ221とタイヤ221を保持するタイヤリム222とを備える。後輪22を支持する軸（減速機20の出力軸）201には、ディスクブレーキ用の円板25が結合され、スイングユニット21の後部には、円板25に対応するブレーキ用キャリパ26が設けられる。タイヤリム222には、センサユニット27が埋め込まれる。センサユニット27は、後述する磁気センサを含み、回転に伴って周囲の磁気発生源との相対位置の変化による磁気環境の変化を、この磁気センサで検出する。磁気発生源としては磁石が用いられる。ここでは、磁石28がキャリパ28に設けられているが、例えば、センサユニット27に隣接するスイングユニット21やスイングアーム（後述）等、自動二輪車の後部に位置する部材に設けることができる。

【0024】

図3は、センサユニット27の機能を示すブロック図である。センサユニット27は、磁気センサ29、制御部30、送信部31、アンテナ32、および電池33を有する。磁気センサ29としては、ホール素子、MR素子およびフラックスゲート磁気センサ素子（例えば、住友特殊金属株式会社製）等、公知の素子を採用することができる。電池33には、耐久性の優れたリチウム電池が用いられる。磁気センサ29、制御部30、送信部31、アンテナ32および電池33はICとして一体化することができ、このICと電池33とをさらに樹脂モールドして一体化し、センサユニット27を構成する。制御部30には、このIC固有の識別情報が予め記憶されている。

【0025】

磁気センサ29は、検出した磁力（単位＝ガウス）に応じた磁気検出信号を生じ、この検出信号は制御部30に入力される。制御部30は入力された磁気検出信号と識別情報を表す信号とを送信部31に入力する。送信部31は入力された信号に基づいて変調された電波をアンテナ32を介して外部に送信する。

【0026】

図4は、警報ユニットの構成を示すブロック図である。警報ユニット50は、センサユニットと分離して車体側に設けられる。警報ユニット50は、制御部としてのCPU51と、前記センサユニット27から送出される電波を受信する受信部52と、スイッチ入力回路53と、出力回路54と、車載バッテリー（図示せず）からの電源をCPU51、スイッチ入力回路53および出力回路54に供給する電源回路55とを有する。CPU51はRAMを内蔵する。また、CPU51にはEEPROM等の記憶装置56が外付けされ、この記憶装置56にはセンサユニット27の識別情報と同じ識別情報が予め登録される。

【0027】

また、車両停車時の磁気センサの出力を検出し、これをリファレンス信号として記憶装置56に登録する。

【0028】

スイッチ入力回路53は、自動二輪車のメインスイッチ（図示せず）のオン・オフに応じた信号をCPU51に入力する。出力回路54は、CPU51の処理結果に応じて、CPU51が車両の不意の移動状態と判断したときに警報出力を発生する。この警報出力はホーンや、ヘッドランプ、方向指示ランプ等、自動二輪車に備えられる保安装置や灯火装置を車載のバッテリーで付勢するために出力される。なお、この警報ユニットはメインスイッチがオフの状態でも車載のバッテリーでバックアップされている。

【0029】

図5は、車両の不意の移動状態の判断機能に係るCPU51の要部機能を示すブロック図である。同図において、CPU51内のRAMで実現される記憶部511はセンサユニット27から受信した磁気検出信号を記憶する。第1識別部512は受信した信号に、記憶装置（EEPROM）56に登録されている識別情報が含まれているかを識別する。識別情報が含まれていたときにセンサユニット27からの磁気検出信号を受信したと判断して第2識別部513が付勢される。第2識別部513は、記憶部511に記憶された磁気検出信号と、後から受信した磁気検出信号とを比較し、そのずれがしきい値以上になったときに車両の不意の移動状態にあることを示す判定信号を出力する。メインスイッチ判定

部514は、スイッチ入力回路53からの信号によりメインスイッチのオフを認識する。メインスイッチオフに応答して記憶部511の記憶内容が保持される。第2識別部513による判定信号は出力回路54から出力され、保安装置や灯火装置等が付勢される。

【0030】

上記機能に基づく移動検出処理を、図6のフローチャートを参照して説明する。図6において、ステップS1では、受信の有無を判別する。受信部52で受信があるとその受信信号がセンサユニット27からのものか、つまり、記憶装置56に登録されている識別情報と同じ識別情報が受信部52で受信されたか否かが判断される（ステップS2）。この判断は第1識別部512で行われる。登録されている識別情報が検出されたならば、その受信識別情報はセンサユニット27からのものであり、磁気検出信号を伴っているはずであり、ステップS3に進んでその磁気検出信号を記憶部511に記憶する。受信した識別情報が、記憶されている識別情報と一致していない場合はエラー処理後（ステップS4）、ステップS1に進む。

【0031】

ステップS5では、メインスイッチがオフになったか否かが判断される。メインスイッチがオフになったときに、記憶部511の記憶動作を停止し、記憶状態を保持する（ステップS6）。メインスイッチがオフにならないうちは、ステップS1～S3によって記憶部511の記憶内容は更新される。

【0032】

記憶部511の記憶動作を停止した後、ステップS7に進み、受信の有無を判別する。受信があれば、ステップS8に進み、記憶装置56に登録されている識別情報と同じ識別情報が受信部52で受信されたか否かが判断される。登録されている識別情報が検出されたならば、ステップS9に進み、記憶部511に保存されている磁気検出信号と現在受信した磁気検出信号との差を検出する。識別情報が一致しないときは、ステップS10に進んでエラー処理を行いステップS7に進む。

【0033】

ステップS11では、検出された差がしきい値より大きいかが判断される。検出された差がしきい値より大きい場合は磁気検出信号が大きく変化すると認識されるので、ステップS12に進んで車両の不意の移動状態を示す判定信号を出力する。これに基づいて移動の警報が発生される。ステップS11の判断が否定であれば、ステップS13に進み、メインスイッチがオンか否かが判断される。メインスイッチがオンになれば、この処理を終える。メインスイッチがオフのままであれば、ステップS7に進んで車両の不意の移動の監視を継続する。

【0034】

上記実施形態では、メインスイッチオフの状態からの磁気検出信号の変化がしきい値よりも大きい場合に車両の不意の移動と判定したが、メインスイッチオフ時の磁気検出信号の大きさをゼロにリセットし、その後の磁気検出信号によって磁気環境の変化を判断してもよい。

【0035】

なお、上記識別情報を車体側の記憶装置56に記憶させる場合、センサユニット27の制御部30に記憶されている識別情報を送信部31から警報ユニット50に送信し、この識別情報を記憶装置56に取り込むようにするのがよい。

【0036】

センサユニット27に無線周波数識別回路つまりRFID（ICタグ、無線タグ、電子タグなどと呼ばれる）を含めることができる。図7は、RFIDの構成を示すブロック図である。RFID40は、RFID制御部41、送受信部42、個人情報記憶部43、蓄電部44、およびアンテナ45からなり、前記センサユニット27とともにICとして構成できる。蓄電部44は、RFID40全体に電力を供給するための回路であり、アンテナ45が受信する電磁波によって発電した電力を蓄積するキャパシタを含む。個人情報記憶部43は、RFID40の個体識別用の識別情報を含む。送受信部42は、外部の読み

書き装置から読み取り信号を受信すると、蓄電部44に電力が蓄積され、RFID制御部41が動作する。受信した読み取り信号を認識すると、個人情報記憶部43から識別情報を読み取り、この識別情報を含む応答信号を送受信部42から外部に送出する。この応答信号は外部の読み書き装置で受信される。

【0037】

センサユニット27にこのような機能を有するRFID40を含めることによって、仮に車両が移動されて、その後発見されたときに、当該移動車両であることを容易に認識可能である。

【0038】

上記実施形態では、自動二輪車のスイングユニットやキャリバに磁石を設けて、センサユニット27で磁気環境の変化を判断するようにしたが、磁石の取り付け位置はこれに限らない。例えば、自動二輪車のシートサブフレームやスイングアームに磁石を設けてもよい。図8は、シートサブフレームやスイングアームを有するタイプの自動二輪車の後部側面図である。同図において、スイングアーム60は、メインチューブ61に対して軸62を介して揺動自在に軸支され、車体後方に延長されている。スイングアーム60の先端には後輪22が軸支される。さらにこの種の自動二輪車は、リアフレーム（リアチューブと同等部材）63の途中からシートサブフレーム64が車体後方に延長されている。後輪22には、前記スクータ型自動二輪車と同様、タイヤリム222にセンサユニット27が装着される。そして、センサユニット27が装着されるタイヤリム222に対して近接する位置において、スイングアーム60もしくはシートサブフレーム64上に磁石28が設けられる。

【0039】

上記実施形態では、タイヤリム222にセンサユニット27を設け、車体フレームもしくは後輪駆動部等（総称的に「車体」という）に磁石を設ける例を示した。しかし、本発明はこれに限定されない。この例とは反対に、タイヤリム222に磁石を装着し、車体側にセンサユニットを装着することができる。この場合、磁石やセンサユニットは外部から見えないように、タイヤリム222や車体を構成する部材にそれぞれ埋め込むのがよい。

【0040】

また、センサユニット222には、磁気センサだけでなく、圧力センサや温度センサを組み込み、空気圧やタイヤの温度等、タイヤの状態を検出できるようにすることもできる。このタイヤの状態の検出結果は、磁気センサで検出された磁気環境のデータと同様、送信部31から外部に送出でき、タイヤ状態判別装置では受信した検出結果を所定の状態（標準空気圧等）と比較して異常判断を行うことができる。タイヤ状態判別装置および移動検出装置のセンサユニットを一体化することにより、回路やバッテリーを共有できる。

【0041】

以上、本発明に係る最良の形態をもとに説明したが、本発明はさらに、次のように変形可能である。センサユニット27で検出する磁気環境の変化は、センサユニット27に対応して設置した磁石との位置関係の変化によるものに限らない。例えば、地磁気を検出できる磁気センサをセンサユニットに組み込み、地磁気を検出するように構成する。こうすれば、センサユニットを装着した後輪が回転すると、地磁気の変化するので、地磁気の変化が、メインスイッチをオフにしたときに記憶された方向から変化すれば、自動二輪車は移動したと判断できる。

【0042】

なお、磁石を複数個所、例えば、シートサブフレームまたはスイングアームに設けることによって、センサユニット内の磁気センサはパルス状の検出出力を生じる。つまり、自動二輪車が走行中は、後輪の回転に伴い、複数の磁石の配置位置に対応した位置で磁力のピークを有する検出出力を得ることができる。従って、自動二輪車が走行中は前記ピーク間の時間に基づいて後輪の回転数すなわち自動二輪車の走行速度を検出することができる。つまり、移動検出装置の要部としてのセンサユニットを自動二輪車走行中は速度検出用のセンサユニットとして利用することができる。

【図面の簡単な説明】

【0043】

【図1】 本発明の一実施形態に係る自動二輪車の後部拡大側面図である。

【図2】 本発明の一実施形態に係る自動二輪車の全体側面図である。

【図3】 センサユニットの構成を示すブロック図である。

【図4】 警報ユニットの構成を示すブロック図である。

【図5】 警報ユニットのCPUの要部機能を示すブロック図である。

【図6】 警報ユニットのCPUの動作を示すフローチャートである。

【図7】 ラジオ周波数識別手段の構成を示すブロック図である。

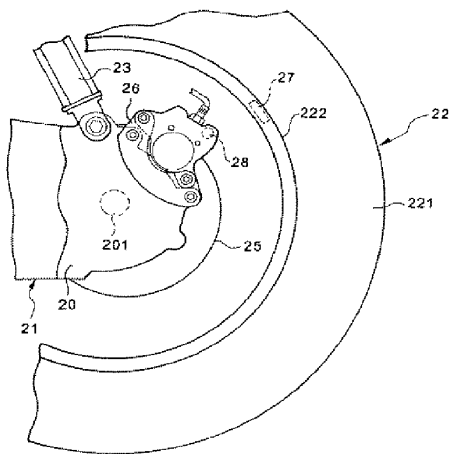
【図8】 センサユニットおよび磁石の配置例に係る車体フレームの後部を示す図である。

【符号の説明】

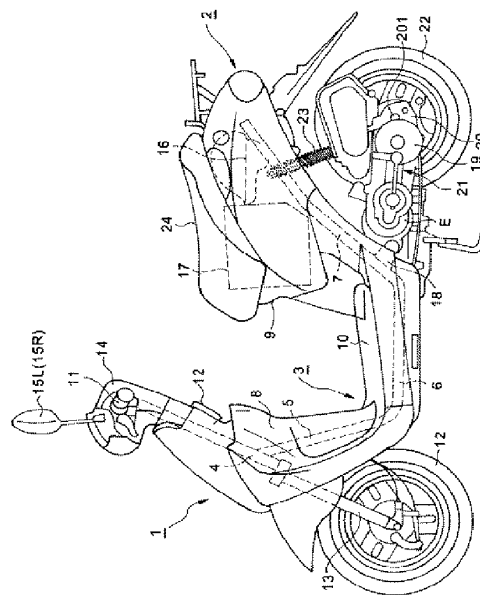
【0044】

20…減速機、 21…スイングユニット、 22…後輪、 25…ディスクブレーキ用円板、 26…ブレーキ用キャリパ、 27…センサユニット、 28…磁石、 31…送信部、 40…RFID、 50…警報ユニット、 60…スイングアーム、 64…シートサブフレーム、 222…タイヤリム、 511…記憶部、 514…メインスイッチ判別部。

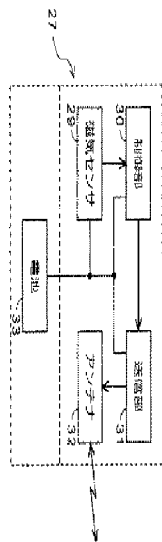
【図1】



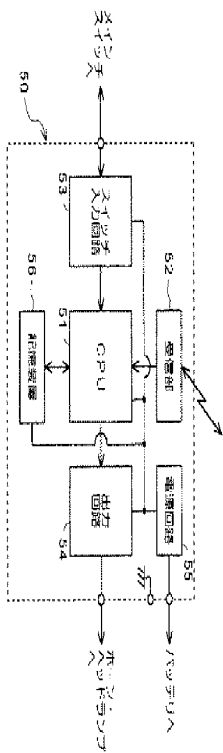
【図2】



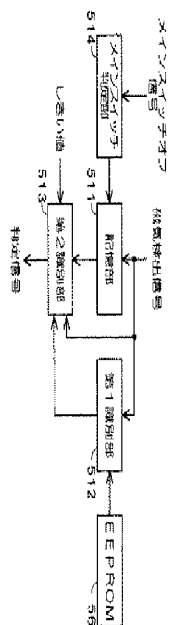
【図3】



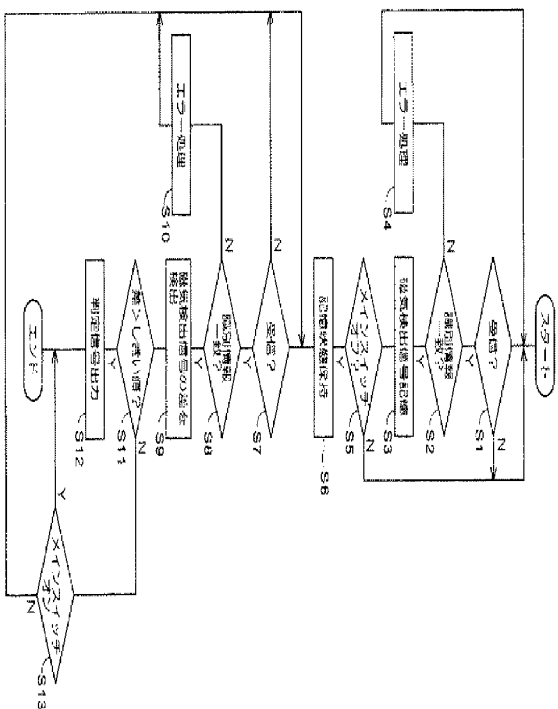
【図4】



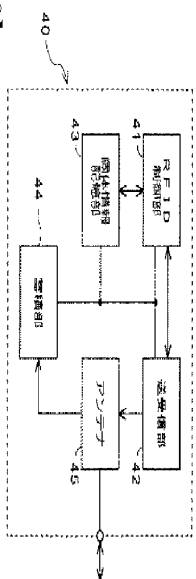
【図5】



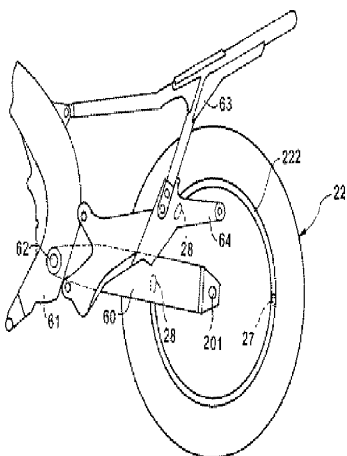
【図6】



【図7】



【図8】



(1 0)

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(51)Int. Cl.⁷

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テーマコード（参考）

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Record 18/25 JP2009171646A POWER SAVING CONTROLLER FOR ELECTRIC CAR AND ELECTRIC CAR EQUIPPED WITH THE SAME

Publication Number: JP2009171646A

Publication Date: 2009-07-30

Title: POWER SAVING CONTROLLER FOR ELECTRIC CAR AND ELECTRIC CAR EQUIPPED WITH THE SAME

Application Number: JP20083531A

Application Date: 2008-01-10

Abstract (English):

PROBLEM TO BE SOLVED: To provide a power saving controller capable of executing power saving control in accordance with the travelling distance to a charging station and the residual capacity of a battery.

SOLUTION: The power saving controller includes: a power fee acquiring section 34 for acquiring a power fee; a residual capacity acquiring section 38 for acquiring the residual capacity of a storage battery 110; a station distance acquiring section 44 for acquiring the travel distance from the present position to a charging station; a power saving propriety determining section 56 for determining whether or not the power saving driving of the electric car 100 is needed based on the power fee acquired by the power fee acquiring section 34, the residual capacity acquired by the residual capacity acquiring section 38 and the travel distance to a charging station acquired by the station distance acquiring means 44; and a power saving control section 58 for suppressing power consumption per unit travel distance of the electric car 100 when the power saving driving propriety determining section 56 determines that power saving driving is needed.

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Abstract - DWPI:

Abstract - DWPI Novelty:

An acquisition unit (34) acquires electric power consumed per unit distance by vehicle. An acquisition unit (38) acquires remaining capacity of storage battery. An acquisition unit (44) acquires distance between present position and charging stand. A determination unit (56) determines whether electric vehicle needs to be run on power-saving mode based on acquired power consumption, battery remaining capacity and distance to charging stand. A control unit (58) reduces power consumption per unit distance of vehicle, when vehicle has to be run in power-saving mode.



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			P007 P014 PU08 QA01 QN03
			QN13 RE13 SE06 TI02 TI08
			TR19

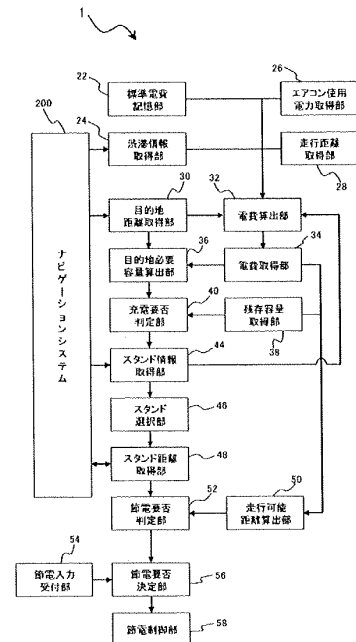
(54) 【発明の名称】 電気自動車の節電制御装置及びそれを備える電気自動車

(57) 【要約】

【課題】 充電スタンドまでの走行距離と電池残存容量に応じて節電制御を行う節電制御装置を提供する。

【解決手段】 電費を取得する電費取得部34と、蓄電池110の残存容量を取得する残存容量取得部38と、現在位置から充電スタンドまでの走行距離を取得するスタンド距離取得部44と、電費取得部34が取得した電費と残存容量取得部38が取得した残存容量とスタンド距離取得部44が取得した充電スタンドまでの走行距離とに基づいて電気自動車100の節電運転が必要であるか否かを判断する節電要否判定部56と、節電運転要否判定部56が、節電運転が必要であると判定した場合には、電気自動車100の単位走行距離当たりの電力消費を抑制する節電制御部58と、を備える。

【選択図】 図3



【特許請求の範囲】

【請求項 1】

蓄電池に充電された電気を利用して走行する電気自動車の消費電力を抑制する節電制御装置であって、

前記電気自動車が単位走行距離あたりに消費する電力量である電費を取得する電費取得部と、

前記蓄電池の残存容量を取得する残存容量取得部と、

現在位置から、前記蓄電池に充電することができる充電スタンドまでの走行距離を取得するスタンド距離取得部と、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した前記蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断する節電要否判定部と、

前記節電要否判定部が、節電運転が必要であると判定した場合には、前記電気自動車の単位走行距離あたりの電力消費を抑制する節電制御部と、

を備えることを特徴とする節電制御装置。

【請求項 2】

請求項 1 に記載の節電制御装置であって、

前記電費取得部が取得した電費と、前記残存容量取得部が取得した残存容量とに基づいて、前記電気自動車が該残存容量で走行可能な距離を算出する走行可能距離算出部を備え、

前記節電要否判定部は、前記走行可能距離算出部が算出した走行可能な距離と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断することを特徴とする節電制御装置。

【請求項 3】

請求項 1 に記載の節電制御装置であって、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車が前記充電スタンドに到達するために必要な電気容量を算出するスタンド必要容量算出部を備え、

前記節電要否判定部は、前記スタンド必要容量算出部が算出した必要な電気容量と、前記残存容量取得部が取得した前記蓄電池の残存容量とに基づいて、前記電気自動車の節電運転が必要であるか否かを判定することを特徴とする節電制御装置。

【請求項 4】

請求項 1 に記載の節電制御装置であって、

現在位置から前記充電スタンドまでの経路を取得するスタンド経路取得部と、

前記スタンド経路取得部が取得した経路の道路渋滞情報を取得するスタンド渋滞情報取得部と、

道路渋滞の度合いに応じた前記電気自動車の標準的な電費を記憶する標準電費記憶部と、

前記スタンド経路取得部が取得した現在位置から前記充電スタンドまでの経路と、前記スタンド渋滞情報取得部が取得した道路渋滞情報と、前記標準電費記憶部が記憶した、当該道路渋滞情報で示される道路渋滞の度合いに応じた標準電費とに基づいて、現在位置から前記充電スタンドまでの走行におけるスタンド平均電費を算出するスタンド電費算出部と、

を備え、

前記節電要否判定部は、前記スタンド電費算出部が算出した現在位置から充電スタンドまでの走行におけるスタンド平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断することを特徴とする節電制御装置。

【請求項5】

請求項1に記載の節電制御装置であって、

前記電気自動車の車内を空調するエアコンと、

前記エアコンが消費する電力消費量を取得するエアコン使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、
を備え、

前記電費算出部は、前記エアコン使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行した走行距離とに基づいて、現在位置から前記充電スタンドまでの走行におけるエアコン平均電費を算出し、

前記充電要否判定部は、前記電費算出部が算出した現在位置から充電スタンドまでの走行におけるエアコン平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判定することを特徴とする節電制御装置。

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【請求項6】

請求項1又は3に記載の節電制御装置であって、

目的地までの走行距離を取得する目的地距離取得部と、

前記電費取得部が取得した前記電気自動車が単位走行距離当たりに消費する電力量である電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断する充電要否判定部と、

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を備え、

前記節電制御部は、前記充電要否判定部が充電が必要であると判定した場合にのみ動作することを特徴とする節電制御装置。

【請求項7】

請求項6に記載の節電制御装置であって、

前記残存容量取得部が取得した前記蓄電池の残存容量と、前記電費取得部が取得した電費とに基づいて、前記電気自動車が該残存容量で走行可能な距離を算出する走行可能距離算出部を備え、

前記節電要否判定部は、前記走行可能距離算出部が算出した前記電気自動車が該残存容量で走行可能な距離と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置。

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【請求項8】

請求項6に記載の節電制御装置であって、

前記目的地距離取得部が取得した距離と、前記電費取得部が取得した電費とに基づいて、前記電気自動車が前記目的地に到達するために必要な電気容量を算出する目的地必要容量算出部を備え、

前記節電要否判定部は、前記目的地必要容量算出部が算出した前記電気自動車が前記目的地に到達するために必要な電気容量と、前記残存容量取得部が取得した前記蓄電池の残存容量とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置。

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【請求項9】

請求項6に記載の節電制御装置であって、

現在位置から前記目的地までの経路を取得する目的地経路取得部と、

前記目的地経路取得部が取得した経路の道路渋滞情報を取得する目的地渋滞情報取得部と、

道路渋滞の度合いに応じた前記電気自動車の標準的な電費を記憶する標準電費記憶部と、

前記目的地経路取得部が取得した現在位置から前記目的地までの経路と、前記目的地渋滞情報取得部が取得した現在位置から前記目的地までの道路渋滞情報と、前記標準電費記

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憶部が記憶した、当該道路渋滞情報で示される道路渋滞の度合いに応じた標準電費とに基づいて、現在位置から前記目的地までの走行における目的地平均電費を算出する目的地電費算出部と、

を備え、

前記充電要否判定部は、前記目的地電費算出部が算出した現在位置から目的地までの走行における目的地平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置。

【請求項 10】

請求項 6 に記載の節電制御装置であって、

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前記電気自動車の車内を空調するエアコンと、

前記エアコンが消費する電力消費量を取得するエアコン使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

を備え、

前記電費算出部は、前記エアコン使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行した走行距離とに基づいて、現在位置から目的地までの走行におけるエアコン平均電費を算出し、

前記充電要否判定部は、前記電費算出部が算出した現在位置から目的地までの走行におけるエアコン平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置。

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【請求項 11】

請求項 1 ～ 3、6 ～ 8 の何れかに記載の節電制御装置であって、

前記電気自動車を走行させる駆動モータが過去所定時間に消費した電力消費量を取得する自動車使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

前記自動車使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行距離とに基づいて、前記電気自動車の過去所定時間における平均の電費を算出する電費算出部と、

を備え、

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前記電費取得部は、前記電費算出部が算出した電費を取得することを特徴とする節電制御装置。

【請求項 12】

請求項 1 ～ 4、6 ～ 9、11 の何れかに記載の節電制御装置であって、

前記電気自動車は、前記電気自動車の車内を空調するエアコンを備え、

前記節電制御部は、前記エアコンで消費される電力量を抑制することにより前記電気自動車の電力消費を抑制することを特徴とする節電制御装置。

【請求項 13】

請求項 1 ～ 12 の何れかに記載の節電制御装置であって、

前記電気自動車の駆動用モータの出力を規制するリミッタを備え、

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前記節電制御部は、前記リミッタを作動させることにより前記電気自動車の電力消費を抑制することを特徴とする節電制御装置。

【請求項 14】

請求項 1 ～ 13 の何れかに記載の節電制御装置を備える電気自動車。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、電気自動車の節電制御装置及びそれを備える電気自動車に関する。

【背景技術】

【0002】

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電気自動車に充電することができる施設（以下、「充電スタンド」と言う）の数は、現時点においてはガソリンスタンドに比べて極めて少ない。すなわち、ガソリン車であれば、燃料残存量が僅かとなってからガソリンスタンドを探して給油することができるが、電気自動車では、電池残存容量が僅かとなったときに充電スタンドを探し始めても、充電スタンドを見つけられず電池切れとなるリスクがある。

【0003】

このような電池切れのリスクを軽減するものとして、特許文献1には、運転開始時又は走行中の電気自動車に対して電池残存容量で到達可能な距離内に存在する充電スタンドの位置情報を提供する充電スタンド情報提供サーバに関する技術が開示されている。

【特許文献1】特開2007-148590号公報

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【発明の開示】

【発明が解決しようとする課題】

【0004】

しかし、特許文献1には、電池残存容量で到達可能な距離内に充電スタンドが存在しない場合には、充電スタンドの情報は提供されない。

そこで、本願発明は、電池残存容量で到達可能な距離内であるか否かに拘らず近隣に存在する充電スタンドの位置情報を該電気自動車に提供するとともに、充電スタンドまでの走行距離と電池残存容量に応じて節電制御を行うことで、該電気自動車の充電スタンドへの到達を可能とする節電制御装置及びそれを備えた電気自動車を提供することを目的とする。

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【課題を解決するための手段】

【0005】

第1の発明は、蓄電池に充電された電気を利用して走行する電気自動車の消費電力を抑制する節電制御装置であって、

前記電気自動車が単位走行距離あたりに消費する電力量である電費を取得する電費取得部と、

前記蓄電池の残存容量を取得する残存容量取得部と、

現在位置から、前記蓄電池に充電することができる充電スタンドまでの走行距離を取得するスタンド距離取得部と、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した前記蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断する節電要否判定部と、

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前記節電運転要否判定部が、節電運転が必要であると判定した場合には、前記電気自動車の単位走行距離あたりの電力消費を抑制する節電制御部と、

を備えることを特徴とする節電制御装置である。

【0006】

第2の発明は、第1の発明に記載の節電制御装置であって、

前記電費取得部が取得した電費と、前記残存容量取得部が取得した残存容量とに基づいて、前記電気自動車が該残存容量で走行可能な距離を算出する走行可能距離算出部を備え

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、前記節電要否判定部は、前記走行可能距離算出部が算出した走行可能な距離と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断することを特徴とする節電制御装置である。

【0007】

第3の発明は、第1の発明に記載の節電制御装置であって、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車が前記充電スタンドに到達するために必要な電気容量を算出するスタンド必要容量算出部を備え、

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前記節電要否判定部は、前記スタンド必要容量算出部が算出した必要な電気容量と、前記残存容量取得部が取得した前記蓄電池の残存容量とに基づいて、前記電気自動車の節電運転が必要であるか否かを判定することを特徴とする節電制御装置である。

【0008】

第4の発明は、第1の発明に記載の節電制御装置であって、
現在位置から前記充電スタンドまでの経路を取得するスタンド経路取得部と、
前記スタンド経路取得部が取得した経路の道路渋滞情報を取得するスタンド渋滞情報取得部と、
道路渋滞の度合いに応じた前記電気自動車の標準的な電費を記憶する標準電費記憶部と、

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前記スタンド経路取得部が取得した現在位置から前記充電スタンドまでの経路と、前記スタンド渋滞情報取得部が取得した道路渋滞情報と、前記標準電費記憶部が記憶した、当該道路渋滞情報で示される道路渋滞の度合いに応じた標準電費とに基づいて、現在位置から前記充電スタンドまでの走行におけるスタンド平均電費を算出するスタンド電費算出部と、

を備え、

前記節電要否判定部は、前記スタンド電費算出部が算出した現在位置から充電スタンドまでの走行におけるスタンド平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断することを特徴とする節電制御装置である。

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【0009】

第5の発明は、第1の発明に記載の節電制御装置であって、

前記電気自動車の車内を空調するエアコンと、

前記エアコンが消費する電力消費量を取得するエアコン使用電力取得部と、

前記電気自動車過去所定時間に走行した走行距離を検出する走行距離検出部と、

を備え、

前記電費算出部は、前記エアコン使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行した走行距離とに基づいて、現在位置から前記充電スタンドまでの走行におけるエアコン平均電費を算出し、

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前記充電要否判定部は、前記電費算出部が算出した現在位置から充電スタンドまでの走行におけるエアコン平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判定することを特徴とする節電制御装置である。

【0010】

第6の発明は、第1又は3の発明に記載の節電制御装置であって、

目的地までの走行距離を取得する目的地距離取得部と、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断する充電要否判定部と、

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を備え、

前記節電制御部は、前記充電要否判定部が充電が必要であると判定した場合にのみ動作することを特徴とする節電制御装置である。

【0011】

第7の発明は、第6の発明に記載の節電制御装置であって、

前記残存容量取得部が取得した前記蓄電池の残存容量と、前記電費取得部が取得した電費とに基づいて、前記電気自動車が該残存容量で走行可能な距離を算出する走行可能距離算出部を備え、

前記節電要否判定部は、前記走行可能距離算出部が算出した前記電気自動車が該残存容

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量で走行可能な距離と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置である。

【0012】

第8の発明は、第6の発明に記載の節電制御装置であって、

前記目的地距離取得部が取得した距離と、前記電費取得部が取得した電費とに基づいて、前記電気自動車が前記目的地に到達するために必要な電気容量を算出する目的地必要容量算出部を備え、

前記節電要否判定部は、前記目的地必要容量算出部が算出した前記電気自動車が前記目的地に到達するために必要な電気容量と、前記残存容量取得部が取得した前記蓄電池の残存容量とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置である。

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【0013】

第9の発明は、第6の発明に記載の節電制御装置であって、

現在位置から前記目的地までの経路を取得する目的地経路取得部と、

前記目的地経路取得部が取得した経路の道路渋滞情報を取得する目的地渋滞情報取得部と、

道路渋滞の度合いに応じた前記電気自動車の標準的な電費を記憶する標準電費記憶部と、

前記目的地経路取得部が取得した現在位置から前記目的地までの経路と、前記目的地渋滞情報取得部が取得した現在位置から前記目的地までの道路渋滞情報と、前記標準電費記憶部が記憶した、当該道路渋滞情報で示される道路渋滞の度合いに応じた標準電費とに基づいて、現在位置から前記目的地までの走行における目的地平均電費を算出する目的地電費算出部と、

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を備え、

前記充電要否判定部は、前記目的地電費算出部が算出した現在位置から目的地までの走行における目的地平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置である。

【0014】

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第10の発明は、第6の発明に記載の節電制御装置であって、

前記電気自動車の車内を空調するエアコンと、

前記エアコンが消費する電力消費量を取得するエアコン使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

を備え、

前記電費算出部は、前記エアコン使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行した走行距離とに基づいて、現在位置から目的地までの走行におけるエアコン平均電費を算出し、

前記充電要否判定部は、前記電費算出部が算出した現在位置から目的地までの走行におけるエアコン平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断することを特徴とする節電制御装置である。

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【0015】

第11の発明は、第1～3、6～8の発明の何れかに記載の節電制御装置であって、

前記電気自動車を走行させる駆動モータが過去所定時間に消費した電力消費量を取得する自動車使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

前記自動車使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行距離とに基づいて、前記電気自動車の過去所定時間における平均の電費を算出する電費算出部と、

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を備え、
前記電費取得部は、前記電費算出部が算出した電費を取得することを特徴とする節電制御装置である。

【0016】

第12の発明は、第1～4、6～9、11の発明の何れかに記載の節電制御装置であって、

前記電気自動車は、前記電気自動車の車内を空調するエアコンを備え、
前記節電制御部は、前記エアコンで消費される電力量を抑制することにより前記電気自動車の電力消費を抑制することを特徴とする節電制御装置である。

【0017】

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第13の発明は、第1～12の発明の何れかに記載の節電制御装置であって、
前記電気自動車の駆動用モータの出力を規制するリミッタを備え、
前記節電制御部は、前記リミッタを作動させることにより前記電気自動車の電力消費を抑制することを特徴とする節電制御装置である。

【0018】

第14の発明は、第1～13の発明の何れかに記載の節電制御装置を備える電気自動車である。

【発明の効果】

【0019】

本発明によれば、充電スタンドまでの走行距離と電池残存容量に応じて節電制御を行う節電制御装置及びそれを備えた電気自動車を提供することができる。

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【発明を実施するための最良の形態】

【0020】

図1は、本発明の一実施形態である節電制御装置1を備えた電気自動車100のブロック構成図である。同図に示すように、電気自動車100は、節電制御装置1、蓄電池110、蓄電池電力計112、蓄電池残存容量検出計120、インバータ130、駆動モータ140、エアコン150、EV(Electric Vehicle:電気自動車)コントローラ160、アクセル162、ブレーキ164、ナビゲーションシステム200等を備える。

【0021】

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蓄電池110は、外部電源から供給される電気や、後述するように駆動モータ140が減速時に車輪142の動力を利用して発電する電気を蓄電する。蓄電池110には、例えば、鉛蓄電池、銀・亜鉛蓄電池、リチウム・イオン蓄電池、ニッケル・金属水酸化物蓄電池、NaS電池、ニッケル・亜鉛蓄電池、リチウム金属蓄電池、大容量高出力のキャパシタなどの二次電池を用いる。

【0022】

蓄電池残存容量検出計120は、蓄電池の残存容量を検出する。
インバータ130は、蓄電池110に蓄電された電気を直流から交流に変換するとともに、後述するEVコントローラ160からの指令に応じて140の出力を制御する。
駆動モータ140は、減速ギア(不図示)を介して車輪142を駆動する。

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【0023】

エアコン150は、蓄電池110から供給される電気を利用して、電気自動車100の車内の温度を調節する冷暖房器である。

エアコン電力計152は、エアコンに供給される電力を検出する。

【0024】

EVコントローラ160は、アクセル162が踏み込まれると、その踏み込み量に応じた加速の指令を駆動モータ140に送信する。また、EVコントローラ160は、ブレーキ164が踏み込まれると、その踏み込み量に応じた減速の指令を駆動モータ140に送信する。

【0025】

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また、E Vコントローラ160は、節電制御装置1とリミッタ166を有する。リミッタ166は、節電制御装置1において節電運転が必要であると判断される（詳細は後述する）と、駆動モータ140へ供給される電力の最大値を所定の値とする。すなわち、一般に電気自動車の駆動モータは、出力が低いほど単位走行距離当たりの消費電力（以下、「電費」という）は改善するので、リミッタ166により駆動モータ140に供給される電力を所定値以下とすることにより、駆動モータ140における消費電力量を抑制することができる。

【0026】

図2は、ナビゲーションシステム200の詳細な構成を示す図である。同図に示すように、GPS受信機210、車速センサ220、方位センサ230、入力手段240、記憶手段250、通信手段260、ナビゲーション制御手段270、表示手段280を備える。

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【0027】

GPS受信機210は、GPS衛星から電波を受信することにより、電気自動車100の現在位置を測位する。

車速センサ220は、電気自動車100の車速を検出する。

方位センサ230は、電気自動車100の進行している方位を検出する。

【0028】

入力手段240は、運転手等（同乗者を含む）から目的地の入力を受付けるタッチパネルなどである。

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記憶手段250は、道路地図情報及び充電スタンド位置情報を記憶する。

通信手段260は、道路の渋滞情報を取得する。

【0029】

ナビゲーション制御手段270は、記憶手段250が記憶する道路地図情報を参照して、GPS受信機210が測位した現在位置から、入力手段240が入力を受付けた目的地までの経路を検索する。また、節電制御装置1において「充電が必要」と判定される（詳細は後述する）と、ナビゲーション制御手段270は、記憶手段250が記憶する道路地図情報及び充電スタンド位置情報を参照して、GPS受信機210が測位した現在位置から最寄の充電スタンドを検索し、現在位置からその充電スタンドまでの経路を検索する。

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【0030】

また、ナビゲーション制御手段270は、車速センサ220が検出する車速と、方位センサ230が検出する方位と、記憶手段250が記憶する道路地図情報とに基づいて、GPS受信機210が測位した電気自動車100の現在位置の誤差を補正することとしてもよく、補正した場合には補正後の現在位置を利用して経路検索等を行う。

【0031】

表示手段280は、電気自動車100の運転者に対して、ナビゲーション制御手段270が検索した目的地までの経路を画面に表示する。

【0032】

図3は、本発明の一実施形態である節電制御装置1のブロック構成図である。同図に示すように、節電制御装置1は、標準電費記憶部22、渋滞情報取得部24、エアコン使用電力取得部26、走行距離取得部28、電費算出部32、電費取得部34、目的地距離取得部30、目的地必要容量算出部36、残存容量取得部38、充電要否判定部40、スタンド情報取得部44、スタンド情報選択部46、スタンド距離取得部48、走行可能距離算出部50、節電要否判定部52、節電入力受付部54、節電要否決定部56、節電制御部58を備える。

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【0033】

標準電費記憶部22は、図4に示すように、エアコン150を使用せず、電気自動車100の通常の方法で運転をした場合の標準的な電費E_s（以下、「標準電費E_s」という）を、渋滞の度合いに応じて記憶する。なお、道路渋滞の度合いとは、例えば、通過車輛の平均時速に基づいて「渋滞」、「混雑」、「順調」に分類される。より具体的には、通

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過車輛の平均時速が20 km/時以下であれば「渋滞」と分類し、40 km/時以下であれば「混雑」と分類し、40 km/時を上回れば「順調」と分類する。

【0034】

図4の例では、道路渋滞状況が「順調」である場合の標準電費 E_s は0.10 kWh/kmであり、「混雑」である場合の標準電費 E_s は0.15 kWh/kmであり、「渋滞」である場合の標準電費 E_s は0.20 kWh/kmとなっている。

【0035】

渋滞情報取得部24は、ナビゲーションシステム200が検索した現在位置から目的地までの経路の各区間における目的地渋滞情報及び各区間の距離をナビゲーションシステム200から取得する。

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【0036】

図5は、渋滞情報取得部24が取得する道路渋滞情報の渋滞情報と区間距離についてのデータ構成を示す図である。同図に示されるように、渋滞情報取得部24は、現在位置から目的地までの経路の各区間（同図の例では、区間X、区間Y、区間Z）についての渋滞情報とそれぞれの区間距離を取得する。

【0037】

渋滞情報取得部24は、同様にして、ナビゲーションシステム200が検索した現在位置から、後述するスタンド情報取得部44が取得した充電スタンドまでの経路の各区間におけるスタンド渋滞情報及び各区間の距離をナビゲーションシステム200から取得する。

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【0038】

エアコン使用電力取得部26は、エアコン電力計152から、過去所定時間（例えば、過去5分間）におけるエアコン150で消費される電力（kW）を取得する。

【0039】

走行距離取得部28は、過去所定時間（例えば、過去5分間）における電気自動車100が走行した距離を取得する。例えば、電気自動車100が有する距離メータ（不図示）の値に基づき、所定時間前の距離メータの値と現時点での距離メータの値との差分をとることにより、過去所定時間の走行距離を取得する。

【0040】

目的地距離取得部30は、ナビゲーションシステム200が算出する現在位置から目的地までの走行距離を取得する。

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【0041】

電費算出部32は、標準電費記憶部22が記憶する標準電費 E_s と、渋滞情報取得部24が取得した目的地渋滞情報と、エアコン使用電力取得部26が取得する過去所定時間におけるエアコン使用による消費電力量と、走行距離取得部28が検出する過去所定時間における電気自動車100が走行した距離とに基づいて、現在位置から目的地までエアコンを使用せずに走行した場合のエアコン切目的地平均電費 E_{n1} 及びエアコンを使用して走行した場合のエアコン入目的地平均電費 E_{c1} を算出する。具体的には、以下の（a）～（h）に示される手順でこの算出を行う。

【0042】

（a）標準電費記憶部22が記憶する標準電費 E_s を参照し、渋滞情報取得部24が取得した各区間の渋滞情報に基づいて、各区間における標準電費 E_s を判定する。例えば、区間Yは、「混雑」の渋滞が発生しているとの情報があるので、標準電費記憶部22を参照して「混雑」時の0.15 kWh/kmが標準電費 E_s であると判定する。

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【0043】

（b）各区間の標準電費 E_s と各区間の距離とに基づいて、エアコン切目的地平均電費 E_{n1} を算出する。例えば、現在位置から目的地までの経路の区間が、区間X、区間Y、区間Zの3区間であるとする、式（1）のような計算を行う。

エアコン切目的地平均電費 $E_n = \{ (\text{区間Xの電費 } 0.10 \text{ kWh/km}) \times (\text{区間Xの距離 } 20 \text{ km}) + (\text{区間Yの電費 } 0.15 \text{ kWh/km}) \times (\text{区間Yの距離 } 8 \text{ km}) +$

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(区間 Z の電費 0.20 kWh/km) $\times$ (区間 Z の距離 10 km) $\} \div$ (区間 X、Y、Z の総計 40 km) $= 0.13 \text{ kWh/km}$. . . (1)

【0044】

(c) 渋滞情報取得部 24 が取得した道路渋滞情報に基づいて、経路上の各区間での電気自動車 100 の車輛速度を推定する。例えば、車輛速度は、当該区間が「渋滞」であれば時速 10 km/h であるとし、当該区間が「混雑」であれば時速 30 km/h であるとし、当該区間が「順調」であれば当該道路の制限速度であるとする。

【0045】

(d) 渋滞情報取得部 24 が取得した各区間の距離を、手順 (c) において推定した各区間における車輛速度で除することにより、当該車輛の各区間の通過に要する時間を算出する。

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【0046】

(e) エアコン使用電力取得部 26 が取得したエアコン消費電力 (kW) に各区間通過時間を乗じることによって、各区間におけるエアコン消費電力量 (kWh) を算出する。

【0047】

(f) 各区間におけるエアコン消費電力量の合計を算出する。

(g) 手順 (f) において算出したエアコン消費電力量の合計を経路の距離で除して、単位距離あたりのエアコン消費電力量 (kWh/km) を算出する。

【0048】

(h) 手順 (b) において算出したエアコン切目的地平均電費 E_{n1} から、手順 (g) において算出した単位距離あたりのエアコン消費電力量を加えて、当該経路においてエアコンを使用して走行した場合のエアコン入目的地平均電費 E_{a1} を算出する。

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【0049】

また、電費算出部 32 は、同様にして、標準電費記憶部 22 が記憶する標準電費 E_s と、渋滞情報取得部 24 が取得したスタンド渋滞情報と、エアコン使用電力取得部 26 が取得する過去所定時間におけるエアコン使用による消費電力量と、走行距離取得部 28 が検出する過去所定時間における電気自動車 100 が走行した距離とに基づいて、現在位置から目的地までエアコンを使用せずに走行した場合のエアコン切スタンド平均電費 E_{n2} 及びエアコンを使用して走行した場合のエアコン入スタンド平均電費 E_{c2} を算出する。

【0050】

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電費取得部 34 は、電費算出部 32 で算出されたエアコン切目的地平均電費 E_{n1} 、エアコン入目的地平均電費 E_{c1} 、エアコン切スタンド平均電費 E_{n2} 、エアコン入スタンド平均電費 E_{c2} を取得する。

【0051】

目的地必要容量算出部 36 は、目的地距離取得部 30 が取得した距離と、電費取得部 34 が取得した電費とに基づいて、電気自動車 100 が目的地に到達するために必要な電気容量 B_g (以下、「必要電気容量 B_g 」という) を算出する。具体的には、現在位置から目的地までの走行距離 (km) を電費取得部 34 が取得したエアコン入目的地平均電費 E_{c1} (kWh/km) で除することによって必要電気容量 B_g を算出する。

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【0052】

残存容量取得部 38 は、蓄電池残存容量検出計 120 から、蓄電池 110 の残存容量 B_r を取得する。

【0053】

充電要否判定部 40 は、残存容量取得部 38 が取得した残存容量 B_r が、目的地必要容量算出部 36 が算出した必要電気容量 B_g を上回れば充電は不要と判定し、残存容量 B_r が必要電気容量 B_g を上回らなければ充電は必要と判定する。

【0054】

なお、上記では、充電要否判定部 40 が、残存容量 B_r と必要電気容量 B_g を比較して充電の要否を判定したが、以下の手順によって充電の要否を判定することとしてもよい。すなわち、走行可能距離算出部 50 が、残存容量取得部 38 が取得した蓄電池 110 の残

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存容量と、電費取得部 34 が取得した各電費とに基づいて、電気自動車 100 が該残存容量で走行可能な距離を算出する。そして、節電要否判定部 40 は、走行可能距離算出部 50 が算出した電気自動車 100 が該残存容量で走行可能な距離と、目的地距離取得部 30 が取得した目的地までの走行距離とに基づいて、電気自動車 100 に充電が必要であるか否かを判定する。

【0055】

スタンド情報取得部 44 は、充電要否判定部 40 が「充電は必要」と判定した場合は、ナビゲーションシステム 200 に照会して、電気自動車 100 を充電する充電スタンドの候補として、現在位置から所定の距離以内に位置する充電スタンドの位置情報を取得する。なお、所定の距離（例えば、10 km）以内に充電スタンドが存在しない場合には、現在位置の近隣に位置する N 箇所（例えば、3 箇所）の充電スタンドの位置情報を取得する。

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【0056】

スタンド選択部 46 は、スタンド情報取得部 44 が位置情報を取得した充電スタンドのうち何れか 1 の充電スタンドの選択を運転手等から受付ける。

【0057】

スタンド距離取得部 48 は、現在位置から、スタンド選択部 46 が選択を受付けた充電スタンドまでの走行距離 D_s （以下、「充電スタンド距離 D_s 」という）をナビゲーションシステム 200 に照会して取得する。

【0058】

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走行可能距離算出部 50 は、残存容量 B_r を、電費取得部 34 が取得したエアコン入スタンド平均電費 E_c2 で除することにより、残存容量 B_r でエアコンを使用して走行可能な距離 D_p （以下、「エアコン入走行可能距離 D_p 」という）を算出する。

【0059】

また、走行可能距離算出部 50 は、残存容量 B_r を、電費取得部 34 が取得したエアコン切スタンド平均電費 E_n2 で除することにより、残存容量 B_r でエアコンを使用せずに走行可能な距離 D_q （ $D_q \geq D_p$ 、以下、「エアコン切走行可能距離 D_q 」という）を算出する。

【0060】

節電要否判定部 52 は、エアコン入走行可能距離 D_p が充電スタンド距離 D_s を上回れば節電運転は不要と判定し、エアコン入走行可能距離 D_p が充電スタンド距離 D_s を上回らなければ節電運転は必要と判定する。

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【0061】

また、節電要否判定部 52 は、エアコン切走行可能距離 D_q が、充電スタンド距離 D_s を上回れば、エアコン 150 の使用を停止するのみの節電で十分と判定する。また、エアコン切走行可能距離 D_q が、充電スタンド距離 D_s を上回らなければ、エアコン 150 の使用停止による節電のみならず、リミッタ 166 による駆動モータ 140 の節電も必要であると判定する。

【0062】

なお、上記では、節電要否判定部 52 が、エアコン入走行可能距離 D_p と充電スタンド距離 D_s を比較して節電の要否を判定したが、以下の手順によって節電の要否を判定することとしてもよい。すなわち、スタンド必要容量算出部（不図示）は、電費取得部 34 が取得した電気自動車 100 が単位走行距離当たりに消費する電力量である電費と、スタンド距離取得部 48 が取得した充電スタンドまでの走行距離とに基づいて、電気自動車 100 が充電スタンドに到達するために必要な電気容量を算出する。そして、節電要否判定部 52 は、スタンド必要容量算出部が算出した必要な電気容量と、残存容量取得部 38 が取得した蓄電池 110 の残存容量とに基づいて、電気自動車 100 の節電運転が必要であるか否かを判定する。

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【0063】

節電入力受付部 54 は、蓄電池 110 に残存容量 B_r が少ない場合であっても、暑い季

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節など運転手等がエアコン150の使用を継続したい場合は、運転手等からエアコン150の使用を継続する旨の入力を受付ける。また、車線が輻輳する道路である等の道路状況からリミッタ166を作動させるべきでないと運転手が判断した場合には、節電入力受付部54は、運転手等からリミッタ166を作動させない旨の入力を受付ける。

【0064】

節電要否決定部56は、節電要否判定部52が判定した結果と、節電入力受付部54が受付けた入力内容とに基づいて、節電の対象を決定する。すなわち、節電要否判定部52がエアコン150及び駆動モータ140での節電運転が必要と判断した場合には、エアコン150をオフとする決定をすると共に、リミッタ166をオンとする決定をする。ただし、節電入力受付部54がエアコン150の使用を継続する旨の入力を受付けている場合には、エアコン150をオンとする決定をする。また、節電入力受付部54がリミッタ166を作動させない旨の入力を受付けている場合には、リミッタ166をオフとする決定をする。

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【0065】

一方、節電要否判定部52がエアコン150のみの節電で十分であると判断した場合には、エアコン150をオフとする決定をする。ただし、節電入力受付部54がエアコン150の作動を継続する旨の入力を受付けている場合には、エアコン150をオンとする決定をし、リミッタ166をオンとする決定をする。なお、節電入力受付部54がリミッタ166を作動させない旨の入力を受付けている場合には、リミッタ166をオフとする決定をする。

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【0066】

節電制御部58は、節電要否決定部56の節電の決定に基づいて、駆動モータ140とエアコン150での電気の消費を抑制することにより、節電を行う。具体的には、節電要否決定部56の決定に基づいて、節電制御部58は、リミッタ166のオン／オフ制御と、エアコン150のオン／オフ制御を行うことにより、電気の消費を抑制する。すなわち、一般に電気自動車の駆動モータは、出力が低いほど電費は向上するので、リミッタ166により駆動モータ140に供給される電力を所定値以下とすることにより、駆動モータ140における消費電力量を抑制することができる。

【0067】

図6(A)、(B)、(C)は、節電制御装置1が行う制御処理を示すフロー図である。

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【0068】

渋滞情報取得部24は、ナビゲーションシステム200から渋滞情報を取得する(図6(A)のS602)。また、エアコン使用電力取得部26は、エアコン150の過去の所定時間の使用電力を取得する(S604)。走行距離取得部28は、過去の所定時間の走行距離を取得する(S606)。

【0069】

電費算出部32は、標準電費記憶部22が記憶する標準的な電費と、渋滞情報取得部24が取得した目的地渋滞情報と、エアコン使用電力取得部26が取得した過去の所定時間のエアコンの使用電力と、走行距離取得部28が取得した過去の所定時間における走行距離とに基づいて、エアコン150を使用して走行した場合のエアコン入目的地平均電費E_{c1}と、エアコン150を使用しないで走行した場合のエアコン切目的地平均電費E_{n1}をそれぞれ算出する(S608)。

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【0070】

また、電費算出部32は、標準電費記憶部22が記憶する標準的な電費と、渋滞情報取得部24が取得したスタンド渋滞情報と、エアコン使用電力取得部26が取得した過去の所定時間のエアコンの使用電力と、走行距離取得部28が取得した過去の所定時間における走行距離とに基づいて、エアコン150を使用して走行した場合のエアコン入スタンド平均電費E_{c2}と、エアコン150を使用しないで走行した場合のエアコン切スタンド平均電費E_{n2}をそれぞれ算出する(S608)。

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【0071】

目的地距離取得部30は、ナビゲーションシステム200から現在位置から目的地までの走行距離を取得する(S610)。目的地必要容量算出部36は、目的地距離取得部30が取得した距離と、電費取得部34が取得した電費とに基づいて、必要電気容量Bgを算出する(S612)。残存容量取得部38は、蓄電池残存容量検出計120から残存容量Brを取得する(S614)。

【0072】

充電要否判定部40は、残存容量Brが、必要電気容量Bgを上回れば充電は不要と判定し(S616:NO)、節電制御装置1の処理は終了する。一方、残存容量Brが電気容量Bgを上回らなければ充電は必要と判定し(S616:YES)、スタンド情報取得部44は、ナビゲーションシステム200から、現在位置の近隣に位置するN箇所(例えば、5箇所)の充電スタンドの位置情報を取得する(S618)。スタンド選択部46は、スタンド情報取得部44が位置情報を取得した充電スタンドのうち何れか1の充電スタンドの選択を運転手等から受付ける(S620)。スタンド距離取得部48は、現在位置から選択された充電スタンドまでの走行距離Dsをナビゲーションシステム200から取得する。(S622)。

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【0073】

走行可能距離算出部50は、残存容量Brをエアコン入スタンド平均電費Ec2で除することにより、残存容量Brでエアコン150を使用して走行可能なエアコン入走行可能距離Dpを算出する(S624)。また、走行可能距離算出部50は、残存容量Brをエアコン切スタンド平均電費En2で除することにより、残存容量でエアコン150を使用しないで走行可能なエアコン切走行可能距離Dqを算出する(S626)。

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【0074】

節電要否判定部52は、エアコン入走行可能距離Dpが、スタンド距離取得部48が取得した現在位置から充電スタンド距離Dsを上回れば、節電運転は不要と判定し(S628:YES)、節電制御装置1の処理は終了する。一方、エアコン入走行可能距離Dpが充電スタンド距離Dsを上回らなければ節電運転は必要と判定する(S628:NO)。

【0075】

次に、節電要否判定部52は、エアコン切走行可能距離Dqが、充電スタンド距離Dsを上回れば(S630:YES)、エアコン150の使用を停止するのみの節電で十分と判定し(S632)、図6(B)のS642に進む。一方、節電要否判定部52は、エアコン切走行可能距離Dqが、充電スタンド距離Dsを上回らなければ(S630:NO)、エアコン150の使用停止による節電のみならず、リミッタ166による駆動モータ140の節電も必要であると判定し(S634)、図6(C)のS662に進む。

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【0076】

節電入力受付部54において、運転手等からエアコン150及びリミッタ166の使用の可否について入力を受付ける(図6(B)のS642)。節電入力受付部54で入力を受付けた内容に基づいて、エアコン150をオフにしてよい場合には(S644:YES)、節電制御部58はエアコン150をオフにして(S646)、終了する。

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【0077】

一方、節電入力受付部54で入力を受付けた内容に基づいて、エアコン150をオフにしてはならない場合には(S644:NO)、節電制御部58はエアコン150をオンのままとし(S648)、S650に進む。

【0078】

節電入力受付部54で入力を受付けた内容に基づいて、リミッタ166をオンにしてよい場合には(S650:YES)、節電制御部58はリミッタ166をオンにして(S652)、終了する。リミッタ166をオンにしてはならない場合には(S650:NO)、節電制御部58はリミッタ166をオフにしたまま(S654)、終了する。

【0079】

また、節電入力受付部54において、運転手等からエアコン150及びリミッタ166

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の使用の可否について入力を受付ける（図6（C）のS662）。節電入力受付部54で入力を受付けた内容に基づいて、エアコン150をオフにしてよい場合には（S664：YES）、節電制御部58はエアコン150をオフにして（S666）、S670に進む。

【0080】

一方、節電入力受付部54で入力を受付けた内容に基づいて、エアコン150をオフにしてはならない場合には（S664：NO）、節電制御部58はエアコン150をオンのままとし（S668）、S670に進む。

【0081】

節電入力受付部54で入力を受付けた内容に基づいて、リミッタ166をオンにしてよい場合には（S670：YES）、節電制御部58はリミッタ166をオンにして（S672）、終了する。リミッタ166をオンにしてはならない場合には（S670：NO）、節電制御部58はリミッタ166をオフにしたまま（S674）、終了する。

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【0082】

以上の通り、本実施形態の節電制御装置1によれば、目的地又は充電スタンドまでの走行距離と電池残存容量に応じて節電制御を行うことにより、電池残存容量で走行可能な距離を延ばすことができる。これにより、電池残存容量が僅かであっても充電スタンドに到達できるようにし、もって蓄電池110の電池切れを防止することができる。

【0083】

また、節電制御装置1によれば、エアコン使用電力取得部26を設けることにより、エアコン150で使用される使用電力量を考慮して上記節電制御を行うことができる。すなわち、エアコン150を停止すればリミッタ166による駆動モータ140の節電運転を行わなくても十分に充電スタンドに到達できる場合には、エアコン150のみの節電とすることができる。

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【0084】

また、節電制御装置1によれば、渋滞情報取得部24において渋滞情報を取得することにより、現在位置から目的地又は充電スタンドまでの経路の道路渋滞を考慮して上記節電制御を行うことができる。すなわち、当該経路の道路が混雑又は渋滞している場合は、一般的に電費が悪化し、蓄電池110の残存容量で走行可能な距離が、道路が混雑していない場合に比べて短くなる。このように、道路の混雑又は渋滞を考慮した上で、節電の可否を判断し、節電制御を行うことができる。

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【0085】

また、節電制御装置1によれば、節電入力受付部54において、運転手等からエアコン150の使用継続の入力を受付けることができる。これにより、夏季等の暑い季節には、エアコン150が機械的に停止することを防止でき、もって運転手の安全運転に寄与することができる。また、節電入力受付部54において、運転手等からリミッタ166の不使用の入力を受付けることができる。これにより、交通量が多く道路が輻輳する路線において、電気自動車100の加速性能が鈍ることが運転の安全に悪影響を及ぼす場合には、リミッタ166が機械的に作動を開始することを防止でき、もって運転手の安全運転に寄与することができる。

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【0086】

次に、本発明の別の実施形態である節電制御装置2について説明する。

図7は、本発明の別の実施形態である節電制御装置2を示す図である。上記実施形態の節電制御装置1では、電費算出部32において、標準電費記憶部22で記憶された標準電費Esと渋滞情報取得部24が取得した道路渋滞情報及び各区間の距離に基づいて平均電費を算出したが、本実施形態の節電制御装置2では、後述するように自動車使用電力取得部60が取得する電気自動車100の消費電力量に基づいて算出する。

【0087】

蓄電池電力計112は、蓄電池110からエアコン150、ヘッドライト（不図示）、カーステレオ（不図示）、ナビゲーションシステム200等の電気自動車100が備える

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各電気機器と、駆動モータ 140 とに供給される電力量を検出する。

【0088】

自動車使用電力取得部 60 は、蓄電池電力計 112 から、過去所定時間（例えば、過去 5 分間）における各電気機器と駆動モータ 140 で消費される電力（kW）を取得する。

【0089】

電費算出部 32 は、自動車使用電力取得部 60 が取得する過去所定時間（例えば、過去 5 分間）における消費電力量（エアコン使用を使用していれば、エアコンでの消費電力量も含む）と、走行距離取得部 28 が検出する過去所定時間（例えば、過去 5 分間）における電気自動車 100 が走行した距離とに基づいて、現在位置から目的地までの走行における過去所定時間の平均電費（エアコン入平均電費 E_{c3} ）の実績を算出する。また、電費算出部 32 は、自動車使用電力取得部 60 が取得する過去所定時間（例えば、過去 5 分間）における消費電力量からエアコンでの消費電力量を差し引いた消費電力量と、走行距離取得部 28 が検出する過去所定時間（例えば、過去 5 分間）における電気自動車 100 が走行した距離とに基づいて、現在位置から目的地までの走行における過去所定時間のエアコン 150 を使用していなかったと仮定した場合の平均電費（エアコン切平均電費 E_{n3} ）を算出する。

【0090】

なお、電費算出部 32 は、電気自動車 100 の消費電力（kW）と走行速度（km/h）に基づいて、電費（kWh/km）を算出してもよい。すなわち、走行速度取得部（不図示）は、電気自動車 100 に設けられた速度計（不図示）から走行速度を取得する。そして、自動車使用電力取得部 60 が取得する消費電力（kW）を該走行速度で除することによって、電費を算出する。

【0091】

上記以外の節電制御装置 2 が備える各部 26～30、34～54 は、節電制御装置 1 において行う制御と同様の制御を行う。なお、目的地必要容量算出部 36 及び走行可能距離算出部 50 の算出においては、エアコン入目的地平均電費 E_{c1} 及びエアコン入スタンド平均電費 E_{c2} に代えてエアコン入平均電費 E_{c3} を用いる。同様に、目的地必要容量算出部 36 及び走行可能距離算出部 50 の算出においては、エアコン切目的地平均電費 E_{n1} 及びエアコン切スタンド平均電費 E_{n2} に代えてエアコン切平均電費 E_{n3} を用いる。

【0092】

以上の通り、本実施形態の節電制御装置 2 によっても、目的地又は充電スタンドまでの走行距離と電池残存容量に応じて節電制御を行うことにより、電池残存容量で走行可能な距離を延ばすことができる。これにより、電池残存容量が僅かであっても充電スタンドに到達できるようにし、もって蓄電池 110 の電池切れを防止することができる。

【0093】

なお、以上の実施形態の説明は、本発明の理解を容易にするためのものであり、本発明を限定するものではない。本発明はその趣旨を逸脱することなく、変更、改良され得ると共に本発明にはその等価物が含まれることは勿論である。

【図面の簡単な説明】

【0094】

【図 1】本発明の一実施形態である節電制御装置 1 を用いて実現される電気自動車 100 のブロック構成図である。

【図 2】ナビゲーションシステム 200 の詳細な構成を示す図である。

【図 3】本発明の一実施形態である節電制御装置 1 のブロック構成図である。

【図 4】標準電費記憶部 22 が記憶する標準的な電費のデータ構成を示す図である。

【図 5】渋滞情報取得部 24 が取得する道路渋滞情報の渋滞情報と区間距離についてのデータ構成を示す図である。

【図 6（A）】節電制御装置 1 が行う制御処理を示すフロー図である。

【図 6（B）】節電制御装置 1 が行う制御処理を示すフロー図である。

【図 6（C）】節電制御装置 1 が行う制御処理を示すフロー図である。

【図 7】 本発明の別の実施形態である節電制御装置 2 を示す図である。

【符号の説明】

【0095】

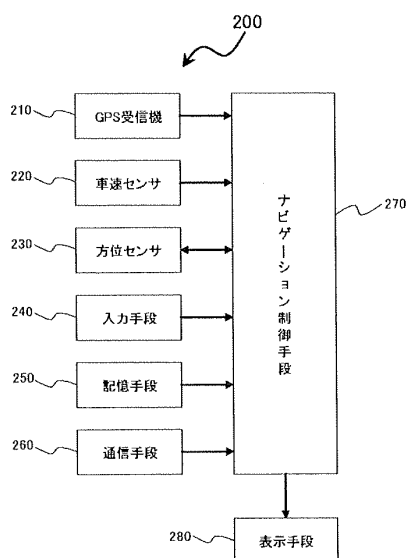
1、2 節電制御装置
 24 渋滞情報取得部
 28 走行距離取得部
 32 電費算出部
 36 目的地必要容量算出部
 40 充電要否判定部
 46 スタンド選択部
 50 走行可能距離算出部
 54 節電入力受付部
 58 節電制御部
 100 電気自動車
 112 蓄電池電力計
 130 インバータ
 142 車輪
 152 エアコン電力計
 162 アクセル
 166 リミッタ
 210 GPS受信機
 230 方位センサ
 250 記憶手段
 270 ナビゲーション制御手段

22 標準電費記憶部
 26 エアコン使用電力取得部
 30 目的地距離取得部
 34 電費取得部
 38 残存容量取得部
 44 スタンド情報取得部
 48 スタンド距離取得部
 52 節電要否判定部
 56 節電要否決定部
 60 自動車使用電力取得部
 110 蓄電池
 120 蓄電池残存容量検出計
 140 駆動モータ
 150 エアコン
 160 EVコントローラ
 164 ブレーキ
 200 ナビゲーションシステム
 220 車速センサ
 240 入力手段
 260 通信手段
 280 表示手段

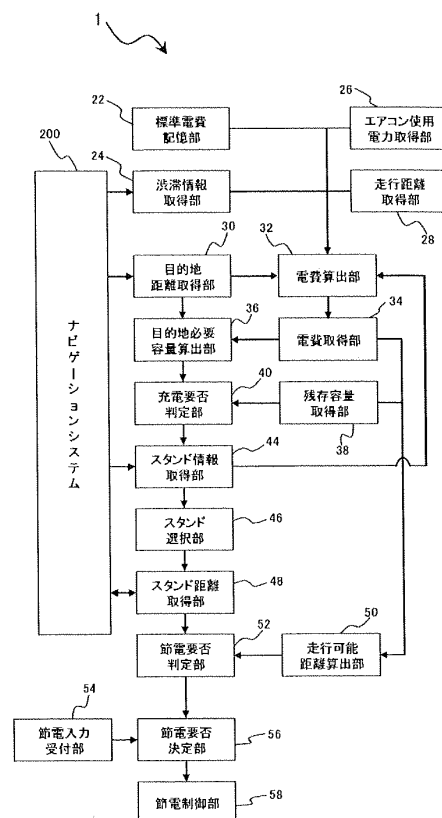
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【図 2】



【図 3】



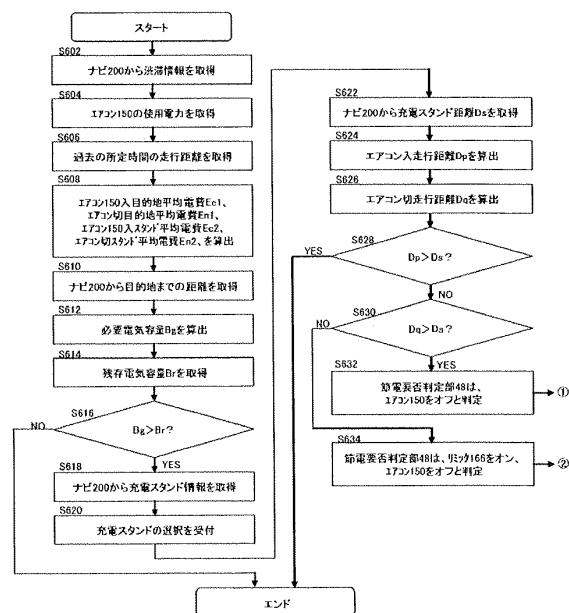
【図 4】

道路渋滞	電 費 (kWh/km)
順 調	0.10
混 雑	0.15
渋 滞	0.20

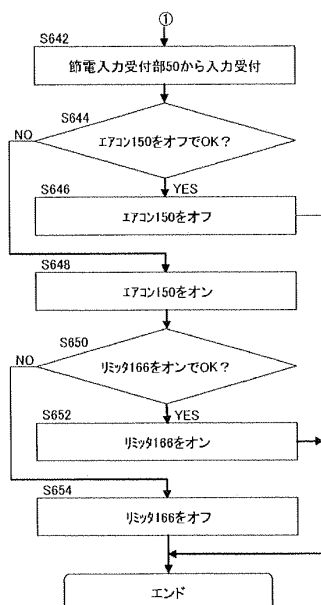
【図 5】

	渋滞情報	区間距離
区間X	順調	20km
区間Y	混雑	8km
区間Z	渋滞	10km
.	.	.
.	.	.
.	.	.

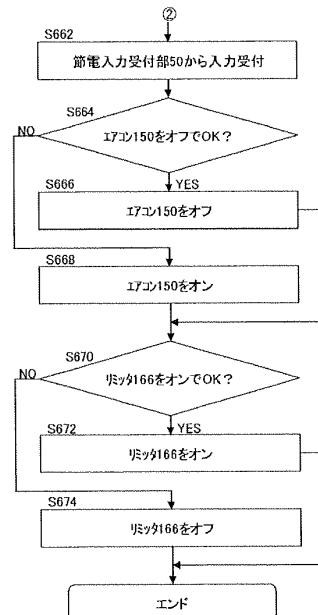
【図 6 (A)】



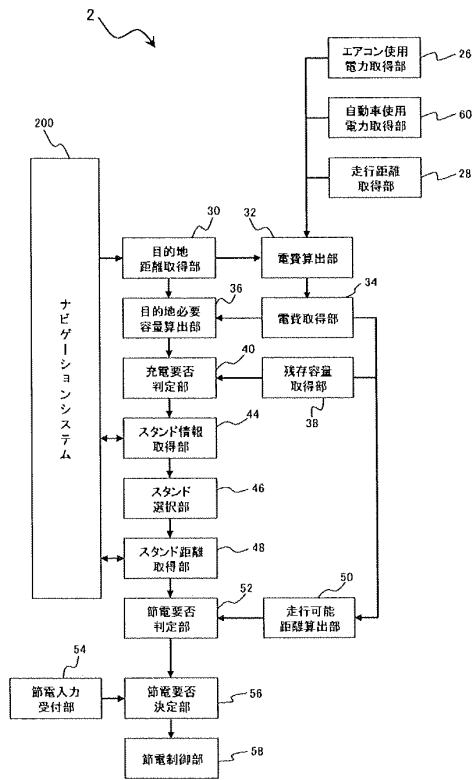
【図 6 (B)】



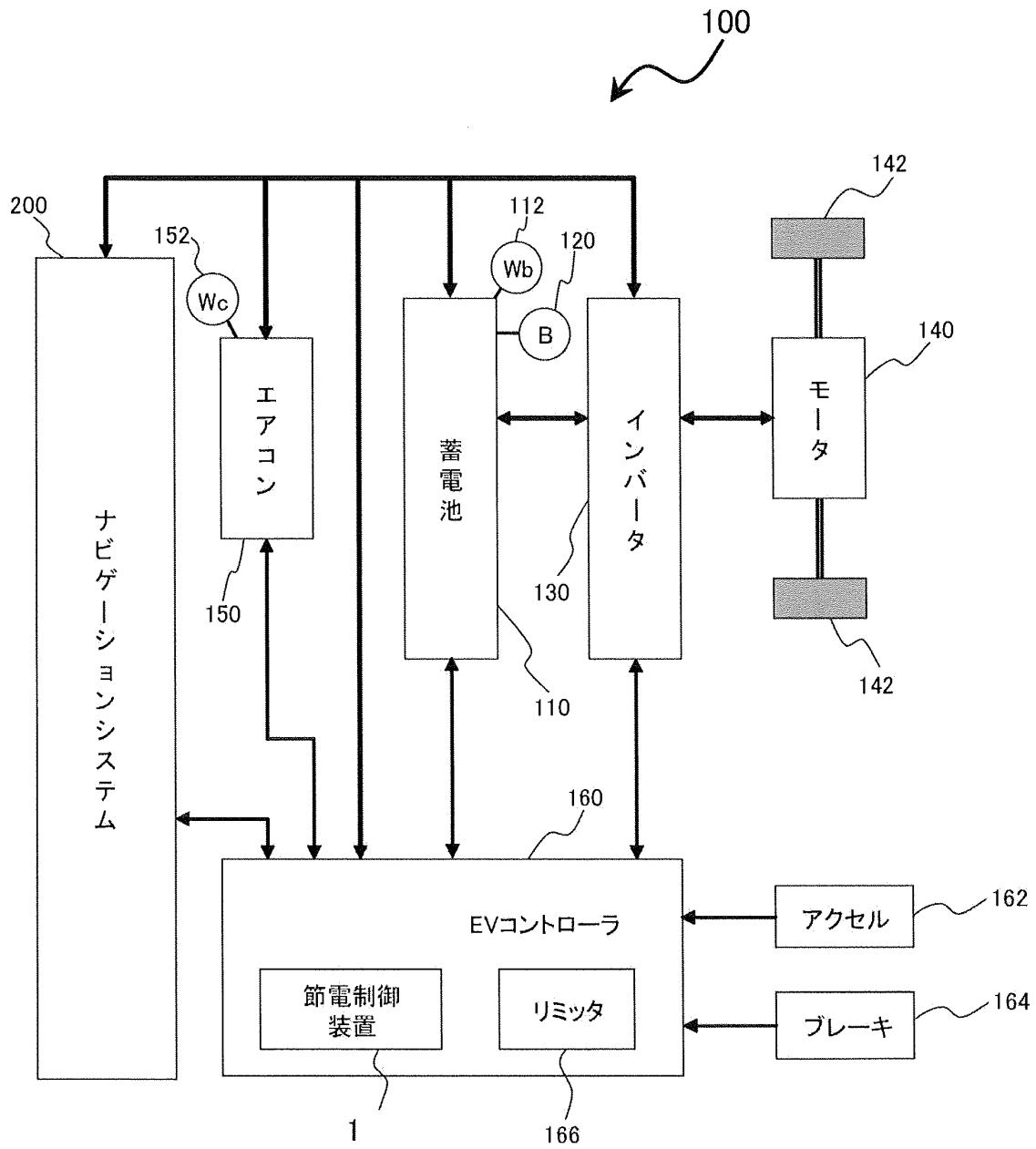
【図 6 (C)】



【図 7】



【図 1】



Thomson Innovation Patent Export, 2013-05-09 18:30:28 -0500

Record 17/25 JP2009171647A POWER SAVING DRIVING SUPPORT DEVICE OF ELECTRIC CAR AND ELECTRIC CAR EQUIPPED WITH THE SAME

Publication Number: JP2009171647A

Publication Date: 2009-07-30

Title: POWER SAVING DRIVING SUPPORT DEVICE OF ELECTRIC CAR AND ELECTRIC CAR EQUIPPED WITH THE SAME

Application Number: JP20083532A

Application Date: 2008-01-10

Abstract (English):

PROBLEM TO BE SOLVED: To provide a power saving driving support device capable of executing power saving control in accordance with the travelling distance to a charging station and the residual capacity of a battery.

SOLUTION: The power saving driving support device 1 suppresses power consumption of an electric car 100 travelling by utilizing power charged in a storage battery 110. The support device 100 includes: a power fee acquiring section 34 for acquiring a power fee as a power rate to be consumed per unit traveling distance by the electric car 100; a residual capacity acquiring section 38 for acquiring the residual capacity of the storage battery 110; a station distance acquiring section 48 for acquiring the travel distance from the present position to a charging station capable of charging the storage battery 110; a possible travelling distance computing section 50 for computing a distance at which the electric car 100 can travel with the residual capacity based on the power fee calculated by the power fee acquiring section 34 and the residual capacity acquired by the residual capacity acquiring section 38; and a power saving propriety display section 60 for displaying the possible travelling distance calculated by the possible travelling distance acquiring section 50 and the travel distance to a charging station acquired by the station distance acquiring section 48.

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Abstract - DWPI:

Abstract - DWPI Novelty:

The apparatus has a power consumption acquisition part (34) acquiring power consumed by an electric vehicle, and a remaining-capacity acquisition part (38) acquiring a capacity of a storage battery. A stand distance acquisition part (48) acquires a distance to a charging stand that charges the storage battery from a present position. A power saving necessity display part (60) displays information regarding a necessity of a power-saving of the electric vehicle based on the distance to the charging stand.



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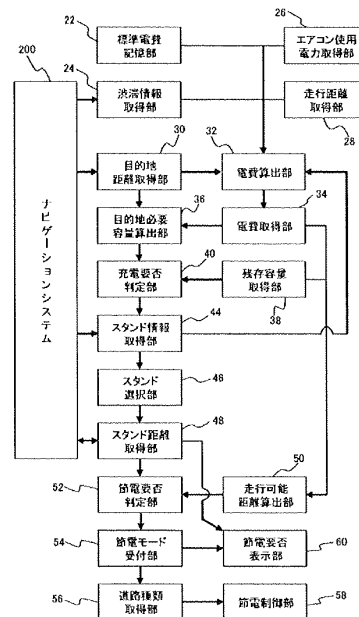
(54) 【発明の名称】 電気自動車の節電運転支援装置及びそれを備える電気自動車

(57) 【要約】

【課題】 充電スタンドまでの走行距離と電池残容量に応じて節電制御を行う節電運転支援装置を提供する。

【解決手段】 蓄電池110に充電された電気を利用して走行する電気自動車100の消費電力を抑制する節電運転支援装置1であって、電気自動車100が単位走行距離あたりに消費する電力量である電費を取得する電費取得部34と、蓄電池110の残存容量を取得する残存容量取得部38と、現在位置から蓄電池110に充電することができる充電スタンドまでの走行距離を取得するスタンド距離取得部48と、電費取得部34が取得した電費と残存容量取得部38が取得した残存容量とに基づいて電気自動車100が該残存容量で走行可能な距離を算出する走行可能距離算出部50と、走行可能距離取得部50が算出した走行可能距離とスタンド距離取得部48が取得した充電スタンドまでの走行距離を表示する節電要否表示部60と、を備える。

【選択図】 図3



【特許請求の範囲】**【請求項 1】**

蓄電池に充電された電気を利用して走行する電気自動車の消費電力を抑制する節電運転支援装置であって、

前記電気自動車が単位走行距離あたりに消費する電力量である電費を取得する電費取得部と、

前記蓄電池の残存容量を取得する残存容量取得部と、

現在位置から、前記蓄電池に充電することができる充電スタンドまでの走行距離を取得するスタンド距離取得部と、

前記電費取得部が取得した電費と、前記残存容量取得部が取得した残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転の要否に関する情報を表示する節電要否表示部と、

を備えることを特徴とする節電運転支援装置。

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【請求項 2】

請求項 1 に記載の節電運転支援装置であって、

前記電費取得部が取得した電費と、前記残存容量取得部が取得した残存容量とに基づいて、前記電気自動車が該残存容量で走行可能な距離を算出する走行可能距離算出部を備え、

前記節電要否表示部は、前記走行可能距離算出部が算出した走行可能距離と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づく情報を表示することを特徴とする節電運転支援装置。

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【請求項 3】

請求項 1 に記載の節電運転支援装置であって、

前記電費取得部が取得した電費と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車が前記充電スタンドに到達するために必要な電気容量を算出するスタンド必要容量算出部を備え、

前記節電要否表示部は、前記電費算出部が算出した必要な電気容量と、前記残存容量取得部が取得した蓄電池の残存容量とに基づく情報を表示することを特徴とする節電運転支援装置。

【請求項 4】

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請求項 1 ～ 3 の何れかに記載の節電運転支援装置であって、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した前記蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断する節電要否判定部と、

運転手等から自動モードの入力を受付ける節電モード受付部と、

前記節電モード受付部が自動モードの入力を受け、かつ前記節電運転要否判定部が節電運転が必要であると判定した場合には、前記電気自動車の単位走行距離あたりの電力消費を抑制する節電制御部と、

を備えることを特徴とする節電運転支援装置。

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【請求項 5】

請求項 4 に記載の節電運転支援装置であって、

現在位置から前記充電スタンドまでの経路を取得するスタンド経路取得部と、

前記スタンド経路取得部が取得した経路の道路渋滞情報を取得するスタンド渋滞情報取得部と、

道路渋滞の度合いに応じて前記電気自動車の標準的な電費を記憶する標準電費記憶部と、

前記スタンド経路取得部が取得した現在位置から前記充電スタンドまでの経路と、前記スタンド渋滞情報取得部が取得した道路渋滞情報と、前記標準電費記憶部が記憶した、当該道路渋滞情報で示される道路渋滞の度合いに応じた標準電費とに基づいて、現在位置か

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ら前記充電スタンドまでの走行におけるスタンド平均電費を算出するスタンド電費算出部と、

を備え、

前記節電要否判定部は、前記スタンド電費算出部が算出した現在位置から充電スタンドまでの走行におけるスタンド平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断することを特徴とする節電運転支援装置。

【請求項 6】

請求項 4 に記載の節電運転支援装置であって、

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前記電気自動車の車内を空調するエアコンと、

前記エアコンが消費する電力消費量を取得するエアコン使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

を備え、

前記電費算出部は、前記エアコン使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行した走行距離とに基づいて、現在位置から前記充電スタンドまでの走行におけるエアコン平均電費を算出し、

前記充電要否判定部は、前記電費算出部が算出した現在位置から充電スタンドまでの走行におけるエアコン平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判定することを特徴とする節電運転支援装置。

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【請求項 7】

請求項 1 ～ 4 の何れかに記載の節電運転支援装置であって、

目的地までの走行距離を取得する目的地距離取得部と、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断する充電要否判定部と、

を備え、

前記節電制御部は、前記充電要否判定部が充電が必要であると判定した場合にのみ動作することを特徴とする節電運転支援装置。

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【請求項 8】

請求項 1 ～ 4 、 7 の何れかに記載の節電運転支援装置であって、

前記電気自動車を走行させる駆動モータが過去所定時間に消費した電力消費量を取得する自動車使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

前記自動車使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行距離とに基づいて、前記電気自動車の過去所定時間における平均の電費を算出する電費算出部と、

を備え、

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前記電費取得部は、前記電費算出部が算出した電費を取得することを特徴とする節電運転支援装置。

【請求項 9】

請求項 1 ～ 5 、 7 ～ 8 の何れかに記載の節電運転支援装置であって、

前記電気自動車は、前記電気自動車の車内を空調するエアコンを備え、

前記節電制御部は、前記エアコンで消費される電力量を抑制することにより前記電気自動車の電力消費を抑制することを特徴とする節電運転支援装置。

【請求項 10】

請求項 1 ～ 9 の何れかに記載の節電運転支援装置であって、

前記電気自動車の駆動用モータの出力を規制するリミッタを備え、

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前記節電制御部は、前記リミッタを作動させることにより前記電気自動車の電力消費を抑制することを特徴とする節電運転支援装置。

【請求項 11】

請求項 1～10 の何れかに記載の節電運転支援装置を備える電気自動車。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、電気自動車の節電運転支援装置及びそれを備える電気自動車に関する。

【背景技術】

【0002】

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電気自動車に充電することができる施設（以下、「充電スタンド」と言う）の数は、現時点においてはガソリンスタンドに比べて極めて少ない。すなわち、ガソリン車であれば、燃料残存量が僅かとなってからガソリンスタンドを探して給油することができるが、電気自動車では、電池残存容量が僅かとなったときに充電スタンドを探し始めても、充電スタンドを見つけられず電池切れとなるリスクがある。

【0003】

このような電池切れのリスクを軽減するものとして、特許文献 1 には、運転開始時又は走行中の電気自動車に対して電池残存容量で到達可能な距離内に存在する充電スタンドの位置情報を提供する充電スタンド情報提供サーバに関する技術が開示されている。

【特許文献 1】特開 2007-148590 号公報

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【発明の開示】

【発明が解決しようとする課題】

【0004】

しかし、特許文献 1 には、電池残存容量で到達可能な距離内に充電スタンドが存在しない場合には、充電スタンドの情報は提供されない。

【0005】

そこで、本願発明は、電池残存容量で到達可能な距離内であるか否かに拘らず近隣に存在する充電スタンドの位置情報を該電気自動車に提供するとともに、充電スタンドまでの走行距離と電池残存容量に応じて、運転手に対して節電運転の支援を行うことで、該電気自動車の充電スタンドへの到達を可能とする節電運転支援装置及びそれを備えた電気自動車を提供することを目的とする。

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【課題を解決するための手段】

【0006】

第 1 の発明は、蓄電池に充電された電気を利用して走行する電気自動車の消費電力を抑制する節電運転支援装置であって、

前記電気自動車が単位走行距離あたりに消費する電力量である電費を取得する電費取得部と、

前記蓄電池の残存容量を取得する残存容量取得部と、

現在位置から、前記蓄電池に充電することができる充電スタンドまでの走行距離を取得するスタンド距離取得部と、

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前記電費取得部が取得した電費と、前記残存容量取得部が取得した残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転の要否に関する情報を表示する節電要否表示部と、

を備えることを特徴とする節電運転支援装置である。

【0007】

第 2 の発明は、第 1 の発明に記載の節電運転支援装置であって、

前記電費取得部が取得した電費と、前記残存容量取得部が取得した残存容量とに基づいて、前記電気自動車が該残存容量で走行可能な距離を算出する走行可能距離算出部を備え、

前記節電要否表示部は、前記走行可能距離算出部が算出した走行可能距離と、前記スタ

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ンド距離取得部が取得した充電スタンドまでの走行距離とに基づく情報を表示することを特徴とする節電運転支援装置である。

【0008】

第3の発明は、第1の発明に記載の節電運転支援装置であって、

前記電費取得部が取得した電費と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の前記充電スタンドに到達するために必要な電気容量を算出するスタンド必要容量算出部を備え、

前記節電要否表示部は、前記電費算出部が算出した必要な電気容量と、前記残存容量取得部が取得した蓄電池の残存容量とに基づく情報を表示することを特徴とする節電運転支援装置である。

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【0009】

第4の発明は、第1～3の発明の何れかに記載の節電運転支援装置であって、

前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した前記蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断する節電要否判定部と、

運転手等から自動モードの入力を受付ける節電モード受付部と、

前記節電モード受付部が自動モードの入力を受付け、かつ前記節電運転要否判定部が節電運転が必要であると判定した場合には、前記電気自動車の単位走行距離あたりの電力消費を抑制する節電制御部と、

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を備えることを特徴とする節電運転支援装置である。

【0010】

第5の発明は、第4の発明に記載の節電運転支援装置であって、

現在位置から前記充電スタンドまでの経路を取得するスタンド経路取得部と、

前記スタンド経路取得部が取得した経路の道路渋滞情報を取得するスタンド渋滞情報取得部と、

道路渋滞の度合いに応じて前記電気自動車の標準的な電費を記憶する標準電費記憶部と、

前記スタンド経路取得部が取得した現在位置から前記充電スタンドまでの経路と、前記スタンド渋滞情報取得部が取得した道路渋滞情報と、前記標準電費記憶部が記憶した、当該道路渋滞情報で示される道路渋滞の度合いに応じた標準電費とに基づいて、現在位置から前記充電スタンドまでの走行におけるスタンド平均電費を算出するスタンド電費算出部と、

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を備え、

前記節電要否判定部は、前記スタンド電費算出部が算出した現在位置から充電スタンドまでの走行におけるスタンド平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判断することを特徴とする節電運転支援装置である。

【0011】

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第6の発明は、第4の発明に記載の節電運転支援装置であって、

前記電気自動車の車内を空調するエアコンと、

前記エアコンが消費する電力消費量を取得するエアコン使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

を備え、

前記電費算出部は、前記エアコン使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行した走行距離とに基づいて、現在位置から前記充電スタンドまでの走行におけるエアコン平均電費を算出し、

前記充電要否判定部は、前記電費算出部が算出した現在位置から充電スタンドまでの走行におけるエアコン平均電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前

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記スタンド距離取得部が取得した充電スタンドまでの走行距離とに基づいて、前記電気自動車の節電運転が必要であるか否かを判定することを特徴とする節電運転支援装置である。

【0012】

第7の発明は、第1～4の発明の何れかに記載の節電運転支援装置であって、
目的地までの走行距離を取得する目的地距離取得部と、
前記電費取得部が取得した前記電気自動車が単位走行距離あたりに消費する電力量である電費と、前記残存容量取得部が取得した蓄電池の残存容量と、前記目的地距離取得部が取得した目的地までの走行距離とに基づいて、前記電気自動車に充電が必要であるか否かを判断する充電要否判定部と、

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を備え、

前記節電制御部は、前記充電要否判定部が充電が必要であると判定した場合にのみ動作することを特徴とする節電運転支援装置である。

【0013】

第8の発明は、第1～4、7の発明の何れかに記載の節電運転支援装置であって、
前記電気自動車を走行させる駆動モータが過去所定時間に消費した電力消費量を取得する自動車使用電力取得部と、

前記電気自動車が過去所定時間に走行した走行距離を検出する走行距離検出部と、

前記自動車使用電力取得部が取得した電力消費量と、前記走行距離検出部が検出した走行距離とに基づいて、前記電気自動車の過去所定時間における平均の電費を算出する電費算出部と、

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を備え、

前記電費取得部は、前記電費算出部が算出した電費を取得することを特徴とする節電運転支援装置である。

【0014】

第9の発明は、第1～5、7～8の発明の何れかに記載の節電運転支援装置であって、
前記電気自動車は、前記電気自動車の車内を空調するエアコンを備え、
前記節電制御部は、前記エアコンで消費される電力量を抑制することにより前記電気自動車の電力消費を抑制することを特徴とする節電運転支援装置である。

【0015】

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第10の発明は、第1～9の発明の何れかに記載の節電運転支援装置であって、
前記電気自動車の駆動用モータの出力を規制するリミッタを備え、
前記節電制御部は、前記リミッタを作動させることにより前記電気自動車の電力消費を抑制することを特徴とする節電運転支援装置である。

【0016】

第11の発明は、第1～10の発明の何れかに記載の節電運転支援装置を備える電気自動車である。

【発明の効果】

【0017】

本発明によれば、充電スタンドまでの走行距離と電池残存容量に応じて、運転手に対して節電運転の支援を行う節電運転支援装置及びそれを備えた電気自動車を提供することができる。

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【発明を実施するための最良の形態】

【0018】

図1は、本発明の一実施形態である節電運転支援装置1を備えた電気自動車100のブロック構成図である。同図に示すように、電気自動車100は、節電運転支援装置1、蓄電池110、蓄電池電力計112、蓄電池残存容量検出計120、インバータ130、駆動モータ140、エアコン150、EV（Electric Vehicle：電気自動車）コントローラ160、アクセル162、ブレーキ164、ナビゲーションシステム200等を備える。

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【0019】

蓄電池110は、外部電源から供給される電気や、後述するように駆動モータ140が減速時に車輪142の動力を利用して発電する電気を蓄電する。蓄電池110には、例えば、鉛蓄電池、銀・亜鉛蓄電池、リチウム・イオン蓄電池、ニッケル・金属水酸化物蓄電池、NaS電池、ニッケル・亜鉛蓄電池、リチウム金属蓄電池、大容量高出力のキャパシタなどの二次電池を用いる。

【0020】

蓄電池残存容量検出計120は、蓄電池の残存容量を検出する。

インバータ130は、蓄電池110に蓄電された電気を直流から交流に変換するとともに、後述するEVコントローラ160からの指令に応じて140の出力を制御する。

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駆動モータ140は、減速ギア（不図示）を介して車輪142を駆動する。

【0021】

エアコン150は、蓄電池110から供給される電気を利用して、電気自動車100の車内の温度を調節する冷暖房器である。

エアコン電力計152は、エアコンに供給される電力を検出する。

【0022】

EVコントローラ160は、アクセル162が踏み込まれると、その踏み込み量に応じた加速の指令を駆動モータ140に送信する。また、EVコントローラ160は、ブレーキ164が踏み込まれると、その踏み込み量に応じた減速の指令を駆動モータ140に送信する。

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【0023】

また、EVコントローラ160は、節電運転支援装置1とリミッタ166を有する。リミッタ166は、節電運転支援装置1において自動モードであるときに節電運転が必要であると判断される（詳細は後述する）と、駆動モータ140へ供給される電力の最大値を所定の値とする。すなわち、一般に電気自動車の駆動モータは、出力が低いほど単位走行距離当たりの消費電力（以下、「電費」という）は改善するので、リミッタ166により駆動モータ140に供給される電力を所定値以下とすることにより、駆動モータ140における消費電力量を抑制することができる。

【0024】

図2は、ナビゲーションシステム200の詳細な構成を示す図である。同図に示すように、GPS受信機210、車速センサ220、方位センサ230、入力手段240、記憶手段250、通信手段260、ナビゲーション制御手段270、表示手段280を備える。

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【0025】

GPS受信機210は、GPS衛星から電波を受信することにより、電気自動車100の現在位置を測位する。

車速センサ220は、電気自動車100の車速を検出する。

方位センサ230は、電気自動車100の進行している方位を検出する。

【0026】

入力手段240は、運転手等（同乗者を含む）から目的地の入力を受付けるタッチパネルなどである。

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記憶手段250は、道路地図情報及び充電スタンド位置情報を記憶する。

通信手段260は、道路の渋滞情報を取得する。

【0027】

ナビゲーション制御手段270は、記憶手段250が記憶する道路地図情報を参照して、GPS受信機210が測位した現在位置から、入力手段240が入力を受付けた目的地までの経路を検索する。また、節電運転支援装置1において「充電が必要」と判定される（詳細は後述する）と、ナビゲーション制御手段270は、記憶手段250が記憶する道路地図情報及び充電スタンド位置情報を参照して、GPS受信機210が測位した現在位置から最寄の充電スタンドを検索し、現在位置からその充電スタンドまでの経路を検索す

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る。

【0028】

また、ナビゲーション制御手段270は、車速センサ220が検出する車速と、方位センサ230が検出する方位と、記憶手段250が記憶する道路地図情報とに基づいて、GPS受信機210が測位した電気自動車100の現在位置の誤差を補正することとしてもよく、補正した場合には補正後の現在位置を利用して経路検索等を行う。

【0029】

表示手段280は、電気自動車100の運転者に対して、ナビゲーション制御手段270が検索した目的地までの経路を画面に表示する。

【0030】

図3は、本発明の一実施形態である節電運転支援装置1のブロック構成図である。同図に示すように、節電運転支援装置1は、標準電費記憶部22、渋滞情報取得部24、エアコン使用電力取得部26、走行距離取得部28、電費算出部32、電費取得部34、目的地距離取得部30、目的地必要容量算出部36、残存容量取得部38、充電要否判定部40、スタンド情報取得部44、スタンド選択部46、スタンド距離取得部48、走行可能距離算出部50、節電要否判定部52、節電モード受付部54、道路種類取得部56、節電制御部58、節電要否表示部60を備える。

【0031】

標準電費記憶部22は、図4に示すように、エアコン150を使用せず、電気自動車100の通常の方法で運転をした場合の標準的な電費 E_s （以下、「標準電費 E_s 」という）を、渋滞の度合いに応じて記憶する。なお、道路渋滞の度合いとは、例えば、通過車輛の平均時速に基づいて「渋滞」、「混雑」、「順調」に分類される。より具体的には、通過車輛の平均時速が20km/時以下であれば「渋滞」と分類し、40km/時以下であれば「混雑」と分類し、40km/時を上回れば「順調」と分類する。

【0032】

図4の例では、道路渋滞状況が「順調」である場合の標準電費 E_s は0.10kWh/kmであり、「混雑」である場合の標準電費 E_s は0.15kWh/kmであり、「渋滞」である場合の標準電費 E_s は0.20kWh/kmとなっている。

【0033】

渋滞情報取得部24は、ナビゲーションシステム200が検索した現在位置から目的地までの経路の各区間における目的地渋滞情報及び各区間の距離をナビゲーションシステム200から取得する。

【0034】

図5は、渋滞情報取得部24が取得する道路渋滞情報の渋滞情報と区間距離についてのデータ構成を示す図である。同図に示されるように、渋滞情報取得部24は、現在位置から目的地までの経路の各区間（同図の例では、区間X、区間Y、区間Z）についての渋滞情報とそれぞれの区間距離を取得する。

【0035】

渋滞情報取得部24は、同様にして、ナビゲーションシステム200が検索した現在位置から、後述するスタンド情報取得部44が取得した充電スタンドまでの経路の各区間におけるスタンド渋滞情報及び各区間の距離をナビゲーションシステム200から取得する。

【0036】

エアコン使用電力取得部26は、エアコン電力計152から、過去所定時間（例えば、過去5分間）におけるエアコン150で消費される電力（kW）を取得する。

【0037】

走行距離取得部28は、過去所定時間（例えば、過去5分間）における電気自動車100が走行した距離を取得する。例えば、電気自動車100が有する距離メータ（不図示）の値に基づき、所定時間前の距離メータの値と現時点での距離メータの値との差分をとることにより、過去所定時間の走行距離を取得する。

【0038】

目的地距離取得部30は、ナビゲーションシステム200が算出する現在位置から目的地までの走行距離を取得する。

【0039】

電費算出部32は、標準電費記憶部22が記憶する標準電費 E_s と、渋滞情報取得部24が取得した目的地渋滞情報と、エアコン使用電力取得部26が取得する過去所定時間におけるエアコン使用による消費電力量と、走行距離取得部28が検出する過去所定時間における電気自動車100が走行した距離とに基づいて、現在位置から目的地までエアコンを使用せずに走行した場合のエアコン切目的地平均電費 E_{n1} 及びエアコンを使用して走行した場合のエアコン入目的地平均電費 E_{c1} を算出する。具体的には、以下の(a)～(h)に示される手順でこの算出を行う。

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【0040】

(a) 標準電費記憶部22が記憶する標準電費 E_s を参照し、渋滞情報取得部24が取得した各区間の渋滞情報に基づいて、各区間における標準電費 E_s を判定する。例えば、区間Yは、「混雑」の渋滞が発生しているとの情報があるので、標準電費記憶部22を参照して「混雑」時の 0.15 kWh/km が標準電費 E_s であると判定する。

【0041】

(b) 各区間の標準電費 E_s と各区間の距離とに基づいて、エアコン切目的地平均電費 E_{n1} を算出する。例えば、現在位置から目的地までの経路の区間が、区間X、区間Y、区間Zの3区間であるとする、式(1)のような計算を行う。

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エアコン切目的地平均電費 $E_n = \{ (\text{区間Xの電費} 0.10 \text{ kWh/km}) \times (\text{区間Xの距離} 20 \text{ km}) + (\text{区間Yの電費} 0.15 \text{ kWh/km}) \times (\text{区間Yの距離} 8 \text{ km}) + (\text{区間Zの電費} 0.20 \text{ kWh/km}) \times (\text{区間Zの距離} 10 \text{ km}) \} \div (\text{区間X、Y、Zの総計} 40 \text{ km}) = 0.13 \text{ kWh/km} \quad \dots (1)$

【0042】

(c) 渋滞情報取得部24が取得した道路渋滞情報に基づいて、経路上の各区間での電気自動車100の車輛速度を推定する。例えば、車輛速度は、当該区間が「渋滞」であれば時速 10 km/h であるとし、当該区間が「混雑」であれば時速 30 km/h であるとし、当該区間が「順調」であれば当該道路の制限速度であるとする。

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【0043】

(d) 渋滞情報取得部24が取得した各区間の距離を、手順(c)において推定した各区間における車輛速度で除することにより、当該車輛の各区間の通過に要する時間を算出する。

【0044】

(e) エアコン使用電力取得部26が取得したエアコン消費電力(kW)に各区間通過時間に乗じることで、各区間におけるエアコン消費電力量(kWh)を算出する。

【0045】

(f) 各区間におけるエアコン消費電力量の合計を算出する。

(g) 手順(f)において算出したエアコン消費電力量の合計を経路の距離で除して、単位距離あたりのエアコン消費電力量(kWh/km)を算出する。

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【0046】

(h) 手順(b)において算出したエアコン切目的地平均電費 E_{n1} から、手順(g)において算出した単位距離あたりのエアコン消費電力量を加えて、当該経路においてエアコンを使用して走行した場合のエアコン入目的地平均電費 E_{a1} を算出する。

【0047】

また、電費算出部32は、同様に、標準電費記憶部22が記憶する標準電費 E_s と、渋滞情報取得部24が取得したスタンド渋滞情報と、エアコン使用電力取得部26が取得する過去所定時間におけるエアコン使用による消費電力量と、走行距離取得部28が検出する過去所定時間における電気自動車100が走行した距離とに基づいて、現在位置から目的地までエアコンを使用せずに走行した場合のエアコン切スタンド平均電費 E_{n2} 及

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びエアコンを使用して走行した場合のエアコン入スタンド平均電費 E_{c2} を算出する。

【0048】

電費取得部34は、電費算出部32で算出されたエアコン切目的地平均電費 E_{n1} 、エアコン入目的地平均電費 E_{c1} 、エアコン切スタンド平均電費 E_{n2} 、エアコン入スタンド平均電費 E_{c2} を取得する。

【0049】

目的地必要容量算出部36は、目的地距離取得部30が取得した距離と、電費取得部34が取得した電費とに基づいて、電気自動車100が目的地に到達するために必要な電気容量 B_g （以下、「必要電気容量 B_g 」という）を算出する。具体的には、現在位置から目的地までの走行距離（ km ）を電費取得部34が取得したエアコン入目的地平均電費 E_{c1} （ kWh/km ）で除することによって必要電気容量 B_g を算出する。

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【0050】

残存容量取得部38は、蓄電池残存容量検出計120から、蓄電池110の残存容量 B_r を取得する。

【0051】

充電要否判定部40は、残存容量取得部38が取得した残存容量 B_r が、目的地必要容量算出部36が算出した必要電気容量 B_g を上回れば充電は不要と判定し、残存容量 B_r が必要電気容量 B_g を上回らなければ充電は必要と判定する。

【0052】

なお、上記では、充電要否判定部40が、残存容量 B_r と必要電気容量 B_g を比較して充電の要否を判定したが、以下の手順によって充電の要否を判定することとしてもよい。すなわち、走行可能距離算出部50が、残存容量取得部38が取得した蓄電池110の残存容量と、電費取得部34が取得した各電費とに基づいて、電気自動車100が該残存容量で走行可能な距離を算出する。そして、充電要否判定部40は、走行可能距離算出部50が算出した電気自動車100が該残存容量で走行可能な距離と、目的地距離取得部30が取得した目的地までの走行距離とに基づいて、電気自動車100に充電が必要であるか否かを判定する。

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【0053】

スタンド情報取得部44は、充電要否判定部40が「充電は必要」と判定した場合は、ナビゲーションシステム200に照会して、電気自動車100を充電する充電スタンドの候補として、現在位置から所定の距離以内に位置する充電スタンドの位置情報を取得する。なお、所定の距離（例えば、10km）以内に充電スタンドが存在しない場合には、現在位置の近隣に位置するN箇所（例えば、3箇所）の充電スタンドの位置情報を取得する。

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【0054】

スタンド選択部46は、スタンド情報取得部44が位置情報を取得した充電スタンドのうち何れか1の充電スタンドの選択を運転手等から受付ける。

【0055】

スタンド距離取得部48は、現在位置から、スタンド選択部46が選択を受付けた充電スタンドまでの走行距離 D_s （以下、「充電スタンド距離 D_s 」という）をナビゲーションシステム200に照会して取得する。

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【0056】

走行可能距離算出部50は、残存容量 B_r を、電費取得部34が取得したエアコン入スタンド平均電費 E_{c2} で除することにより、残存容量 B_r でエアコンを使用して走行可能な距離 D_p （以下、「エアコン入走行可能距離 D_p 」という）を算出する。

【0057】

また、走行可能距離算出部50は、残存容量 B_r を、電費取得部34が取得したエアコン切スタンド平均電費 E_{n2} で除することにより、残存容量 B_r でエアコンを使用せずに走行可能な距離 D_q （ $D_q \geq D_p$ 、以下、「エアコン切走行可能距離 D_q 」という）を算出する。

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【0058】

節電要否判定部52は、エアコン入走行可能距離D_pが充電スタンド距離D_sを上回れば節電運転は不要と判定し、エアコン入走行可能距離D_pが充電スタンド距離D_sを上回らなければ節電運転は必要と判定する。

【0059】

また、節電要否判定部52は、エアコン切走行可能距離D_qが、充電スタンド距離D_sを上回れば、エアコン150の使用を停止するのみの節電で十分と判定する。また、エアコン切走行可能距離D_qが、充電スタンド距離D_sを上回らなければ、エアコン150の使用停止による節電のみならず、リミッタ166による駆動モータ140の節電も必要であると判定する。

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【0060】

なお、上記では、節電要否判定部52が、エアコン入走行可能距離D_pと充電スタンド距離D_sを比較して節電の要否を判定したが、以下の手順によって節電の要否を判定することとしてもよい。すなわち、スタンド必要容量算出部（不図示）は、電費取得部34が取得した電気自動車100が単位走行距離あたりに消費する電力量である電費と、スタンド距離取得部48が取得した充電スタンドまでの走行距離とに基づいて、電気自動車100が充電スタンドに到達するために必要な電気容量を算出する。そして、節電要否判定部52は、スタンド必要容量算出部が算出した必要な電気容量と、残存容量取得部38が取得した蓄電池110の残存容量とに基づいて、電気自動車100の節電運転が必要であるか否かを判定する。

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【0061】

節電モード受付部54は、節電制御部58による節電制御を行わない手動モードと、後述する節電制御部58による道路種類に応じて選択的に節電制御を行う自動モードと、節電制御部58による節電制御を強制的に行う強制モードとの切換えの入力を受付ける。例えば、蓄電池110に残存容量B_rが少ない場合であっても、暑い季節など運転手等がエアコン150の使用を継続する場合は、運転手から手動モードの入力を受付ける。また、例えば、蓄電池110が残存容量B_rが少ないが充電スタンドまでの遠い場合には、運転手から強制モードの入力を受付け、電池切れのリスクをより確実に低減する。

【0062】

道路種類取得部56は、走行中の道路の種類が、高速道路等の自動車専用道であるか、一般道であるかの情報をナビゲーションシステム200に照会して取得する。

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【0063】

節電制御部58は、節電モード受付部54が自動モードの選択を受付け、かつ道路種類取得部56が自動車専用道を走行中であるとの情報を取得した場合には、駆動モータ140とエアコン150での電気の消費を抑制することにより、節電を行う。具体的には、節電制御部58は、リミッタ166のオン／オフ制御と、エアコン150のオン／オフ制御を行うことにより、電気の消費を抑制する。すなわち、一般に電気自動車の駆動モータは、出力が低いほど電費は向上するので、リミッタ166により駆動モータ140に供給される電力を所定値以下とすることにより、駆動モータ140における消費電力量を抑制することができる。

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【0064】

なお、節電制御部58は、節電モード受付部54が手動モードの入力を受付けた場合には、作動しない。

【0065】

また、道路種類取得部56から自動車専用道を走行中である旨の情報を取得した場合には、歩行者の飛び出しや車の割り込み等突発的な危険に遭遇することがほとんどないので、リミッタ166を作動させて節電制御を行う。しかし、道路種類取得部56から一般道を走行中である旨の情報を取得した場合には、突発的な危険に遭遇する可能性があり、そのような危険を回避するためには駆動モータ140の出力を制限しない方が好ましいところ、リミッタ166を作動させず、節電制御を行わない。

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【0066】

節電要否表示部60は、走行可能距離算出部50が算出した走行可能距離と、スタンド距離取得部48が取得した充電スタンドまでの走行距離とを、それらの長短が比較できるように表示する。図6は、節電要否表示部60が表示する表示画面の一例を示す図である。同図に示すように、走行可能距離が6km、充電スタンドまでの走行距離が8kmと並行して表示され、節電運転の必要性が一目でわかる。

【0067】

また、節電要否表示部60は、走行可能距離算出部50が算出した走行可能距離から、スタンド距離取得部48が取得した充電スタンドまでの走行距離を差し引いた差分の距離を表示してもよい。図7は、節電要否表示部60が表示する表示画面の第2の例を示す図である。例えば、走行可能距離が6km、充電スタンドまでの走行距離が8kmであるとすると差分はマイナス2kmであるので、同図に示すように、中央の原点から左側に2kmに相当する棒グラフが表示され、節電運転の必要性が一目でわかる。

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【0068】

また、節電要否表示部60は、スタンド必要容量算出部が算出した必要な電気容量と、残存容量取得部38が取得した蓄電池110の残存容量とを、それらの長短が比較できるように表示してもよく、それらの容量の差分を表示してもよい。図8は、節電要否表示部60が表示する表示画面の第3の例を示す図である。同図に示すように、残存容量が0.6kWh、充電スタンドまでの必要容量が0.8kWhと並行して表示され、節電運転の必要性が一目でわかる。

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【0069】

なお、節電要否表示部60の表示は、時間の経過又は電気自動車100の移動に応じて随時更新される。

【0070】

図9(A)、(B)、(C)は、節電運転支援装置1が行う制御処理を示すフロー図である。

渋滞情報取得部24は、ナビゲーションシステム200から渋滞情報を取得する(図9(A)のS902)。また、エアコン使用電力取得部26は、エアコン150の過去の所定時間の使用電力を取得する(S904)。走行距離取得部28は、過去の所定時間の走行距離を取得する(S906)。

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【0071】

電費算出部32は、標準電費記憶部22が記憶する標準的な電費と、渋滞情報取得部24が取得した目的地渋滞情報と、エアコン使用電力取得部26が取得した過去の所定時間のエアコンの使用電力と、走行距離取得部28が取得した過去の所定時間における走行距離とに基づいて、エアコン150を使用して走行した場合のエアコン入目的地平均電費 E_{c1} と、エアコン150を使用しないで走行した場合のエアコン切目的地平均電費 E_{n1} をそれぞれ算出する(S908)。

【0072】

また、電費算出部32は、標準電費記憶部22が記憶する標準的な電費と、渋滞情報取得部24が取得したスタンド渋滞情報と、エアコン使用電力取得部26が取得した過去の所定時間のエアコンの使用電力と、走行距離取得部28が取得した過去の所定時間における走行距離とに基づいて、エアコン150を使用して走行した場合のエアコン入スタンド平均電費 E_{c2} と、エアコン150を使用しないで走行した場合のエアコン切スタンド平均電費 E_{n2} をそれぞれ算出する(S908)。

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【0073】

目的地距離取得部30は、ナビゲーションシステム200から現在位置から目的地までの走行距離を取得する(S910)。目的地必要容量算出部36は、目的地距離取得部30が取得した距離と、電費取得部34が取得した電費とに基づいて、必要電気容量 B_g を算出する(S912)。残存容量取得部38は、蓄電池残存容量検出計120から残存容量 B_r を取得する(S914)。

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【0074】

充電要否判定部40は、残存容量Brが、必要電気容量Bgを上回れば充電は不要と判定し（S916：NO）、節電運転支援装置1の処理は終了する。一方、残存容量Brが電気容量Bgを上回らなければ充電は必要と判定し（S916：YES）、スタンド情報取得部44は、ナビゲーションシステム200から、現在位置の近隣に位置するN箇所（例えば、5箇所）の充電スタンドの位置情報を取得する（S918）。スタンド選択部46は、スタンド情報取得部44が位置情報を取得した充電スタンドのうち何れか1の充電スタンドの選択を運転手等から受付ける（S920）。スタンド距離取得部48は、現在位置から選択された充電スタンドまでの走行距離Dsをナビゲーションシステム200から取得する。（S922）。 10

【0075】

走行可能距離算出部50は、残存容量Brをエアコン入スタンド平均電費Ec2で除することにより、残存容量Brでエアコン150を使用して走行可能なエアコン入走行可能距離Dpを算出する（S924）。また、走行可能距離算出部50は、残存容量Brをエアコン切スタンド平均電費En2で除することにより、残存容量でエアコン150を使用しないで走行可能なエアコン切走行可能距離Dqを算出する（S926）。また、節電要否表示部60は、走行可能距離算出部50が算出したエアコン切走行可能距離Dq及びエアコン切走行可能距離Dq、並びにスタンド距離取得部48が取得した充電スタンドDsまでの走行距離を表示する（S928）。 20

【0076】

節電モード受付部54が、手動モード、自動モード、強制モードのうちの何れかの節電モードを受付ける（S930）。節電モード受付部54が自動モードの入力を受付けていれば、自動モードを選択し（S932：（1））、S934に進む。一方、節電モード受付部54が手動モードの入力を受付けていれば、手動モードを選択し（S932：（2））、終了する。また、節電モード受付部54が強制モードの入力を受付けていれば、強制モードを選択し（S932：（3））、S938に進む。 20

【0077】

道路種類取得部56は、走行中の道路の種類が、自動車専用道であるか、一般道であるかの情報を取得する（S934）。走行中の道路の種類が自動車専用道であれば（S936：YES）、S938に進む。一方、走行中の道路の種類が一般道であれば（S936：NO）、終了する。 30

【0078】

節電要否判定部52は、エアコン入走行可能距離Dpが、スタンド距離取得部48が取得した現在位置から充電スタンド距離Dsを上回れば、節電運転は不要と判定し（S938：YES）、節電運転支援装置1の処理は終了する。一方、エアコン入走行可能距離Dpが充電スタンド距離Dsを上回らなければ節電運転は必要と判定する（S938：NO）。 30

【0079】

次に、節電要否判定部52は、エアコン切走行可能距離Dqが、充電スタンド距離Dsを上回れば（S940：YES）、エアコン150の使用を停止するのみの節電で十分と判定し（S942）、図9（B）のS952に進む。一方、節電要否判定部52は、エアコン切走行可能距離Dqが、充電スタンド距離Dsを上回らなければ（S940：NO）、エアコン150の使用停止による節電のみならず、リミッタ166による駆動モータ140の節電も必要であると判定し（S944）、図9（C）のS972に進む。 40

【0080】

節電モード受付部54において、運転手等からエアコン150及びリミッタ166の使用の可否について入力を受付ける（図9（B）のS952）。節電モード受付部54で入力を受付けた内容に基づいて、エアコン150をオフにしてよい場合には（S954：YES）、節電制御部58はエアコン150をオフにして（S956）、終了する。 50

【0081】

一方、節電モード受付部 5 4 で入力を受付けた内容に基づいて、エアコン 1 5 0 をオフにしてはならない場合には (S 9 5 4 : N O)、節電制御部 5 8 はエアコン 1 5 0 をオンのままとし (S 9 5 8)、S 9 6 0 に進む。

【0082】

節電モード受付部 5 4 で入力を受付けた内容に基づいて、リミッタ 1 6 6 をオンにしてよい場合には (S 9 6 0 : Y E S)、節電制御部 5 8 はリミッタ 1 6 6 をオンにして (S 9 6 2)、終了する。リミッタ 1 6 6 をオンにしてはならない場合には (S 9 6 0 : N O)、節電制御部 5 8 はリミッタ 1 6 6 をオフにしたまま (S 9 6 4)、終了する。

【0083】

また、節電モード受付部 5 4 において、運転手等からエアコン 1 5 0 及びリミッタ 1 6 6 の使用の可否について入力を受付ける (図 9 (C) の S 9 7 2)。節電モード受付部 5 4 で入力を受付けた内容に基づいて、エアコン 1 5 0 をオフにしてよい場合には (S 9 7 4 : Y E S)、節電制御部 5 8 はエアコン 1 5 0 をオフにして (S 9 7 6)、S 9 8 0 に進む。

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【0084】

一方、節電モード受付部 5 4 で入力を受付けた内容に基づいて、エアコン 1 5 0 をオフにしてはならない場合には (S 9 7 4 : N O)、節電制御部 5 8 はエアコン 1 5 0 をオンのままとし (S 9 7 8)、S 9 8 0 に進む。

【0085】

節電モード受付部 5 4 で入力を受付けた内容に基づいて、リミッタ 1 6 6 をオンにしてよい場合には (S 9 8 0 : Y E S)、節電制御部 5 8 はリミッタ 1 6 6 をオンにして (S 9 8 2)、終了する。リミッタ 1 6 6 をオンにしてはならない場合には (S 9 8 0 : N O)、節電制御部 5 8 はリミッタ 1 6 6 をオフにしたまま (S 9 8 4)、終了する。

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【0086】

以上の通り、本実施形態の節電運転支援装置 1 によれば、目的地又は充電スタンドまでの走行距離と電池残存容量に応じて、運転手に対して節電運転の支援を行うことができる。これにより、運転手は、電池残存容量が僅かであっても充電スタンドに到達できるように節電運転に努めることができ、もって蓄電池 1 1 0 の電池切れを防止することができる。

【0087】

また、節電運転支援装置 1 によれば、節電モード受付部 5 4 において、運転手等から手動モード、自動モード、強制モードの入力を受付けることができる。運転手等が、手動モードを選択すれば、夏季等の暑い季節には、エアコン 1 5 0 が機械的に停止することを防止でき、もって運転手の安全運転に寄与することができる。また、交通量が多く道路が輻輳する路線において、電気自動車 1 0 0 の加速性能が鈍ることが運転の安全に悪影響を及ぼす場合には、リミッタ 1 6 6 が機械的に作動を開始することを防止でき、もって運転手の安全運転に寄与することができる。一方、運転手等が、強制モードを選択すれば、蓄電池 1 1 0 が残存容量 B r が少ないが充電スタンドまでの遠い場合であっても、電池切れとなるリスクをより確実に低減することができる。

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【0088】

また、節電運転支援装置 1 によれば、節電モード受付部 5 4 において自動モードの入力を受付けた場合には、エアコン 1 5 0 で使用される使用電力量を考慮して上記節電制御を行うことができる。すなわち、エアコン 1 5 0 を停止すればリミッタ 1 6 6 による駆動モータ 1 4 0 の節電運転を行わなくても十分に充電スタンドに到達できる場合には、エアコン 1 5 0 のみの節電とすることができる。

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【0089】

また、節電運転支援装置 1 によれば、渋滞情報取得部 2 4 において渋滞情報を取得することにより、現在位置から目的地又は充電スタンドまでの経路の道路渋滞を考慮して上記節電制御を行うことができる。すなわち、当該経路の道路が混雑又は渋滞している場合は、一般的に電費が悪化し、蓄電池 1 1 0 の残存容量で走行可能な距離が、道路が混雑して

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いない場合に比べて短くなる。このように、道路の混雑又は渋滞を考慮した上で、節電の要否を判断し、節電制御を行うことができる。

【0090】

次に、本発明の別の実施形態である節電運転支援装置2について説明する。

図10は、本発明の別の実施形態である節電運転支援装置2を示す図である。上記実施形態の節電運転支援装置1では、電費算出部32において、標準電費記憶部22で記憶された標準電費 E_s と渋滞情報取得部24が取得した道路渋滞情報及び各区間の距離に基づいて平均電費を算出したが、後述するように本実施形態の節電運転支援装置2では、自動車使用電力取得部62が取得する電気自動車100の消費電力量に基づいて算出する。

【0091】

蓄電池電力計112は、蓄電池110からエアコン150、ヘッドライト（不図示）、カーステレオ（不図示）、ナビゲーションシステム200等の電気自動車100が備える各電気機器と、駆動モータ140とに供給される電力量を検出する。

【0092】

自動車使用電力取得部62は、蓄電池電力計112から、過去所定時間（例えば、過去5分間）における各電気機器と駆動モータ140で消費される電力（kW）を取得する。

【0093】

電費算出部32は、自動車使用電力取得部62が取得する過去所定時間（例えば、過去5分間）における消費電力量（エアコン使用を使用していれば、エアコンでの消費電力量も含む）と、走行距離取得部28が検出する過去所定時間（例えば、過去5分間）における電気自動車100が走行した距離とに基づいて、現在位置から目的地までの走行における過去所定時間の平均電費（エアコン入平均電費 E_{c3} ）の実績を算出する。また、電費算出部32は、自動車使用電力取得部62が取得する過去所定時間（例えば、過去5分間）における消費電力量からエアコンでの消費電力量を差し引いた消費電力量と、走行距離取得部28が検出する過去所定時間（例えば、過去5分間）における電気自動車100が走行した距離とに基づいて、現在位置から目的地までの走行における過去所定時間のエアコン150を使用していなかったと仮定した場合の平均電費（エアコン切平均電費 E_{n3} ）を算出する。

【0094】

なお、電費算出部32は、電気自動車100の消費電力（kW）と走行速度（km/h）に基づいて、電費（kWh/km）を算出してもよい。すなわち、走行速度取得部（不図示）は、電気自動車100に設けられた速度計（不図示）から走行速度を取得する。そして、自動車使用電力取得部62が取得する消費電力（kW）を該走行速度で除することによって、電費を算出する。

【0095】

上記以外の節電運転支援装置2が備える各部26～30、34～54は、節電運転支援装置1において行う制御と同様の制御を行う。なお、目的地必要容量算出部36及び走行可能距離算出部50の算出においては、エアコン入目的地平均電費 E_{c1} 及びエアコン入スタンド平均電費 E_{c2} に代えてエアコン入平均電費 E_{c3} を用いる。同様に、目的地必要容量算出部36及び走行可能距離算出部50の算出においては、エアコン切目的地平均電費 E_{n1} 及びエアコン切スタンド平均電費 E_{n2} に代えてエアコン切平均電費 E_{n3} を用いる。

【0096】

以上の通り、本実施形態の節電運転支援装置2によっても、目的地又は充電スタンドまでの走行距離と電池残存容量に応じて節電制御を行うことにより、電池残存容量で走行可能な距離を延ばすことができる。これにより、電池残存容量が僅かであっても充電スタンドに到達できるようにし、もって蓄電池110の電池切れを防止することができる。

【0097】

なお、以上の実施形態の説明は、本発明の理解を容易にするためのものであり、本発明を限定するものではない。本発明はその趣旨を逸脱することなく、変更、改良され得ると

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共に本発明にはその等価物が含まれることは勿論である。

【図面の簡単な説明】

【 0 0 9 8 】

【図 1】本発明の一実施形態である節電運転支援装置 1 を用いて実現される電気自動車 1 0 0 のブロック構成図である。

【図 2】ナビゲーションシステム 2 0 0 の詳細な構成を示す図である。

【図 3】本発明の一実施形態である節電運転支援装置 1 のブロック構成図である。

【図 4】標準電費記憶部 2 2 が記憶する標準的な電費のデータ構成を示す図である。

【図 5】渋滞情報取得部 2 4 が取得する道路渋滞情報の渋滞情報と区間距離についてのデータ構成を示す図である。

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【図 6】節電要否表示部 6 0 が表示する表示画面の一例を示す図である。

【図 7】節電要否表示部 6 0 が表示する表示画面の第 2 の例を示す図である。

【図 8】節電要否表示部 6 0 が表示する表示画面の第 3 の例を示す図である。

【図 9 (A)】節電運転支援装置 1 が行う制御処理を示すフロー図である。

【図 9 (B)】節電運転支援装置 1 が行う制御処理を示すフロー図である。

【図 9 (C)】節電運転支援装置 1 が行う制御処理を示すフロー図である。

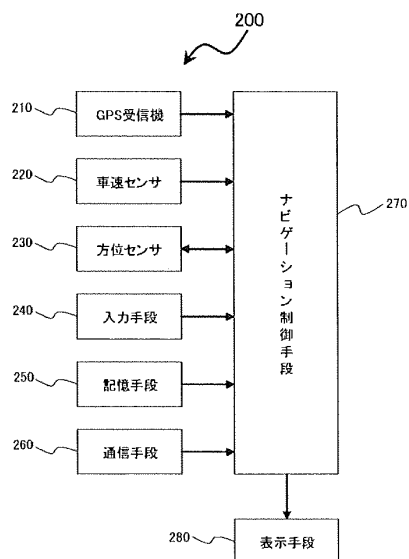
【図 1 0】本発明の別の実施形態である節電運転支援装置 2 を示す図である。

【符号の説明】

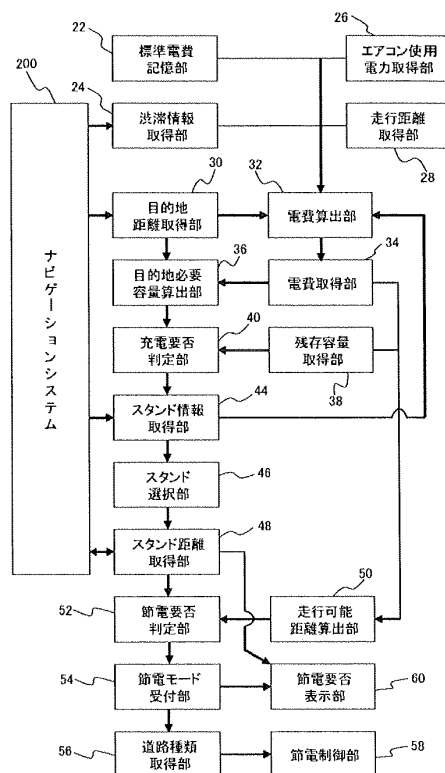
【 0 0 9 9 】

1、2	節電運転支援装置	2 2	標準電費記憶部	20
2 4	渋滞情報取得部	2 6	エアコン使用電力取得部	
2 8	走行距離取得部	3 0	目的地距離取得部	
3 2	電費算出部	3 4	電費取得部	
3 6	目的地必要容量算出部	3 8	残存容量取得部	
4 0	充電要否判定部	4 4	スタンド情報取得部	
4 6	スタンド選択部	4 8	スタンド距離取得部	
5 0	走行可能距離算出部	5 2	節電要否判定部	
5 4	節電モード受付部	5 6	道路種類取得部	
5 8	節電制御部	6 0	節電要否表示部	
6 2	自動車使用電力取得部	1 0 0	電気自動車	30
1 1 0	蓄電池	1 1 2	蓄電池電力計	
1 2 0	蓄電池残存容量検出計	1 3 0	インバータ	
1 4 0	駆動モータ	1 4 2	車輪	
1 5 0	エアコン	1 5 2	エアコン電力計	
1 6 0	E V コントローラ	1 6 2	アクセル	
1 6 4	ブレーキ	1 6 6	リミッタ	
2 0 0	ナビゲーションシステム	2 1 0	G P S 受信機	
2 2 0	車速センサ	2 3 0	方位センサ	
2 4 0	入力手段	2 5 0	記憶手段	
2 6 0	通信手段	2 7 0	ナビゲーション制御手段	40
2 8 0	表示手段			

【図 2】



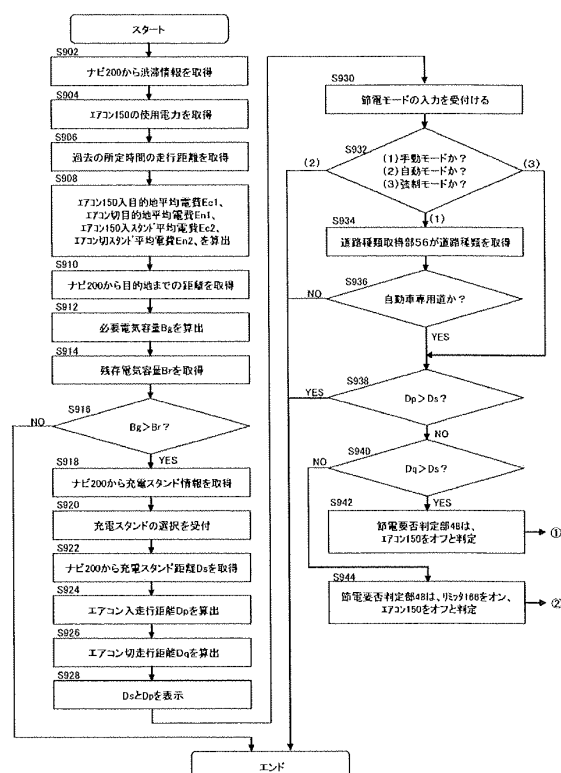
【図 3】



【図 4】

道路渋滞	電 費	
	(kWh/km)	
順 調	0.10	
混 雑	0.15	
渋 滞	0.20	

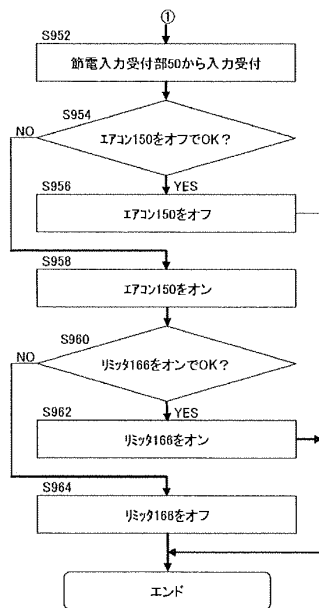
【図 9 (A)】



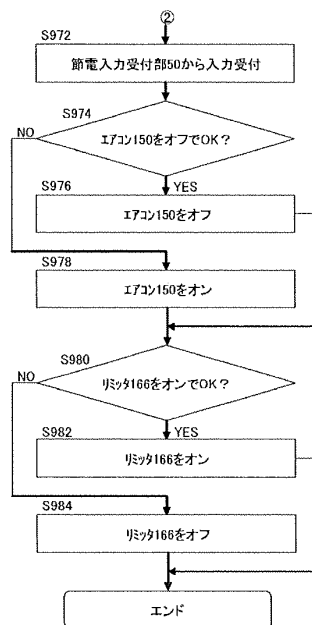
【図 5】

	渋滞情報	区間距離
区間X	順調	20km
区間Y	混雑	8km
区間Z	渋滞	10km
.	.	.
.	.	.

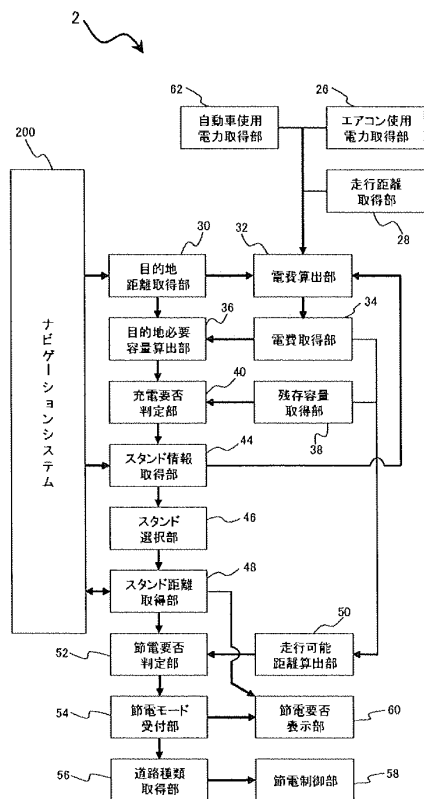
【図 9（B）】



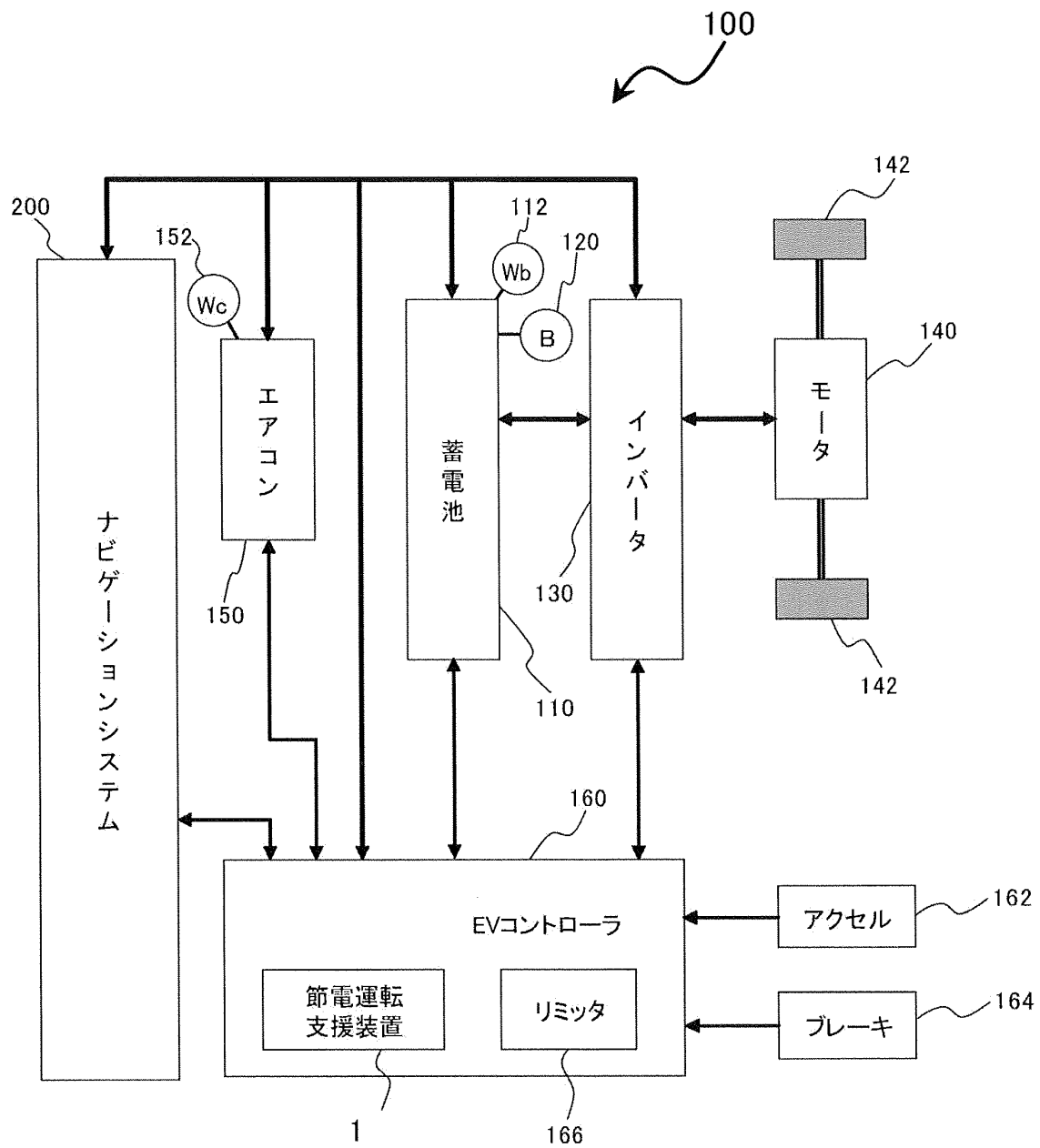
【図 9（C）】



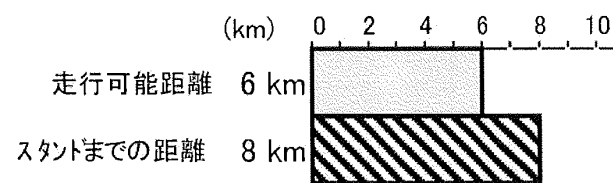
【図 10】



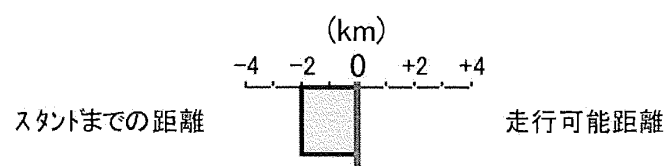
【図 1】



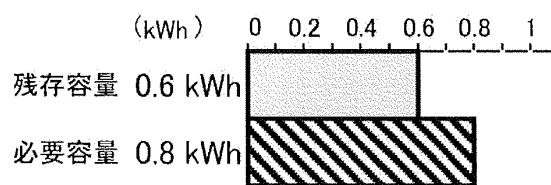
【図 6】



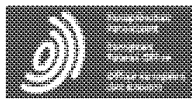
【図 7】



【図 8】



No documents available for this priority number.



Espacenet

Bibliographic data: JP4319289 (B2) — 2009-08-26

BATTERY REPLACING APPARATUS

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Applicant(s): HONDA MOTOR CO LTD

Classification: - **international:** *H01M10/42; H02J7/00*
- **cooperative:** *Y02E60/12; Y02T90/12; Y02T90/128*

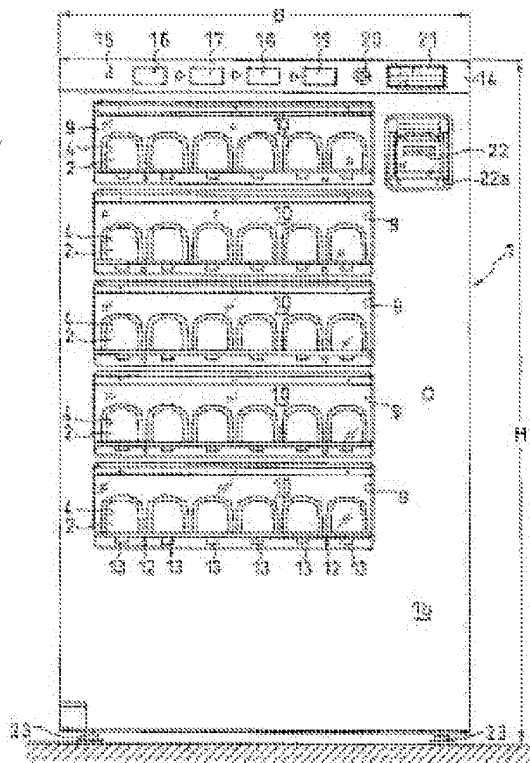
Application number: JP19990144910 19990525

Priority number(s): JP19990144910 19990525

Also published as: JP2000341868 (A)

Abstract of JP2000341868 (A)

PROBLEM TO BE SOLVED: To provide a small-sized battery replacing apparatus suitable for indoor use. **SOLUTION:** A battery replacing apparatus 1 has a plurality of slots 4 for charging by chargers batteries 2 inserted respectively into the plurality of slots 4. The batteries 2, after completing their chargings are lent to users according to the indications of the apparatus 1. When lending the battery 2, its battery- lock provided in the holding mechanism of the apparatus 1 is released to protrude it more forward than the adjacent batteries 2. The height of the battery replacing apparatus 1 is set to 120 cm so that it suits to the securing of a perspective and to the maintaining of a good appearance, even when it is provided in a convenience store, etc.



Last updated: 19.12.2012 Worldwide Database 5.8.4; 92p

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

CLAIMS

(57)[Claim(s)]

[Claim 1]

In battery exchange equipment which has a storage part which consists of two or more cylinder-like-object-with-base objects which store a battery for electric motors, an electric power unit, and a battery charger which charges the aforementioned battery, and provides a charged battery, The number of batteries of right and left directions is made more than the number of batteries of a vertical direction in a storage part of the aforementioned battery,

While inside installation is carried out and an internal atmosphere is maintained only depending on ventilation with installation atmosphere,

An overall height is set as abbreviated 110-130 centimeter,

From a transverse plane of battery exchange equipment, said cylinder-like-object-with-base object makes it incline that the back falls, and is installed so that the bottom part side may be placed caudad, and a terminal for battery charge is provided by upper part of a bottom part of this cylinder-like-object-with-base object,

A control device which consists of a lock control means which holds a received battery to the aforementioned storage part, a charging control means for charging a battery which accepted in the aforementioned storage part, and a lock release control means which releases holding of a storage part which has stored a charged battery according to a user's demand,

A component energized by means of a spring in order to extrude a battery to the opening side of this cylinder-like-object-with-base object when holding of said cylinder-like-object-with-base object is released,

Battery exchange equipment possessing a displaying means which displays a cylinder-like-object-with-base object vacant among two or more aforementioned cylinder-like-object-with-base objects, and a cylinder-like-object-with-base object which has stored a charged battery so that recognition is possible respectively.

[Claim 2]

It is the bottom about the aforementioned electric power unit and a control device,

It is a middle stage about the aforementioned storage part,

The battery exchange equipment according to claim 1 having arranged guide mechanism including the aforementioned displaying means to the highest rung.

[Claim 3]

The battery exchange equipment possessing Hwang who ventilates an internal atmosphere according to claim 1 or 2.

[Claim 4]

The battery exchange equipment according to any one of claims 1 to 3, wherein the aforementioned indoor one is indoor [of a convenience store].

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

Especially the present invention relates to battery exchange equipment preferable for concentrating and managing charge, a loan, etc. of the battery carried in the electric motor which makes an electric motor a driving source about battery exchange equipment.

[0002]

[Description of the Prior Art]

In recent years, in order to assist with people's strength of its legs, the bicycle (henceforth a "motor assisted bicycle") which carries an electric motor as an auxiliary power unit is used. Batteries, such as a nickel-cadmium battery which can repeat and carry out the reuse of the charge, are used for this electric motor as a power supply.

[0003]

By the way, when the user of a motor assisted bicycle owns a battery individually, there is troublesomeness which must manage charge etc. by self. Since this troublesomeness is eliminated, the system which concentrates and manages charge of a battery can be considered. For example, if the user of a motor assisted bicycle borrows and uses the battery by which central control is carried out and a battery is exhausted, the battery exchange system which newly borrows the battery by which returned the battery and full charge was carried out can be considered.

[0004]

JP,H10-293874,A has disclosed the battery exchange equipment which performs a loan and return of a battery automatically to the registered user. By arranging such battery exchange equipment everywhere, a user can not only be released from the troublesomeness of battery managements, such as charge and storage, but can use a motor assisted bicycle in the wide range, without caring about battery consumption.

[0005]

[Problem to be solved by the invention]

The automatic changer of an above-mentioned battery has a structure suitable for outside installation so that conveniently [a user's use visited by vehicles, such as a motor assisted bicycle,]. However, consideration of the amenity of a user use should also consider inside

installation. However, the battery exchange equipment on condition of outside installation has an indispensable air-conditioner for making states, such as an installation area, climate, and the weather, suit, or eliminating the heat produced at the time of battery charge. Therefore, battery exchange equipment was enlarged and there was a problem of not being suitable in inside installation.

[0006]

The present invention solves above-mentioned problem and an object of the present invention is to provide small battery exchange equipment suitable for inside installation.

[0007]

[Means for solving problem]

In the battery exchange equipment which the present invention for attaining the above-mentioned purpose has a storage part which consists of two or more cylinder-like-object-with-base objects which store the battery for electric motors, and a battery charger which charges the aforementioned battery, and provides a charged battery, While inside installation is carried out and an internal atmosphere is maintained only depending on ventilation with installation atmosphere, It is set as abbreviated 110-130 centimeter by the overall height, and the above-mentioned cylinder-like-object-with-base object, The first characteristics are at the point that make it incline that the back falls and are installed from the transverse plane of battery exchange equipment so that the bottom part side may be placed caudad, and the terminal for battery charge of the bottom part of this cylinder-like-object-with-base object is provided. Since according to the first characteristics battery exchange equipment should fit use indoors and whole height is especially set as 110-130 cm, people tend to take a battery in and out to a storage part, and also effective use of putting a thing on the upper surface of a swap device can be aimed at.

[0008]

The present invention has the second characteristics in the point which made the number of the batteries of right and left directions more than the number of the batteries of the vertical direction in the aforementioned battery storage part. According to the second characteristics, the number of storage of a battery is increased, making height low with about 110-130 cm.

[0009]

The lock control means which holds the battery which the present invention possessed the electric power unit and the control device, and the aforementioned control device received to the aforementioned storage part, It consists of a charging control means for charging the battery received in the aforementioned storage part, and a lock release control means which releases holding of the storage part which has stored the charged battery according to a user's demand, When holding of the above-mentioned cylinder-like-object-with-base object is released, in order to extrude a battery to the opening side of this cylinder-like-object-with-base object, the 3rd characteristics are at the point of providing further the component energized by means of a spring. According to the 3rd characteristics, the received battery is locked by the storage part, lock release of the charged battery is carried out, and it is appropriated for the use.

[0010]

The aforementioned storage part consists of two or more cylinder-like-object-with-base objects, and the present invention has the 4th characteristics in the point of having provided the displaying means which displays a cylinder-like-object-with-base object vacant among the above-mentioned cylinder-like-object-with-base objects, and the cylinder-like-object-with-base object which has stored the charged battery so that recognition is possible respectively. According to the 4th characteristics, the user can recognize the existence of the battery in a storage part, and the existence of a charged battery through a display.

[0011]

The present invention has the fifth characteristics in the point which has arranged the guide mechanism in which the aforementioned storage part is included in the bottom, and it includes the aforementioned displaying means for the aforementioned electric power unit and a control device in a middle stage to the highest rung. According to the fifth characteristics, a battery is arranged in the position which goes in and out easily at a position with legible guide mechanism.

[0012]

The present invention has the sixth characteristics in the point of having provided the fan which ventilates an internal atmosphere, and the seventh characteristics are at the point that the aforementioned indoor one is indoor [of a convenience store]. According to the sixth characteristics, an inside is ventilated in the atmosphere in which battery exchange equipment was installed. Since the battery exchange equipment concerned is set as 110-130 cm in height according to the seventh characteristics, when it arranges together with other shelf spaces and installs, the prospect of the inside of a shop of a convenience store is secured, and also it becomes preferable for putting a thing and goods also on the upper surface of a swap device.

[0013]

[Mode for carrying out the invention]

Hereafter, the present invention is described with reference to Drawings. The front view and Fig.2 in which the battery exchange equipment which requires Fig.1 for one embodiment of the present invention is shown are the side surface cross sectional view. The battery exchange equipment 1 consists of a housing in which an outside makes a rectangular parallelepiped in a figure. This housing consists of the lid 1b which can be opened and closed freely to the main part 1a which has the space in which two or more batteries 2 and the controller (it consists of an electric power unit and a control device) 3 are accommodated, and the main part 1a. The battery 2 is constituted as a battery pack which loaded with two or more battery cells into cases, such as resin.

[0014]

The slot 4 as a storage part which stored every one battery 2 is provided by the main part 1a, and the slot 4 is provided by six rows wide and five steps of length, respectively. That is, the battery exchange equipment 1 of this embodiment can accommodate a total of 30 batteries simultaneously. The slot 4 has the maintaining structure (it mentions later for details) 5 of the battery 2. The terminal 6 for battery charge of the bottom part of the slot 4, i.e., a back wall surface, is provided, and this terminal 6 is connected to the battery charger 7.

[0015]

If it has a sensor means (the below-mentioned limit switch 56) which detects that the battery 2 was inserted and insertion of the battery 2 is detected, the slot 4 will energize the battery charger 7 and will charge this battery 2. Detection of the battery 2, start indication of charge, etc. can be performed by the aforementioned controller 3. The control device of the controller 3 has a control means containing the register which can recognize whether the charged battery is stored by which slot 4, when charge of the battery 2 is completed. The charge battery display by the below-mentioned displaying means is performed by the contents of this register. The battery charger 7 can share the one battery charger 7 by three slots, for example rather than can be separately provided into each slot 4, respectively.

[0016]

The fan 8 for exhaust air is provided by the upper back face of the main part 1a. If an air conditioning means is provided to the battery exchange equipment 1 therefore, large space will be taken and it is not suitable for use indoors. So, in this embodiment, not using the air conditioning means taken largely, space was carried out, because ventilation with the open air (atmosphere of a setting position) was carried out with the fan 8. As a result, the miniaturization of the battery exchange equipment 1 is attained like the after-mentioned.

[0017]

Corresponding to arrangement of the slot 4, five steps of oblong windows 9 are provided by the lid 1b, and the door 10 common to a wrap is integrally provided by this window 9 in the front face of the slot 4 of six rows. The door 10 can be formed with a transparent resin sheet, and is supported by the hinge 11 provided in the upper part, enabling free opening and closing. When the door 10 is closed, the stopper 12 with which the lower end part back surface of this door 10 abuts is provided by the edge of the window 9. As for the stopper 12, it is preferable that they are spring materials, such as rubber with a buffer function. A user is accessible about the battery 2 accommodated in the slot 4 which the telltale light (for example, LED) 13 is provided by the window 9 corresponding to each slot 4, and this telltale light 13 is turning on or blinking, and this slot 4. In order to avoid **** of a figure in [Fig.1](#), the codes 12 and 13 which show a stopper and a telltale light only about the slot of the bottom are attached.

[0018]

The slot 4 of not restricting to an above-mentioned number which stores the battery 2 is natural. The window 9 is not restricted oblong but is good also as longwise in accordance with the sequence of the slot 4. In this case, the door 10 of it being good to support with the hinge which has the rotating shaft which became longwise and was extended to the vertical direction is also natural. It supposes that the door 10 which can be freely opened and closed only in a required number of the windows 9 is provided according to the number of the slots 4, and when there are few slots 4, a lid is attached to the window 9 which is not used and it may be made to close. And what is necessary is to open the plugged-up window 9 wide according to this, and just to attach the door 10 there, when the slot 4 is extended.

[0019]

The display panel 14 is formed in the upper part of the lid 1b, and the power indicator 15, the waiting indicator machine 16, the operating procedure indicators 17, 18, and 19, the card return lamp 20, and the card use remaining number display machine 21 are provided. The waiting indicator machine 16 and the operating procedure indicators 17, 18, and 19 consist of a dial window which wrote in the message previously, and a lamp which irradiates with this dial window. In the waiting indicator machine 16, the character "under preparation" at the operating procedure indicator 17 the character of "please put a battery charger into the place of lighting", The character of "please put in a card" is displayed on the operating procedure indicator 18, and the character of "please take out a battery charger from the place of blink" is displayed on the operating procedure indicator 19, respectively. The loading slot 22 for inserting a prepaid card is formed in the side part of the window 9 of the highest rung of the lid 1b. In the loading slot 22, the transparent resin covering 22a which can be opened and closed freely can be provided.

[0020]

The leg 23 is provided by the lower part of the battery exchange equipment 1. As for height H of this battery exchange equipment 1, 45 cm and the width B of 120 cm and the depth D are 72.5 cm. The extraction and insertion ease of the battery 2 which especially height H saw ergonomically among these dimensions, It is preferable to determine in consideration of a fine sight when it arranges with reservation and other merchandise display stands of the prospect at the time of installing in stores, such as a convenience store, and it is preferable that it is around 120-cm the range which is 10 cm.

[0021]

Next, it describes about operation of the battery exchange equipment 1. When there is nothing, the battery exchange equipment 1 of two charged battery turns ON the waiting indicator machine 16, and shows the character "under preparation." When the charged battery 2 can be lent out, the waiting indicator machine 16 is turned OFF, the character "under preparation" is erased, the operating procedure indicator 17 is turned ON instead of this, and the character of "please put a battery charger into the place of lighting" is displayed. The telltale light 13 corresponding to the empty slot 4 is made to turn on with this display. When there are two or more empty slots 4, all those telltale lights 13 may be made to turn on, one of the slots 4 may be chosen and the telltale light 13 may be made to turn on so that each slot 4 may average and may be used.

[0022]

Fig.3 is a flow chart which shows processing of battery exchange. This processing is performed by the control device (a microcomputer is included) in the controller 3. In Step S1, it is distinguished whether the battery 2 went into the slot 4. If put into the battery 2, the battery 2 which he proceeded to Step S2 and was received will confirm whether to be a pure thing. When the battery 2 is pure and it is normal (Step S3 denies), it proceeds to step S4. The warning lamp to which the light is switched on in the case of abnormalities, and cautions are urged can be provided to the aforementioned lid 1b.

[0023]

In step S4, the operating procedure indicator 18 is turned ON and the operating procedure

indicator 17 is turned OFF. The character of "please put a battery charger into the place of lighting" disappears, and the character of "please put in a card" is instead displayed by this. In Step S5, it is judged whether the prepaid card was inserted in the aforementioned loading slot 22. If a card is inserted, the card proceeded and inserted in Step S6 will be checked. Specifically, the received card suits the battery exchange equipment 1, judges whether it is a proper prepaid card corresponding to the loan conditions of the schedule, in the case of a right card, subtracts a charge, and displays a remaining number on the card use remaining number display machine 21. [0024]

In Step S7, the operating procedure indicator 18 is turned OFF and the operating procedure indicator 19 is turned ON. The character of "please put in a card" disappears and the character of "please take out a battery charger from the place of blink" is instead displayed by this. With the display of this character of "please take out a battery charger from the place of blink", the telltale light 13 corresponding to the slot 4 in which the charged battery 2 is accommodated is blinked. [0025]

When there are two or more charged batteries 2, one of the slots 4 may be chosen at random, and the telltale light 13 may be blinked so that the telltale light 13 of the slot 4 corresponding to those all may be blinked and all the slots 4 may be used uniformly. It is judged in Step S8 whether the battery 2 was taken out. If the battery 2 is taken out, it will proceed to step S9, and the card return lamp 20 is turned ON, and a card is returned. [0026]

In the above-mentioned example, in order to use the battery exchange equipment 1, the prepaid card was used, but only when the ID card previously published by only the registered user is used, it is made to perform exchange of the battery 2. [0027]

The battery exchange equipment 1 concentrates two or more sets, and it may be made to manage it. Fig.4 is a configuration diagram of the battery rental system which concentrates and manages two or more battery exchange equipment 1. The battery exchange equipment 1 is connected to the controlling device 25 via the network 24. The battery exchange equipment 1 is arranged at the convenience store etc., for example, and the controlling device 25 concentrated two or more pieces of the battery exchange equipment 1, and it has managed it. A user contracts with a system donor, registers as a user, and receives issue of an ID card. When an ID card is used, the battery exchange equipment 1 recognizes the information described by the ID card, exchanges a user's personal information by communication with the controlling device 25, and performs a receptionist (return) and loan of the battery 2. Such a battery rental system is explained in full detail by the prior application (JP,H10-293874,A) by these people. A prepaid card or not only an ID card but cash is received, and, of course, it may be made to respond to battery exchange. [0028]

Fig.5 is a perspective view of the battery 2, Fig.6 is a front view of the battery 2 and Fig.7 is the bottom view. In these figures, the battery 2 has the battery pack 26 of the approximately rectangular solid which accommodated two or more battery cells (not shown) and a battery cell.

The battery pack 26 consists of the pack portions 26R and 26L divided into two by the crack surface 27 in alignment with the longitudinal direction, and these pack portions 26R and 26L are formed in symmetrical shape bordering on the crack surface 27. The design of a mold when molding the pack portions 26R and 26L becomes easy, for example by making symmetrical form of the pack portions 26R and 26L to the crack surface 27.

[0029]

To the aforementioned crack surface 27, the terminals 28 and 29 connected to the positive electrode and anode of a battery cell, respectively are exposed to the position of symmetry, and are arranged at the front of the battery 2. The engaging hole 30 which engages with the locking device (it mentions later) provided by the slot 4 is formed in the transverse-plane slippage crowning of the battery pack 26. In order to secure slidability with the wall surface of the slot 4 when accommodating the battery 2 in the slot 4, and the stability after accommodating, the muscle-like protruding part 31 of two sections extended to the longitudinal direction is formed in the bottom surface of the battery pack 26.

[0030]

The pack portions 26R and 26L can be integrally attached with the bolt 33A (Fig.7) using the screwholes 32 and 33. The slot 34 serves as a key in the case of carrying, and contributes to improvement in grip operativity. The dimension of the lateral cross sectional shape of the battery pack 26 is good to be set to what is called palm size so that it may be easy to hold people by hand. For example, when it sees from a transverse plane, height h is about 80 mm, and the width b is about 55 palm-sized mm.

[0031]

The hole 35 which penetrated the battery pack 26 horizontally can be used for letting the wire or rope portion which makes some keys pass when the battery 2 is carried in a motor assisted bicycle. The stage portion 36 formed in the angle of the battery pack 26 serves as a hooking part used for fixing the battery 2 to a vehicle body, when the battery 2 is carried in a motor assisted bicycle. The example carried in the motor assisted bicycle mentions the battery 2 later about Fig.17 etc. The seal (design seal) 37 which described the kind of battery 2, the manufacturer name, the handling warning sign, etc. is stuck on the region inserted into the bottom surface of the battery pack 26 by the aforementioned muscle-like protruding part 31. By sticking between the muscle-like protruding parts 31, this seal 37 is protected by the muscle-like protruding part 31 in the case of insertion into the slot 4, or drawing, and has the advantage of being hard to hurt.

[0032]

The form of the battery pack 26 is described further. Since the pack portions 26R and 26L are symmetrical shape, it represents with the pack portion 26R, and they are described. As for the side view of the pack portion 26R of the battery pack 26, and Fig.9, the inner surface figure and Fig.10 of Fig.8 are essential part section (A-A section of Fig.9) figures, and, as for Fig.5 and a same sign, identical parts are shown. In particular, in Fig.9 and Fig.10, the rib 38 is provided by the inner surface of the pack portion 26R, and reinforcement of the pack portion 26R, positioning of the battery cell 39 accommodated, and a buffer can be presented. The form of the rib 38 is not

limited to this.

[0033]

In Fig.9, although the battery cell 39 shows the chisel with the fictitious outline in part, the thing more than the number illustrated further is integrally formed, for example by a heat contraction nature tube etc., and the battery pack 26 is loaded with it. The slot 40 of the multistage for fixing the aforementioned terminal 29 to the wall surface by the side of the transverse plane of the pack portion 26R is formed.

[0034]

The neighborhood of a terminal of the battery 2 is described further. Fig.11 is an essential part front view of the battery pack 26, and Fig.12 is an essential part cross sectional view of the battery pack 26. The terminals 28 and 29 hold a predetermined interval to the attachment 41 made of resin, and are attached to it. There is a screw part in the terminals 28 and 29, and the nut 42 for concluding the cables 39a and 39b for connection with the battery cell 39 is screwed on this screw part.

[0035]

Fitting of the attachment 41 is carried out to the multistage slot 40 of the pack portions 26R and 26L, and it is pinched and fixed to both. The end of the terminals 28 and 29 is faced outside from the hole of the pack portions 26R and 26L. Between the battery cell 39 and the pack portion, the cushion 39c which consists of spring materials, such as rubber, is arranged. The engaging hole 30 by which engagement is carried out to the lock rod (after-mentioned) of the slot 4 is formed in the battery pack 26, and also the surface in which this engaging hole 30 is formed can form another engaging hole 30A in the surface of an opposite side. The function of these engaging holes 30 and 30A is mentioned later.

[0036]

Next, the structure of the slot 4 is described. It is a perspective diagram in which the side view of the slot 4 in which Fig.13 includes a battery holding mechanism, and Fig.14 show the essential part cross-sectional view of the slot 4, and Fig.15 shows the inner surface of the slot 4. In these figures, the inlet member 43 which gave the taper 43a is provided so that it may become easy for the slot 4 to insert the battery 2, and this inlet member 43 is fixed to the slot main part 44 formed of sheet metal work with the bolt 43b. The slot main part 44 consists of the lower board 44a and the upper board 44b for securing the space in which the battery 2 is accommodated. The upper board 44b serves as the base which carries the battery holding mechanism 5. On the upper board 44b, the lock rod 45 which can move up and down freely, the arm 46 which moves the lock rod 45 up and down, the solenoid 47 which energizes the arm 46 to one side, and the energizing direction according the arm 46 to the solenoid 47 have the helical extension spring 48 energized to an opposite direction.

[0037]

The lock rod 45 is supported by the components 49 and 50, enabling free up-and-down motion, and the arm 46 is supported by the component 51 by the pivot shaft 51a, enabling free rotation. The end of the arm 46 has bifurcated to the letter of a fork, and bifurcated [the] is engaging with

the pin 45a of the lock rod 45. One end of the helical extension spring 48 is hooked on the other end of the arm 46, and the other end of the helical extension spring 48 is hooked on the component 52. One end of the connecting rod 53 is hooked on the pars intermedia of the pivot shaft 51a and the hooking part of one helical extension spring 48 end, and the other end of the connecting rod 53 is hooked on the plunger 54 of the solenoid 47.

[0038]

The shaking plate 55 supported by the pivot shaft 55a is provided by the component 52. One end of this shaking plate 55 is set as the actuator 56a of the limit switch 56 so that an abutment is possible, and the other end is set as the upper surface of the battery 2 inserted in the slot 4 so that an abutment is possible. The aforementioned other end of the shaking plate 55 is energized with the torsion coil spring 57 at the battery 2 side.

[0039]

The slidable plate 58 is provided to the upper board 44b, that standing board 58a is penetrated on this plate 58, and engagement of the shaft 59 is carried out. The both ends of the shaft 59 are engaging with the long hole 60a provided by the side board 60 of the upper board 44b. The end of the bracket 61 is combined with the portion projected from the aforementioned long hole 60a of the shaft 59 to the method of outside. The push bar 62 which has penetrated the lower board 44a so that the slot 4 may be crossed is combined with the other end of the bracket 61. The push bar 62 is guided movable in the extraction and insertion direction of the battery 2 by the guide groove 63 dug by the side board of the lower board 44a.

[0040]

The aforementioned limit switch 56 is attached to one standing board 64a of the plate 64 fixed to the upper board 44b. One end of the helical extension spring 65 is hooked on the standing board 64b of another side of the plate 64, and the other end of the helical extension spring 65 is hooked on the shaft 59. The plate 58 is energized by the operation of the helical extension spring 65 at the opening side of the slot 4. The tag block 66 is provided, a bottom part, i.e., in the inner part of, the slot 4, and the terminals 6 and 6 ([Fig.15](#)) connected to the aforementioned battery charger 7 are embedded under this tag block 66. The battery 2 is inserted, when the terminals 28 and 29 of the battery 2 reach the position in contact with the terminals 6 and 6, it drops on the plate 64 and the hole 58c is formed so that the lock rod 45 may deflect downward and can engage with the engaging hole 30 of the battery 2.

[0041]

When the battery 2 is not inserted at the time of operation, the solenoid 47 is energized and the plunger 54 is drawn in the solenoid 47. Therefore, in [Fig.13](#), it rotates clockwise and the arm 46 can be pulling up the lock rod 45 up. While the lock rod 45 can be pulling up, the engagement of the plate 58 and the lock rod 45 is released, and the plate 58 is pulled by the helical extension spring 65, and is deflected leftward in [Fig.13](#). Thereby, the push bar 62 combined with the plate 58 via the bracket 61 is deflected by opening slippage of a slot in the guide groove 63.

[0042]

If the battery 2 is inserted into the slot 4, the push bar 62 will be abutted and the push bar 62 will

be pushed aside by the end face (surface where the aforementioned terminals 28 and 29 are arranged) of the battery 2 to the direction in the inner part of the slot 4. On the other hand, in order that the actuator 56a may be abutted and the upper surface of the battery 2 may push up this up by inserting the battery 2, the limit switch 56 is set to ON. The ON operation of this limit switch 56 is recognized by the aforementioned controller 3, and the controller 3 outputs the signal which stops the energization of the solenoid 47. If it responds to this signal and the energization of the solenoid 47 is stopped, the arm 46 will be pulled by the helical extension spring 48, and will be rotated counterclockwise, and the lock rod 45 will be energized caudad. However, since the lower end surface of the lock rod 45 abuts the upper surface of the plate 58 until it is pushed aside by the push bar 62 into the slot 4 and the plate 58 deflects to a predetermined position in connection with this motion, the lock rod 45 does not reach the lower end of that stroke, but remains on the way.

[0043]

It is pushed aside by the push bar 62 into the slot 4, and when the plate 58 deflects in the push bar 62 and the direction and the terminals 28 and 29 of the battery 2 contact the terminals 6 and 6 by it, respectively, the aforementioned dropping hole 58b is penetrated and the lock rod 45 falls caudad. In this way, the lower end of the lock rod 45 engages with the engaging hole 30 of the battery 2, and the battery 2 is locked in the slot 4.

[0044]

If the battery 2 is inserted into the slot 4, the controller 3 will energize the battery charger 7 and will start charge of the battery 2 concerned. The battery 2 is charged, if preparation whose user takes out the battery 2 from the slot 4 can be performed, the solenoid 47 will be energized by the instruction of the controller 3, the lock rod 45 can pull up up, and a lock will be released. As a result, the push bar 62 acts so that it may be pulled by the helical extension spring 65 and the battery 2 may be extruded from the slot 4.

[0045]

Fig.16 is a cross sectional view showing the form of the slot 4 typically. As shown in this figure, the slot 4 consists of the back portion 4a by which the battery 2 is supported, and the swollen part 4b formed so that the battery 2 might have projected and it might be easy to hold a user by hand, from the inlet member 43, this swollen part 4b comes together direction jam of the front aforementioned door 10, and the opening is passed through and carried out. As the chain line in a figure showed, the battery 2 is projected in the door 10 direction by the extrusion operation by the push bar 62.

[0046]

Since the portion which has faced outside, the tip 4, i.e., the slot, of the battery 2, projects ahead from the battery 2 of other slots 4 by the above-mentioned extrusion operation, a user's extraction operation becomes easy. It is also much more easy to hold the end by the aforementioned swollen part 4b conjointly that the sectional shape of the battery 2 is palm size.

[0047]

Next, the motor assisted bicycle carrying the above-mentioned battery 2 is described. Each of

Fig.17, Fig.18, and Fig.19 is the right side views of a motor assisted bicycle, and shows the portion of each other same [a same sign] or equivalent. The vehicle body frame 67 is provided with the following in Fig.17.

The head tube 68 of the front of solvent.

The downpipe 69 extended for the back falling from the head tube 68.

The rear fork 70 combined near the lower end of the downpipe 69.

The seat pillar 71 which is combined with a lower end of the downpipe 69 and rises to a method of Gokami.

The front fork 72 is supported movably by the aforementioned head tube 68 so that steering is possible, and the front wheel 73 is supported pivotally by the lower end of the front fork 72. The handle 74 is combined with the upper end of the front fork 72.

[0048]

The supporting spindle 75 by which fitting was elastically carried out to the seat pillar 71 to this seat pillar 71 is provided, and the upper end of the supporting spindle 75 is equipped with the sheet 76. The stay 77 extends for the back falling from the upper end of the seat pillar 71, it is combined integrally and the intersection of this stay 77 and the rear fork 70 forms the bearing of the rear wheel 78.

[0049]

The bearing pipe (not shown) extended to the right and left of the vehicle body is combined with the intersection of the seat pillar 71 and the downpipe 69, and the pedal 79 and the front sprocket 80 are provided by the crankshaft which penetrated this bearing pipe. The pedal 79 of providing also on the left-hand side of a vehicle body is natural. The back sprocket 81 is connected with the center of the rear wheel 78, and the chain 82 is constructed between the front sprocket 80 and the back sprocket 81.

[0050]

The power unit 86 including the electric motor which gives the power for assisting the treading strength concerning the pedal 79 to a motor assisted bicycle is provided, and the output shaft 83 of the electric motor adjoins front sprocket 80 back, and is arranged. The chain 82 is constructed in the assistant sprocket 84 combined with the output shaft 83 so that it may appear in the upper part. The tension of the chain 82 is adjusted by changing the position of the tension regulation sprocket 85. Bolting of the power unit 86 is carried out to the bracket 70a fixed to the rear fork 70 by welding etc., and the bracket (not shown) fixed to the lower end of the downpipe 69 by welding etc., and it is combined with it.

[0051]

The battery carrier 87 is welded to the seat pillar 71 to the space between the rear wheels 78. It is formed in dished and the battery 2 turned the aforementioned terminals 28 and 29 down, and along with the seat pillar 71, the battery carrier 87 is longwise and is settled. The snap ring 89 further connected with the buckle 88 and the buckle 88 is provided by the seat pillar 71. The upper end of the battery 2 is reliably fixed to the seat pillar 71 by hooking the snap ring 89 on the aforementioned stage portion 36 of the upper end part angle of the battery 2, and rotating the

buckle 88.

[0052]

The feed part 90 containing the contact in contact with the aforementioned terminals 28 and 29 is provided by the lower end of the battery 2, and electric power is supplied to the power unit 86 through this feed part 90. In the chain 82 upper part, form is set up so that the wrap chain covers 91 may, on the whole, cover the front sprocket 80 and the assistant sprocket 84 further. Since the hole 92 which suits the through-hole 35 dug by the battery pack 26 is formed in the battery carrier 87, Theft prevention of not only the theft of a motor assisted bicycle but the battery 2 is achieved by applying to through the wire or rope portion which makes some keys to this hole 92 and the through-hole 35 of the battery pack 26, applying it to the rear wheel 78, passing, and locking.

[0053]

In Fig.18, the battery carrier 87 is fixed ahead of the seat pillar 71, and the battery 2 is placed ahead [seat-pillar 71]. Thus, also in the vehicle body frame which a setting space cannot secure, the battery 2 can be carried in seat-pillar 71 back. The chain covers 91 are set as the form which covers a chisel in part (upper part) about the front sprocket 80.

[0054]

In Fig.19, an end is compared and the downpipe 69 is combined with the pars intermedia of the seat pillar 71. And the rear fork 70 is extended to back, a lower end part, i.e., near a crankshaft, the seat pillar 71. Reservation of the space which arranges the power unit 86 behind the front sprocket 80 in the structure of such a vehicle body frame 67 is difficult. Then, in the chain 82, the power unit 86 is ahead arranged rather than the front sprocket 80, and it is [the assistant sprocket 84 is rolled and] made to be ahead constructed from the front sprocket 80 it. In order to realize arrangement of such a power unit 86, a part of power unit 86 is combined with the vehicle body frame 67 via the bracket 93 welded to the lower part of the downpipe 69.

[0055]

The attachment mode of the power unit 86 to the vehicle body frame 67 is described further.

Fig.20 is an essential part enlarged drawing of the Fig.17 in which the essential part of a motor assisted bicycle is shown, and Fig.17 and a same sign are identical parts. The chain covers 91 are removed. In Fig.20, the power unit 86 builds in the electric motor 94, and rotation of this electric motor 94 is transmitted to the output shaft 23 via the transmission mechanism which is not illustrated. As the bosses 96 and 97 project over the method of outside, they are formed in the casing 95. The boss 96 is combined with the bracket 70a provided by the rear fork 70 with the bolt nut 98, and the boss 97 is combined with the bracket 100 caudad projected from the bearing pipe 99 which has combined the downpipe 69 and the seat pillar 71 with the bolt nut 101.

[0056]

As for the power unit 86, it is preferable on manufacture that it can deal with the mold of the vehicle body frame assumed variously. Then, using common "mold", the casing 95 is manufactured, and various vehicle body frames are suited, and it was made to be attached. That is, when distance of the bolthole formed in the bosses 96 and 97 is set to S, the 3rd boss 102 is

assumed that a bolthole is placed at the position of the distance S from the bolthole of these both sides. And according to the mold of a vehicle body frame attached, it is determined any of these bosses it leaves a product. Thus, by setting up the "mold" of manufacture, various casings which can respond also to various attachment modes can be manufactured easily.

[0057]

The tension regulation sprocket 85 is attached to the lever 104 supported pivotally with the pivot shaft 103 by the casing 95. By the spring means which is not illustrated, rotational energization of the lever 104 is carried out to the counterclockwise rotation in a figure, the tension regulation sprocket 85 rotates and the suitable tension for the chain 82 is given by this.

[0058]

According to the above-mentioned embodiment, the battery 2 was carried in the motor assisted bicycle. However, this battery 2 can be used not only for this but for other electric products, for example, a portable cassette deck and CD player. When using it as a power supply of these electric products, the adapter for connecting the battery 2 and the input terminal of these electric products is needed. And when combining this adapter with the battery 2 reliably, the aforementioned engaging holes 30 and 30A are useful.

[0059]

That is, the adapter 105 can be made to hold to the battery pack 26 in Fig. 12 using the engaging holes 30 and 30A. The adapter 105 has the aforementioned terminals 28 and 29 and a terminal (not shown) which contacts, when this adapter 105 is combined with the battery pack 26, and it can connect the battery 2 to an electric product through the code 106 pulled out from this terminal.

[0060]

In this way, since the battery 2 can be shared with a motor assisted bicycle and other electric products, For example, music can be enjoyed, also when a battery is removed from a motor assisted bicycle, electric power is supplied to audio goods and a power supply is not easily acquired out in the fields etc. at the cycling point which uses a motor assisted bicycle.

[0061]

[Effect of the Invention]

According to invention of Claim 1 thru/or Claim 7, small battery exchange equipment suitable for use indoors is provided so that clearly from the above description. Since it is made to depend for an internal atmosphere on installation atmosphere by invention of Claim 1 especially, an air-conditioner is unnecessary. In invention of Claim 2, although height is made low, many numbers of battery storage are securable. In invention of Claim 3, a battery is reliably held during a charging period in a storage part. In invention of Claim 4, the acceptance state of a battery and the existence of a charged battery can be recognized, and convenience is improved.

[0062]

Since the storage part of a battery is in equipment intermediate height in invention of Claim 5, while in-and-out of a battery is easy, visual recognition of guide mechanism is easy. In invention of Claim 6, installation atmosphere and an atmosphere inside the plane are forcibly ventilated by

a fan. The effect by the prospect of inside of a shop or reservation of a fine sight is much more remarkable especially by being installed in a convenience store tor in invention of Claim 7.

[Brief Description of the Drawings]

[Drawing 1]It is a front view of the battery exchange equipment concerning one embodiment of the present invention.

[Drawing 2]It is a side surface cross sectional view of the battery exchange equipment concerning one embodiment of the present invention.

[Drawing 3]It is a flow chart of battery exchange.

[Drawing 4]It is a configuration diagram of a battery rental system.

[Drawing 5]It is a perspective view of a battery.

[Drawing 6]It is a front view of a battery.

[Drawing 7]It is a bottom view of a battery.

[Drawing 8]It is a side view of the pack portion of a battery pack.

[Drawing 9]It is an inner surface figure of a pack portion.

[Drawing 10]It is an A-A cross sectional view of Fig.9.

[Drawing 11]It is an essential part front view of a battery pack.

[Drawing 12]It is an essential part cross sectional view of a battery pack.

[Drawing 13]It is a side view of a slot.

[Drawing 14]It is an essential part cross-sectional view of a slot.

[Drawing 15]It is a perspective diagram showing the inner surface of a slot.

[Drawing 16]It is a cross sectional view showing the form of a slot typically.

[Drawing 17]It is a right side view of a motor assisted bicycle.

[Drawing 18]It is a right side view of a motor assisted bicycle.

[Drawing 19]It is a right side view of a motor assisted bicycle.

[Drawing 20]It is an essential part enlarged drawing showing the essential part of a motor assisted bicycle.

[Explanations of letters or numerals]

1 -- battery exchange equipment, 2 -- battery, 3 -- controller, and 4 -- slot, 5 -- a battery holding mechanism, 6 -- terminal, 7 -- battery charger, 9 -- window, and 10 -- door, 11 -- a hinge, 12 -- stopper, 13 -- telltale light, and 14 -- display panel, 22 -- a card slot, 26 -- battery pack, and 26L, 26 R -- pack portion, 27 -- a crack surface and 28, 29 -- a terminal and 30, 30 A -- an engaging hole and 31 -- muscle-like protruding part, 35 -- a through-hole, 36 -- stage portion, 37 -- design seal, and 39 -- battery cell, 40 -- terminal fixing grooves and 45 -- a lock rod and 46 -- an arm and 47 -- a solenoid and 56 -- a limit switch and 61 -- a bracket and 62 -- a push bar and 71 -- a seat pillar and 86 -- a power unit and 87 -- a battery carrier and 88 -- a buckle and 89 -- the snap ring

TECHNICAL FIELD

[Field of the Invention]

Especially the present invention relates to battery exchange equipment preferable for concentrating and managing charge, a loan, etc. of the battery carried in the electric motor which makes an electric motor a driving source about battery exchange equipment.

[0002]

PRIOR ART

[Description of the Prior Art]

In recent years, in order to assist with people's strength of its legs, the bicycle (henceforth a "motor assisted bicycle") which carries an electric motor as an auxiliary power unit is used. Batteries, such as a nickel-cadmium battery which can repeat and carry out the reuse of the charge, are used for this electric motor as a power supply.

[0003]

By the way, when the user of a motor assisted bicycle owns a battery individually, there is troublesomeness which must manage charge etc. by self. Since this troublesomeness is eliminated, the system which concentrates and manages charge of a battery can be considered. For example, if the user of a motor assisted bicycle borrows and uses the battery by which central control is carried out and a battery is exhausted, the battery exchange system which newly borrows the battery by which returned the battery and full charge was carried out can be considered.

[0004]

JP,H10-293874,A has disclosed the battery exchange equipment which performs a loan and return of a battery automatically to the registered user. By arranging such battery exchange equipment everywhere, a user can not only be released from the troublesomeness of battery managements, such as charge and storage, but can use a motor assisted bicycle in the wide range, without caring about battery consumption.

[0005]

EFFECT OF THE INVENTION

[Effect of the Invention]

According to invention of Claim 1 thru/or Claim 7, small battery exchange equipment suitable for use indoors is provided so that clearly from the above description. Since it is made to depend for an internal atmosphere on installation atmosphere by invention of Claim 1 especially, an air-conditioner is unnecessary. In invention of Claim 2, although height is made low, many numbers of battery storage are securable. In invention of Claim 3, a battery is reliably held during a charging period in a storage part. In invention of Claim 4, the acceptance state of a battery and

the existence of a charged battery can be recognized, and convenience is improved.

[0062]

Since the storage part of a battery is in equipment intermediate height in invention of Claim 5, while in-and-out of a battery is easy, visual recognition of guide mechanism is easy. In invention of Claim 6, installation atmosphere and an atmosphere inside the plane are forcibly ventilated by a fan. The effect by the prospect of inside of a shop or reservation of a fine sight is much more remarkable especially by being installed in a convenience store tor in invention of Claim 7.

TECHNICAL PROBLEM

[Problem to be solved by the invention]

The automatic changer of an above-mentioned battery has a structure suitable for outside installation so that conveniently [a user's use visited by vehicles, such as a motor assisted bicycle,]. However, consideration of the amenity of a user use should also consider inside installation. However, the battery exchange equipment on condition of outside installation has an indispensable air-conditioner for making states, such as an installation area, climate, and the weather, suit, or eliminating the heat produced at the time of battery charge. Therefore, battery exchange equipment was enlarged and there was a problem of not being suitable in inside installation.

[0006]

The present invention solves above-mentioned problem and an object of the present invention is to provide small battery exchange equipment suitable for inside installation.

[0007]

MEANS

[Means for solving problem]

In the battery exchange equipment which the present invention for attaining the above-mentioned purpose has a storage part which consists of two or more cylinder-like-object-with-base objects which store the battery for electric motors, and a battery charger which charges the aforementioned battery, and provides a charged battery, While inside installation is carried out and an internal atmosphere is maintained only depending on ventilation with installation atmosphere, It is set as abbreviated 110-130 centimeter by the overall height, and the above-mentioned cylinder-like-object-with-base object, The first characteristics are at the point that make it incline that the back falls and are installed from the transverse plane of battery exchange equipment so that the bottom part side may be placed caudad, and the terminal for battery charge of the bottom part of this cylinder-like-object-with-base object is provided. Since according to the first characteristics battery exchange equipment should fit use indoors and whole height is especially set as 110-130 cm, people tend to take a battery in and out to a storage part, and also effective use of putting a thing on the upper surface of a swap device can be aimed at.

[0008]

The present invention has the second characteristics in the point which made the number of the batteries of right and left directions more than the number of the batteries of the vertical direction in the aforementioned battery storage part. According to the second characteristics, the number of storage of a battery is increased, making height low with about 110-130 cm.

[0009]

The lock control means which holds the battery which the present invention possessed the electric power unit and the control device, and the aforementioned control device received to the aforementioned storage part, It consists of a charging control means for charging the battery received in the aforementioned storage part, and a lock release control means which releases holding of the storage part which has stored the charged battery according to a user's demand. When holding of the above-mentioned cylinder-like-object-with-base object is released, in order to extrude a battery to the opening side of this cylinder-like-object-with-base object, the 3rd characteristics are at the point of providing further the component energized by means of a spring. According to the 3rd characteristics, the received battery is locked by the storage part, lock release of the charged battery is carried out, and it is appropriated for the use.

[0010]

The aforementioned storage part consists of two or more cylinder-like-object-with-base objects, and the present invention has the 4th characteristics in the point of having provided the displaying means which displays a cylinder-like-object-with-base object vacant among the above-mentioned cylinder-like-object-with-base objects, and the cylinder-like-object-with-base object which has stored the charged battery so that recognition is possible respectively. According to the 4th characteristics, the user can recognize the existence of the battery in a storage part, and the existence of a charged battery through a display.

[0011]

The present invention has the fifth characteristics in the point which has arranged the guide mechanism in which the aforementioned storage part is included in the bottom, and it includes the aforementioned displaying means for the aforementioned electric power unit and a control device in a middle stage to the highest rung. According to the fifth characteristics, a battery is arranged in the position which goes in and out easily at a position with legible guide mechanism.

[0012]

The present invention has the sixth characteristics in the point of having provided the fan which ventilates an internal atmosphere, and the seventh characteristics are at the point that the aforementioned indoor one is indoor [of a convenience store]. According to the sixth characteristics, an inside is ventilated in the atmosphere in which battery exchange equipment was installed. Since the battery exchange equipment concerned is set as 110-130 cm in height according to the seventh characteristics, when it arranges together with other shelf spaces and installs, the prospect of the inside of a shop of a convenience store is secured, and also it becomes preferable for putting a thing and goods also on the upper surface of a swap device.

[0013]

[Mode for carrying out the invention]

Hereafter, the present invention is described with reference to Drawings. The front view and Fig.2 in which the battery exchange equipment which requires Fig.1 for one embodiment of the present invention is shown are the side surface cross sectional view. The battery exchange equipment 1 consists of a housing in which an outside makes a rectangular parallelepiped in a figure. This housing consists of the lid 1b which can be opened and closed freely to the main part 1a which has the space in which two or more batteries 2 and the controller (it consists of an electric power unit and a control device) 3 are accommodated, and the main part 1a. The battery 2 is constituted as a battery pack which loaded with two or more battery cells into cases, such as resin.

[0014]

The slot 4 as a storage part which stored every one battery 2 is provided by the main part 1a, and the slot 4 is provided by six rows wide and five steps of length, respectively. That is, the battery exchange equipment 1 of this embodiment can accommodate a total of 30 batteries simultaneously. The slot 4 has the maintaining structure (it mentions later for details) 5 of the battery 2. The terminal 6 for battery charge of the bottom part of the slot 4, i.e., a back wall surface, is provided, and this terminal 6 is connected to the battery charger 7.

[0015]

If it has a sensor means (the below-mentioned limit switch 56) which detects that the battery 2 was inserted and insertion of the battery 2 is detected, the slot 4 will energize the battery charger 7 and will charge this battery 2. Detection of the battery 2, start indication of charge, etc. can be performed by the aforementioned controller 3. The control device of the controller 3 has a control means containing the register which can recognize whether the charged battery is stored by which slot 4, when charge of the battery 2 is completed. The charge battery display by the below-mentioned displaying means is performed by the contents of this register. The battery charger 7 can share the one battery charger 7 by three slots, for example rather than can be separately provided into each slot 4, respectively.

[0016]

The fan 8 for exhaust air is provided by the upper back face of the main part 1a. If an air conditioning means is provided to the battery exchange equipment 1 therefore, large space will be taken and it is not suitable for use indoors. So, in this embodiment, not using the air conditioning means taken largely, space was carried out, because ventilation with the open air (atmosphere of a setting position) was carried out with the fan 8. As a result, the miniaturization of the battery exchange equipment 1 is attained like the after-mentioned.

[0017]

Corresponding to arrangement of the slot 4, five steps of oblong windows 9 are provided by the lid 1b, and the door 10 common to a wrap is integrally provided by this window 9 in the front face of the slot 4 of six rows. The door 10 can be formed with a transparent resin sheet, and is supported by the hinge 11 provided in the upper part, enabling free opening and closing. When the door 10 is closed, the stopper 12 with which the lower end part back surface of this door 10

abuts is provided by the edge of the window 9. As for the stopper 12, it is preferable that they are spring materials, such as rubber with a buffer function. A user is accessible about the battery 2 accommodated in the slot 4 which the telltale light (for example, LED) 13 is provided by the window 9 corresponding to each slot 4, and this telltale light 13 is turning on or blinking, and this slot 4. In order to avoid **** of a figure in Fig.1, the codes 12 and 13 which show a stopper and a telltale light only about the slot of the bottom are attached.

[0018]

The slot 4 of not restricting to an above-mentioned number which stores the battery 2 is natural. The window 9 is not restricted oblong but is good also as longwise in accordance with the sequence of the slot 4. In this case, the door 10 of it being good to support with the hinge which has the rotating shaft which became longwise and was extended to the vertical direction is also natural. It supposes that the door 10 which can be freely opened and closed only in a required number of the windows 9 is provided according to the number of the slots 4, and when there are few slots 4, a lid is attached to the window 9 which is not used and it may be made to close. And what is necessary is to open the plugged-up window 9 wide according to this, and just to attach the door 10 there, when the slot 4 is extended.

[0019]

The display panel 14 is formed in the upper part of the lid 1b, and the power indicator 15, the waiting indicator machine 16, the operating procedure indicators 17, 18, and 19, the card return lamp 20, and the card use remaining number display machine 21 are provided. The waiting indicator machine 16 and the operating procedure indicators 17, 18, and 19 consist of a dial window which wrote in the message previously, and a lamp which irradiates with this dial window. In the waiting indicator machine 16, the character "under preparation" at the operating procedure indicator 17 the character of "please put a battery charger into the place of lighting", The character of "please put in a card" is displayed on the operating procedure indicator 18, and the character of "please take out a battery charger from the place of blink" is displayed on the operating procedure indicator 19, respectively. The loading slot 22 for inserting a prepaid card is formed in the side part of the window 9 of the highest rung of the lid 1b. In the loading slot 22, the transparent resin covering 22a which can be opened and closed freely can be provided.

[0020]

The leg 23 is provided by the lower part of the battery exchange equipment 1. As for height H of this battery exchange equipment 1, 45 cm and the width B of 120 cm and the depth D are 72.5 cm. The extraction and insertion ease of the battery 2 which especially height H saw ergonomically among these dimensions, It is preferable to determine in consideration of a fine sight when it arranges with reservation and other merchandise display stands of the prospect at the time of installing in stores, such as a convenience store, and it is preferable that it is around 120-cm the range which is 10 cm.

[0021]

Next, it describes about operation of the battery exchange equipment 1. When there is nothing, the battery exchange equipment 1 of two charged battery turns ON the waiting indicator machine

16, and shows the character "under preparation." When the charged battery 2 can be lent out, the waiting indicator machine 16 is turned OFF, the character "under preparation" is erased, the operating procedure indicator 17 is turned ON instead of this, and the character of "please put a battery charger into the place of lighting" is displayed. The telltale light 13 corresponding to the empty slot 4 is made to turn on with this display. When there are two or more empty slots 4, all those telltale lights 13 may be made to turn on, one of the slots 4 may be chosen and the telltale light 13 may be made to turn on so that each slot 4 may average and may be used.

[0022]

Fig.3 is a flow chart which shows processing of battery exchange. This processing is performed by the control device (a microcomputer is included) in the controller 3. In Step S1, it is distinguished whether the battery 2 went into the slot 4. If put into the battery 2, the battery 2 which he proceeded to Step S2 and was received will confirm whether to be a pure thing. When the battery 2 is pure and it is normal (Step S3 denies), it proceeds to step S4. The warning lamp to which the light is switched on in the case of abnormalities, and cautions are urged can be provided to the aforementioned lid 1b.

[0023]

In step S4, the operating procedure indicator 18 is turned ON and the operating procedure indicator 17 is turned OFF. The character of "please put a battery charger into the place of lighting" disappears, and the character of "please put in a card" is instead displayed by this. In Step S5, it is judged whether the prepaid card was inserted in the aforementioned loading slot 22. If a card is inserted, the card proceeded and inserted in Step S6 will be checked. Specifically, the received card suits the battery exchange equipment 1, judges whether it is a proper prepaid card corresponding to the loan conditions of the schedule, in the case of a right card, subtracts a charge, and displays a remaining number on the card use remaining number display machine 21.

[0024]

In Step S7, the operating procedure indicator 18 is turned OFF and the operating procedure indicator 19 is turned ON. The character of "please put in a card" disappears and the character of "please take out a battery charger from the place of blink" is instead displayed by this. With the display of this character of "please take out a battery charger from the place of blink", the telltale light 13 corresponding to the slot 4 in which the charged battery 2 is accommodated is blinked.

[0025]

When there are two or more charged batteries 2, one of the slots 4 may be chosen at random, and the telltale light 13 may be blinked so that the telltale light 13 of the slot 4 corresponding to those all may be blinked and all the slots 4 may be used uniformly. It is judged in Step S8 whether the battery 2 was taken out. If the battery 2 is taken out, it will proceed to step S9, and the card return lamp 20 is turned ON, and a card is returned.

[0026]

In the above-mentioned example, in order to use the battery exchange equipment 1, the prepaid card was used, but only when the ID card previously published by only the registered user is used, it is made to perform exchange of the battery 2.

[0027]

The battery exchange equipment 1 concentrates two or more sets, and it may be made to manage it. Fig.4 is a configuration diagram of the battery rental system which concentrates and manages two or more battery exchange equipment 1. The battery exchange equipment 1 is connected to the controlling device 25 via the network 24. The battery exchange equipment 1 is arranged at the convenience store etc., for example, and the controlling device 25 concentrated two or more pieces of the battery exchange equipment 1, and it has managed it. A user contracts with a system donor, registers as a user, and receives issue of an ID card. When an ID card is used, the battery exchange equipment 1 recognizes the information described by the ID card, exchanges a user's personal information by communication with the controlling device 25, and performs a receptionist (return) and loan of the battery 2. Such a battery rental system is explained in full detail by the prior application (JP,H10-293874,A) by these people. A prepaid card or not only an ID card but cash is received, and, of course, it may be made to respond to battery exchange.

[0028]

Fig.5 is a perspective view of the battery 2, Fig.6 is a front view of the battery 2 and Fig.7 is the bottom view. In these figures, the battery 2 has the battery pack 26 of the approximately rectangular solid which accommodated two or more battery cells (not shown) and a battery cell. The battery pack 26 consists of the pack portions 26R and 26L divided into two by the crack surface 27 in alignment with the longitudinal direction, and these pack portions 26R and 26L are formed in symmetrical shape bordering on the crack surface 27. The design of a mold when molding the pack portions 26R and 26L becomes easy, for example by making symmetrical form of the pack portions 26R and 26L to the crack surface 27.

[0029]

To the aforementioned crack surface 27, the terminals 28 and 29 connected to the positive electrode and anode of a battery cell, respectively are exposed to the position of symmetry, and are arranged at the front of the battery 2. The engaging hole 30 which engages with the locking device (it mentions later) provided by the slot 4 is formed in the transverse-plane slippage crowning of the battery pack 26. In order to secure slidability with the wall surface of the slot 4 when accommodating the battery 2 in the slot 4, and the stability after accommodating, the muscle-like protruding part 31 of two sections extended to the longitudinal direction is formed in the bottom surface of the battery pack 26.

[0030]

The pack portions 26R and 26L can be integrally attached with the bolt 33A (Fig.7) using the screwholes 32 and 33. The slot 34 serves as a key in the case of carrying, and contributes to improvement in grip operativity. The dimension of the lateral cross sectional shape of the battery pack 26 is good to be set to what is called palm size so that it may be easy to hold people by hand. For example, when it sees from a transverse plane, height h is about 80 mm, and the width b is about 55 palm-sized mm.

[0031]

The hole 35 which penetrated the battery pack 26 horizontally can be used for letting the wire or

rope portion which makes some keys pass when the battery 2 is carried in a motor assisted bicycle. The stage portion 36 formed in the angle of the battery pack 26 serves as a hooking part used for fixing the battery 2 to a vehicle body, when the battery 2 is carried in a motor assisted bicycle. The example carried in the motor assisted bicycle mentions the battery 2 later about Fig.17 etc. The seal (design seal) 37 which described the kind of battery 2, the manufacturer name, the handling warning sign, etc. is stuck on the region inserted into the bottom surface of the battery pack 26 by the aforementioned muscle-like protruding part 31. By sticking between the muscle-like protruding parts 31, this seal 37 is protected by the muscle-like protruding part 31 in the case of insertion into the slot 4, or drawing, and has the advantage of being hard to hurt.

[0032]

The form of the battery pack 26 is described further. Since the pack portions 26R and 26L are symmetrical shape, it represents with the pack portion 26R, and they are described. As for the side view of the pack portion 26R of the battery pack 26, and Fig.9, the inner surface figure and Fig.10 of Fig.8 are essential part section (A-A section of Fig.9) figures, and, as for Fig.5 and a same sign, identical parts are shown. In particular, in Fig.9 and Fig.10, the rib 38 is provided by the inner surface of the pack portion 26R, and reinforcement of the pack portion 26R, positioning of the battery cell 39 accommodated, and a buffer can be presented. The form of the rib 38 is not limited to this.

[0033]

In Fig.9, although the battery cell 39 shows the chisel with the fictitious outline in part, the thing more than the number illustrated further is integrally formed, for example by a heat contraction nature tube etc., and the battery pack 26 is loaded with it. The slot 40 of the multistage for fixing the aforementioned terminal 29 to the wall surface by the side of the transverse plane of the pack portion 26R is formed.

[0034]

The neighborhood of a terminal of the battery 2 is described further. Fig.11 is an essential part front view of the battery pack 26, and Fig.12 is an essential part cross sectional view of the battery pack 26. The terminals 28 and 29 hold a predetermined interval to the attachment 41 made of resin, and are attached to it. There is a screw part in the terminals 28 and 29, and the nut 42 for concluding the cables 39a and 39b for connection with the battery cell 39 is screwed on this screw part.

[0035]

Fitting of the attachment 41 is carried out to the multistage slot 40 of the pack portions 26R and 26L, and it is pinched and fixed to both. The end of the terminals 28 and 29 is faced outside from the hole of the pack portions 26R and 26L. Between the battery cell 39 and the pack portion, the cushion 39c which consists of spring materials, such as rubber, is arranged. The engaging hole 30 by which engagement is carried out to the lock rod (after-mentioned) of the slot 4 is formed in the battery pack 26, and also the surface in which this engaging hole 30 is formed can form another engaging hole 30A in the surface of an opposite side. The function of these engaging holes 30 and 30A is mentioned later.

[0036]

Next, the structure of the slot 4 is described. It is a perspective diagram in which the side view of the slot 4 in which [Fig.13](#) includes a battery holding mechanism, and [Fig.14](#) show the essential part cross-sectional view of the slot 4, and [Fig.15](#) shows the inner surface of the slot 4. In these figures, the inlet member 43 which gave the taper 43a is provided so that it may become easy for the slot 4 to insert the battery 2, and this inlet member 43 is fixed to the slot main part 44 formed of sheet metal work with the bolt 43b. The slot main part 44 consists of the lower board 44a and the upper board 44b for securing the space in which the battery 2 is accommodated. The upper board 44b serves as the base which carries the battery holding mechanism 5. On the upper board 44b, the lock rod 45 which can move up and down freely, the arm 46 which moves the lock rod 45 up and down, the solenoid 47 which energizes the arm 46 to one side, and the energizing direction according the arm 46 to the solenoid 47 have the helical extension spring 48 energized to an opposite direction.

[0037]

The lock rod 45 is supported by the components 49 and 50, enabling free up-and-down motion, and the arm 46 is supported by the component 51 by the pivot shaft 51a, enabling free rotation. The end of the arm 46 has bifurcated to the letter of a fork, and bifurcated [the] is engaging with the pin 45a of the lock rod 45. One end of the helical extension spring 48 is hooked on the other end of the arm 46, and the other end of the helical extension spring 48 is hooked on the component 52. One end of the connecting rod 53 is hooked on the pars intermedia of the pivot shaft 51a and the hooking part of one helical extension spring 48 end, and the other end of the connecting rod 53 is hooked on the plunger 54 of the solenoid 47.

[0038]

The shaking plate 55 supported by the pivot shaft 55a is provided by the component 52. One end of this shaking plate 55 is set as the actuator 56a of the limit switch 56 so that an abutment is possible, and the other end is set as the upper surface of the battery 2 inserted in the slot 4 so that an abutment is possible. The aforementioned other end of the shaking plate 55 is energized with the torsion coil spring 57 at the battery 2 side.

[0039]

The slidable plate 58 is provided to the upper board 44b, that standing board 58a is penetrated on this plate 58, and engagement of the shaft 59 is carried out. The both ends of the shaft 59 are engaging with the long hole 60a provided by the side board 60 of the upper board 44b. The end of the bracket 61 is combined with the portion projected from the aforementioned long hole 60a of the shaft 59 to the method of outside. The push bar 62 which has penetrated the lower board 44a so that the slot 4 may be crossed is combined with the other end of the bracket 61. The push bar 62 is guided movable in the extraction and insertion direction of the battery 2 by the guide groove 63 dug by the side board of the lower board 44a.

[0040]

The aforementioned limit switch 56 is attached to one standing board 64a of the plate 64 fixed to the upper board 44b. One end of the helical extension spring 65 is hooked on the standing board

64b of another side of the plate 64, and the other end of the helical extension spring 65 is hooked on the shaft 59. The plate 58 is energized by the operation of the helical extension spring 65 at the opening side of the slot 4. The tag block 66 is provided, a bottom part, i.e., in the inner part of, the slot 4, and the terminals 6 and 6 (Fig.15) connected to the aforementioned battery charger 7 are embedded under this tag block 66. The battery 2 is inserted, when the terminals 28 and 29 of the battery 2 reach the position in contact with the terminals 6 and 6, it drops on the plate 64 and the hole 58c is formed so that the lock rod 45 may deflect downward and can engage with the engaging hole 30 of the battery 2.

[0041]

When the battery 2 is not inserted at the time of operation, the solenoid 47 is energized and the plunger 54 is drawn in the solenoid 47. Therefore, in Fig.13, it rotates clockwise and the arm 46 can be pulling up the lock rod 45 up. While the lock rod 45 can be pulling up, the engagement of the plate 58 and the lock rod 45 is released, and the plate 58 is pulled by the helical extension spring 65, and is deflected leftward in Fig.13. Thereby, the push bar 62 combined with the plate 58 via the bracket 61 is deflected by opening slippage of a slot in the guide groove 63.

[0042]

If the battery 2 is inserted into the slot 4, the push bar 62 will be abutted and the push bar 62 will be pushed aside by the end face (surface where the aforementioned terminals 28 and 29 are arranged) of the battery 2 to the direction in the inner part of the slot 4. On the other hand, in order that the actuator 56a may be abutted and the upper surface of the battery 2 may push up this up by inserting the battery 2, the limit switch 56 is set to ON. The ON operation of this limit switch 56 is recognized by the aforementioned controller 3, and the controller 3 outputs the signal which stops the energization of the solenoid 47. If it responds to this signal and the energization of the solenoid 47 is stopped, the arm 46 will be pulled by the helical extension spring 48, and will be rotated counterclockwise, and the lock rod 45 will be energized caudad. However, since the lower end surface of the lock rod 45 abuts the upper surface of the plate 58 until it is pushed aside by the push bar 62 into the slot 4 and the plate 58 deflects to a predetermined position in connection with this motion, the lock rod 45 does not reach the lower end of that stroke, but remains on the way.

[0043]

It is pushed aside by the push bar 62 into the slot 4, and when the plate 58 deflects in the push bar 62 and the direction and the terminals 28 and 29 of the battery 2 contact the terminals 6 and 6 by it, respectively, the aforementioned dropping hole 58b is penetrated and the lock rod 45 falls caudad. In this way, the lower end of the lock rod 45 engages with the engaging hole 30 of the battery 2, and the battery 2 is locked in the slot 4.

[0044]

If the battery 2 is inserted into the slot 4, the controller 3 will energize the battery charger 7 and will start charge of the battery 2 concerned. The battery 2 is charged, if preparation whose user takes out the battery 2 from the slot 4 can be performed, the solenoid 47 will be energized by the instruction of the controller 3, the lock rod 45 can pull up up, and a lock will be released. As a

result, the push bar 62 acts so that it may be pulled by the helical extension spring 65 and the battery 2 may be extruded from the slot 4.

[0045]

Fig.16 is a cross sectional view showing the form of the slot 4 typically. As shown in this figure, the slot 4 consists of the back portion 4a by which the battery 2 is supported, and the swollen part 4b formed so that the battery 2 might have projected and it might be easy to hold a user by hand, from the inlet member 43, this swollen part 4b comes together direction jam of the front aforementioned door 10, and the opening is passed through and carried out. As the chain line in a figure showed, the battery 2 is projected in the door 10 direction by the extrusion operation by the push bar 62.

[0046]

Since the portion which has faced outside, the tip 4, i.e., the slot, of the battery 2, projects ahead from the battery 2 of other slots 4 by the above-mentioned extrusion operation, a user's extraction operation becomes easy. It is also much more easy to hold the end by the aforementioned swollen part 4b conjointly that the sectional shape of the battery 2 is palm size.

[0047]

Next, the motor assisted bicycle carrying the above-mentioned battery 2 is described. Each of Fig.17, Fig.18, and Fig.19 is the right side views of a motor assisted bicycle, and shows the portion of each other same [a same sign] or equivalent. The vehicle body frame 67 is provided with the following in Fig.17.

The head tube 68 of the front of solvent.

The downpipe 69 extended for the back falling from the head tube 68.

The rear fork 70 combined near the lower end of the downpipe 69.

The seat pillar 71 which is combined with a lower end of the downpipe 69 and rises to a method of Gokami.

The front fork 72 is supported movably by the aforementioned head tube 68 so that steering is possible, and the front wheel 73 is supported pivotally by the lower end of the front fork 72. The handle 74 is combined with the upper end of the front fork 72.

[0048]

The supporting spindle 75 by which fitting was elastically carried out to the seat pillar 71 to this seat pillar 71 is provided, and the upper end of the supporting spindle 75 is equipped with the sheet 76. The stay 77 extends for the back falling from the upper end of the seat pillar 71, it is combined integrally and the intersection of this stay 77 and the rear fork 70 forms the bearing of the rear wheel 78.

[0049]

The bearing pipe (not shown) extended to the right and left of the vehicle body is combined with the intersection of the seat pillar 71 and the downpipe 69, and the pedal 79 and the front sprocket 80 are provided by the crankshaft which penetrated this bearing pipe. The pedal 79 of providing also on the left-hand side of a vehicle body is natural. The back sprocket 81 is connected with the center of the rear wheel 78, and the chain 82 is constructed between the front sprocket 80 and the

back sprocket 81.

[0050]

The power unit 86 including the electric motor which gives the power for assisting the treading strength concerning the pedal 79 to a motor assisted bicycle is provided, and the output shaft 83 of the electric motor adjoins front sprocket 80 back, and is arranged. The chain 82 is constructed in the assistant sprocket 84 combined with the output shaft 83 so that it may appear in the upper part. The tension of the chain 82 is adjusted by changing the position of the tension regulation sprocket 85. Bolting of the power unit 86 is carried out to the bracket 70a fixed to the rear fork 70 by welding etc., and the bracket (not shown) fixed to the lower end of the downpipe 69 by welding etc., and it is combined with it.

[0051]

The battery carrier 87 is welded to the seat pillar 71 to the space between the rear wheels 78. It is formed in dished and the battery 2 turned the aforementioned terminals 28 and 29 down, and along with the seat pillar 71, the battery carrier 87 is longwise and is settled. The snap ring 89 further connected with the buckle 88 and the buckle 88 is provided by the seat pillar 71. The upper end of the battery 2 is reliably fixed to the seat pillar 71 by hooking the snap ring 89 on the aforementioned stage portion 36 of the upper end part angle of the battery 2, and rotating the buckle 88.

[0052]

The feed part 90 containing the contact in contact with the aforementioned terminals 28 and 29 is provided by the lower end of the battery 2, and electric power is supplied to the power unit 86 through this feed part 90. In the chain 82 upper part, form is set up so that the wrap chain covers 91 may, on the whole, cover the front sprocket 80 and the assistant sprocket 84 further. Since the hole 92 which suits the through-hole 35 dug by the battery pack 26 is formed in the battery carrier 87, Theft prevention of not only the theft of a motor assisted bicycle but the battery 2 is achieved by applying to through the wire or rope portion which makes some keys to this hole 92 and the through-hole 35 of the battery pack 26, applying it to the rear wheel 78, passing, and locking.

[0053]

In Fig.18, the battery carrier 87 is fixed ahead of the seat pillar 71, and the battery 2 is placed ahead [seat-pillar 71]. Thus, also in the vehicle body frame which a setting space cannot secure, the battery 2 can be carried in seat-pillar 71 back. The chain covers 91 are set as the form which covers a chisel in part (upper part) about the front sprocket 80.

[0054]

In Fig.19, an end is compared and the downpipe 69 is combined with the pars intermedia of the seat pillar 71. And the rear fork 70 is extended to back, a lower end part, i.e., near a crankshaft, the seat pillar 71. Reservation of the space which arranges the power unit 86 behind the front sprocket 80 in the structure of such a vehicle body frame 67 is difficult. Then, in the chain 82, the power unit 86 is ahead arranged rather than the front sprocket 80, and it is [the assistant sprocket 84 is rolled and] made to be ahead constructed from the front sprocket 80 it. In order to

realize arrangement of such a power unit 86, a part of power unit 86 is combined with the vehicle body frame 67 via the bracket 93 welded to the lower part of the downpipe 69.

[0055]

The attachment mode of the power unit 86 to the vehicle body frame 67 is described further.

Fig.20 is an essential part enlarged drawing of the Fig.17 in which the essential part of a motor assisted bicycle is shown, and Fig.17 and a same sign are identical parts. The chain covers 91 are removed. In Fig.20, the power unit 86 builds in the electric motor 94, and rotation of this electric motor 94 is transmitted to the output shaft 23 via the transmission mechanism which is not illustrated. As the bosses 96 and 97 project over the method of outside, they are formed in the casing 95. The boss 96 is combined with the bracket 70a provided by the rear fork 70 with the bolt nut 98, and the boss 97 is combined with the bracket 100 caudad projected from the bearing pipe 99 which has combined the downpipe 69 and the seat pillar 71 with the bolt nut 101.

[0056]

As for the power unit 86, it is preferable on manufacture that it can deal with the mold of the vehicle body frame assumed variously. Then, using common "mold", the casing 95 is manufactured, and various vehicle body frames are suited, and it was made to be attached. That is, when distance of the bolthole formed in the bosses 96 and 97 is set to S, the 3rd boss 102 is assumed that a bolthole is placed at the position of the distance S from the bolthole of these both sides. And according to the mold of a vehicle body frame attached, it is determined any of these bosses it leaves a product. Thus, by setting up the "mold" of manufacture, various casings which can respond also to various attachment modes can be manufactured easily.

[0057]

The tension regulation sprocket 85 is attached to the lever 104 supported pivotally with the pivot shaft 103 by the casing 95. By the spring means which is not illustrated, rotational energization of the lever 104 is carried out to the counterclockwise rotation in a figure, the tension regulation sprocket 85 rotates and the suitable tension for the chain 82 is given by this.

[0058]

According to the above-mentioned embodiment, the battery 2 was carried in the motor assisted bicycle. However, this battery 2 can be used not only for this but for other electric products, for example, a portable cassette deck and CD player. When using it as a power supply of these electric products, the adapter for connecting the battery 2 and the input terminal of these electric products is needed. And when combining this adapter with the battery 2 reliably, the aforementioned engaging holes 30 and 30A are useful.

[0059]

That is, the adapter 105 can be made to hold to the battery pack 26 in Fig.12 using the engaging holes 30 and 30A. The adapter 105 has the aforementioned terminals 28 and 29 and a terminal (not shown) which contacts, when this adapter 105 is combined with the battery pack 26, and it can connect the battery 2 to an electric product through the code 106 pulled out from this terminal.

[0060]

In this way, since the battery 2 can be shared with a motor assisted bicycle and other electric products, For example, music can be enjoyed, also when a battery is removed from a motor assisted bicycle, electric power is supplied to audio goods and a power supply is not easily acquired out in the fields etc. at the cycling point which uses a motor assisted bicycle.
[0061]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a front view of the battery exchange equipment concerning one embodiment of the present invention.

[Drawing 2]It is a side surface cross sectional view of the battery exchange equipment concerning one embodiment of the present invention.

[Drawing 3]It is a flow chart of battery exchange.

[Drawing 4]It is a configuration diagram of a battery rental system.

[Drawing 5]It is a perspective view of a battery.

[Drawing 6]It is a front view of a battery.

[Drawing 7]It is a bottom view of a battery.

[Drawing 8]It is a side view of the pack portion of a battery pack.

[Drawing 9]It is an inner surface figure of a pack portion.

[Drawing 10]It is an A-A cross sectional view of Fig.9.

[Drawing 11]It is an essential part front view of a battery pack.

[Drawing 12]It is an essential part cross sectional view of a battery pack.

[Drawing 13]It is a side view of a slot.

[Drawing 14]It is an essential part cross-sectional view of a slot.

[Drawing 15]It is a perspective diagram showing the inner surface of a slot.

[Drawing 16]It is a cross sectional view showing the form of a slot typically.

[Drawing 17]It is a right side view of a motor assisted bicycle.

[Drawing 18]It is a right side view of a motor assisted bicycle.

[Drawing 19]It is a right side view of a motor assisted bicycle.

[Drawing 20]It is an essential part enlarged drawing showing the essential part of a motor assisted bicycle.

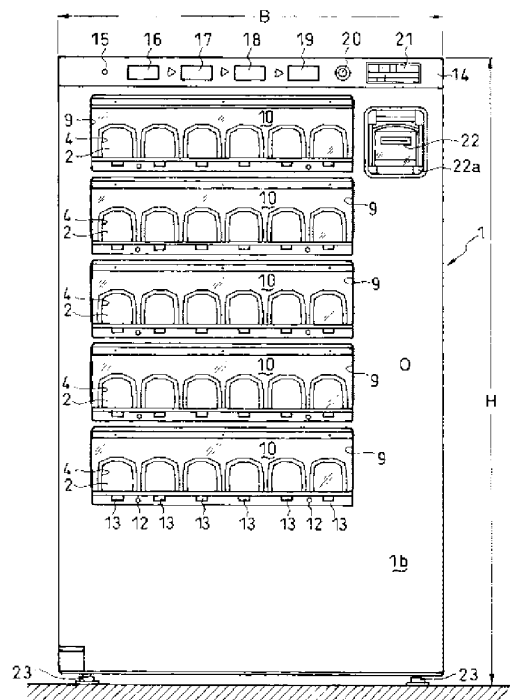
[Explanations of letters or numerals]

1 -- battery exchange equipment, 2 -- battery, 3 -- controller, and 4 -- slot, 5 -- a battery holding mechanism, 6 -- terminal, 7 -- battery charger, 9 -- window, and 10 -- door, 11 -- a hinge, 12 -- stopper, 13 -- telltale light, and 14 -- display panel, 22 -- a card slot, 26 -- battery pack, and 26L, 26 R -- pack portion, 27 -- a crack surface and 28, 29 -- a terminal and 30, 30 A -- an engaging hole and 31 -- muscle-like protruding part, 35 -- a through-hole, 36 -- stage portion, 37 -- design seal, and 39 -- battery cell, 40 -- terminal fixing grooves and 45 -- a lock rod and 46 -- an arm and 47 -- a solenoid and 56 -- a limit switch and 61 -- a bracket and 62 -- a push bar and 71 -- a

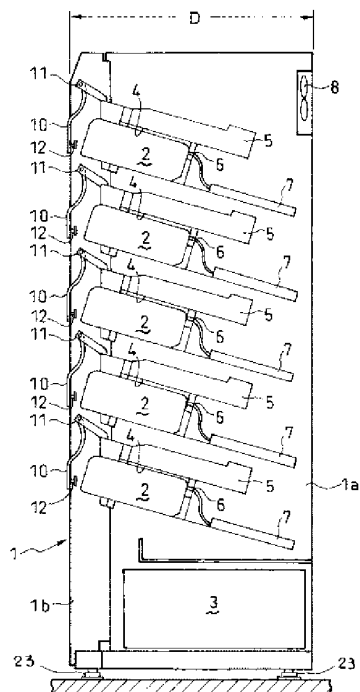
seat pillar and 86 -- a power unit and 87 -- a battery carrier and 88 -- a buckle and 89 -- the snap ring

DRAWINGS

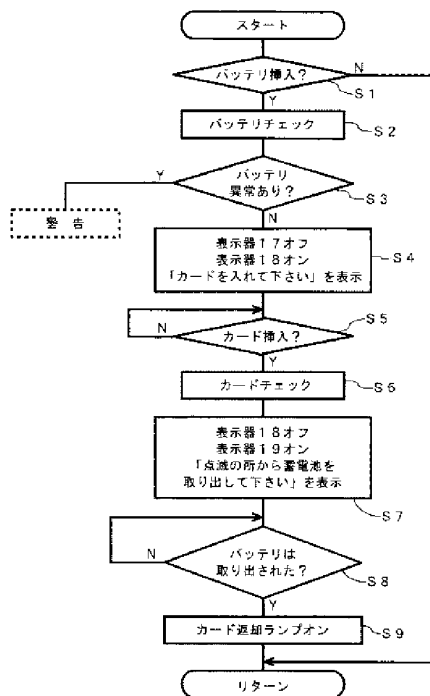
[Drawing 1]



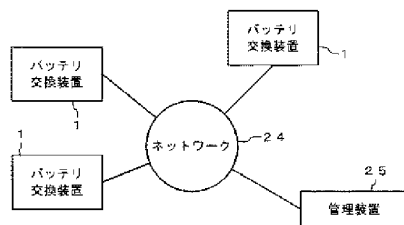
[Drawing 2]



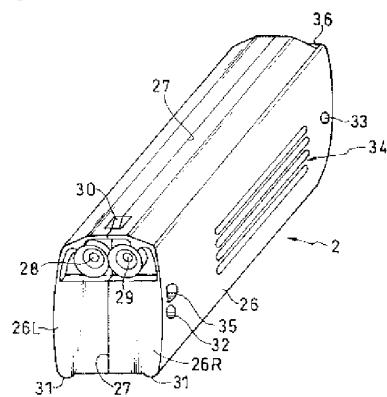
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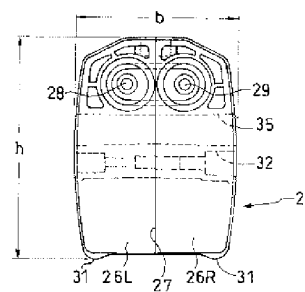
[Drawing 4]



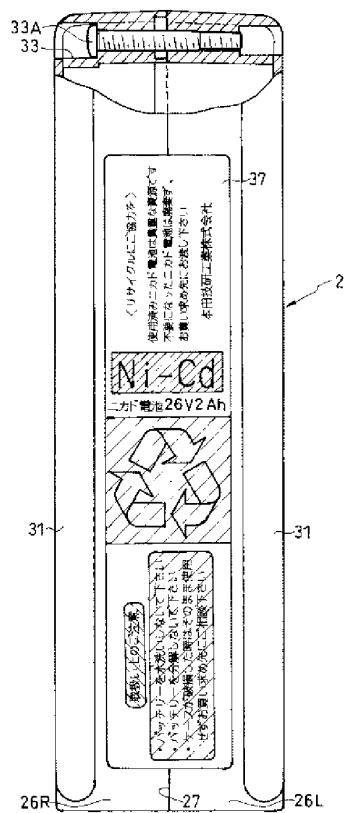
[Drawing 5]



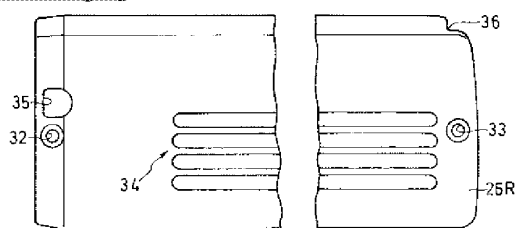
[Drawing 6]



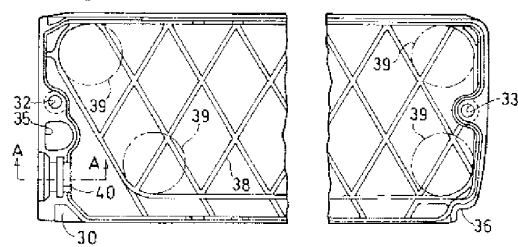
[Drawing 7]



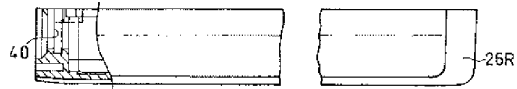
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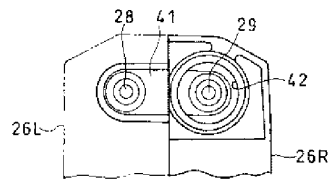
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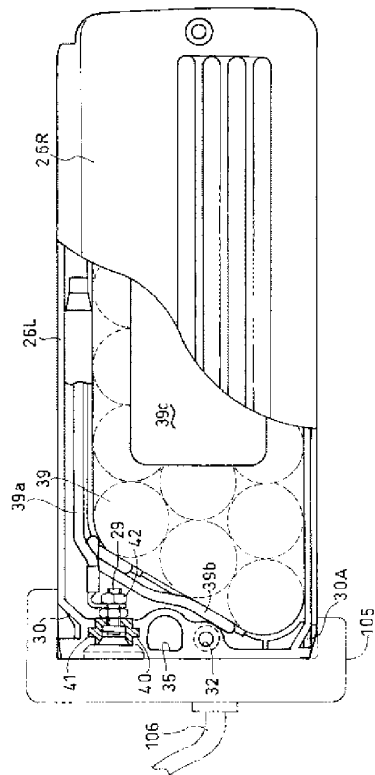
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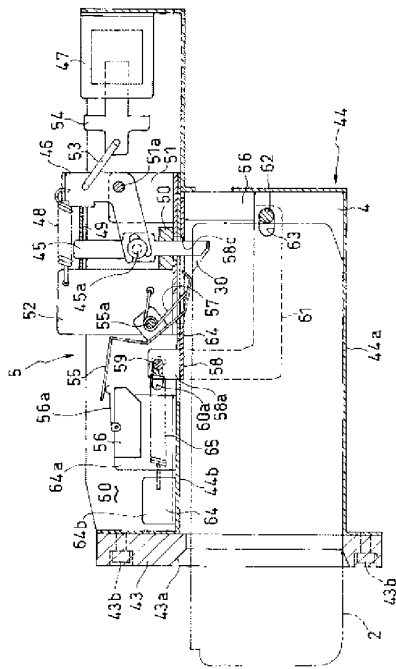
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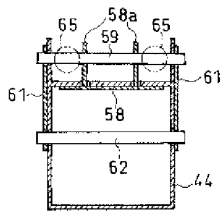
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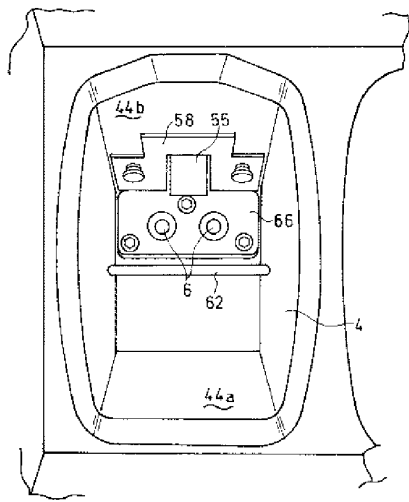
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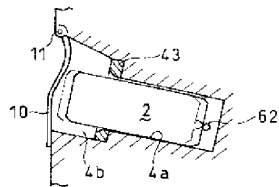
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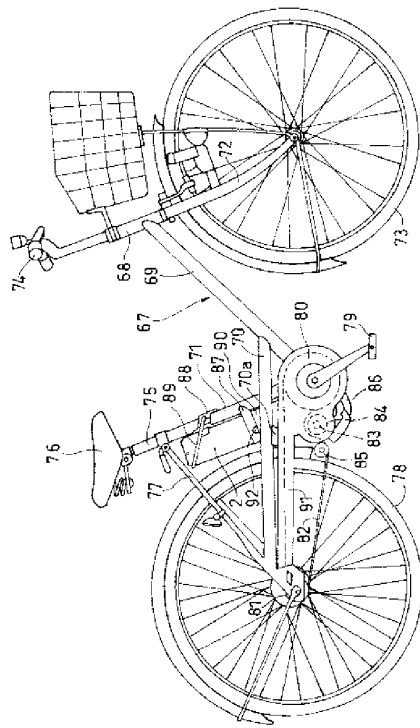
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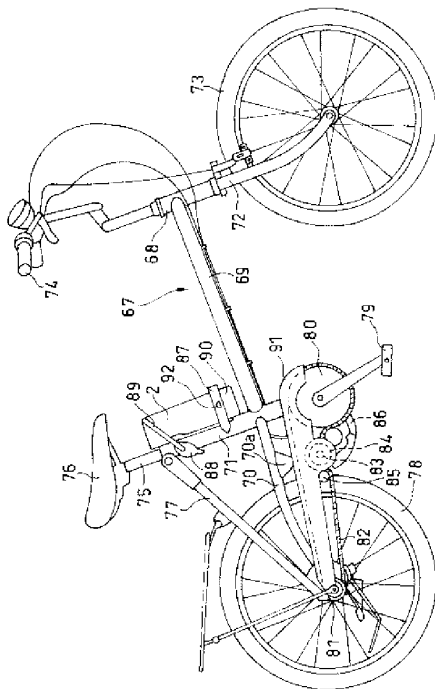
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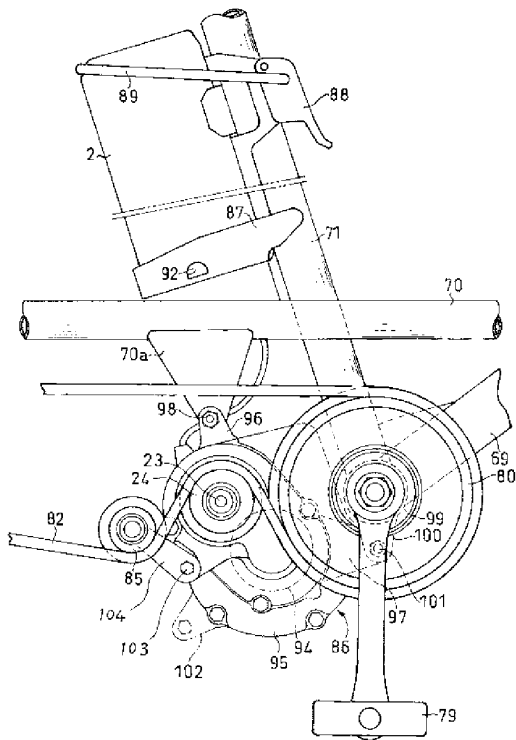
[Drawing 17]



[Drawing 18]



[Drawing 20]



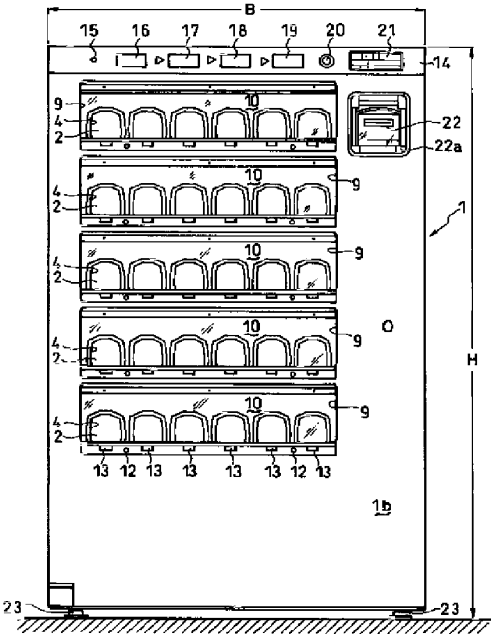
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(54) 【発明の名称】 バッテリー交換装置

(57) 【要約】
【課題】 屋内での利用に適した小型のバッテリー交換装置を提供すること。
【解決手段】 バッテリー交換装置1は複数のスロット4を有し、このスロット4に挿入されたバッテリー2は充電器7で充電される。充電済みのバッテリー2は指示に従ってユーザに貸出される。貸出しに際しては保持機構5に設けられたバッテリーロックが外され、バッテリー2は隣接するバッテリー2よりも前方に突出される。バッテリー交換装置1の高さは、コンビニエンスストア等に設置しても、見通しの確保や美観の維持に適したように120cmに設定している。



【特許請求の範囲】

【請求項1】 バッテリーを収納する収納部と、前記バッテリーを充電する充電器とを有し、充電済みバッテリーを提供するバッテリー交換装置において、屋内設置され、内部雰囲気が設置雰囲気との換気のみ依存して維持されるとともに、全高が略80～120センチメートルに設定されていることを特徴とするバッテリー交換装置。

【請求項2】 前記バッテリー収納部における上下方向のバッテリーの数よりも左右方向のバッテリーの数を多くしたことを特徴とする請求項1記載のバッテリー交換装置。

【請求項3】 電源装置と、制御装置とを具備し、前記制御装置が、受入れたバッテリーを前記収納部に保持するロック制御手段と、前記収納部に受入れたバッテリーを充電するための充電制御手段と、充電済みバッテリーを収納している収納部の保持を利用者の要求に応じて解除するロック解除制御手段とからなることを特徴とする請求項1または2記載のバッテリー交換装置。

【請求項4】 前記収納部が複数の有底筒体からなり、前記有底筒体のうち、空いている有底筒体、および充電済みバッテリーを収納している有底筒体をそれぞれ認識可能に表示する表示手段を具備したことを特徴とする請求項1～請求項3のいずれかに記載のバッテリー交換装置。

【請求項5】 前記電源装置および制御装置を最下段に、前記収納部を中段に、前記表示手段を含む案内手段を最上段に配置したことを特徴とする請求項1～請求項4のいずれかに記載のバッテリー交換装置。

【請求項6】 内部雰囲気を換気するファンを具備したことを特徴とする請求項1～請求項5のいずれかに記載のバッテリー交換装置。

【請求項7】 前記屋内は、コンビニエンスストアであることを特徴とする請求項1～請求項6のいずれかに記載のバッテリー交換装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、バッテリー交換装置に関し、特に、電動機を駆動源とする電動車両に搭載されるバッテリーの充電および貸出し等を集中して管理するのに好適なバッテリー交換装置に関する。

【0002】

【従来の技術】近年、人の脚力を補助するため、電動機を補助動力源として搭載した自転車（以下、「電動アシスト自転車」という）が利用されている。この電動機には、充電を繰り返して再使用することができるニッケル-カドミウム電池等のバッテリーが電源として使用され

る。

【0003】ところで、電動アシスト自転車のユーザがバッテリーを個人的に所有した場合、充電等の管理を自己で行わなければならない煩わしさがある。この煩わしさを解消するため、バッテリーの充電を集中して管理するシステムが考えられる。例えば、電動アシスト自転車のユーザが、集中管理されているバッテリーを借り受けて使用し、バッテリーが消耗したならば、そのバッテリーを返却してフル充電されたバッテリーを新たに借り受けるバッテリー交換システムが考えられる。

【0004】特開平10-293874号公報には、登録されたユーザに対して、バッテリーの貸出しおよび返却を自動的に行うバッテリー交換装置が開示されている。このようなバッテリー交換装置を随所に配備することにより、ユーザは充電や保管等のバッテリー管理の煩わしさから解放されるだけでなく、バッテリー消耗を気にすることなく広い範囲で電動アシスト自転車を利用することができる。

【0005】

【発明が解決しようとする課題】上述のバッテリーの自動交換装置は、電動アシスト自転車等の車両で訪れるユーザの利用に便利のように、屋外設置に適した構造になっている。しかし、ユーザの利用の快適性を考慮すると、屋内設置も検討されるべきである。ところが、屋外設置を前提としているバッテリー交換装置は、設置地域、気候、気象等の状態に適合させたり、バッテリー充電時に生じる熱を排除したりするための空調装置が必須となっている。そのために、バッテリー交換装置が大型化し、屋内設置には適さないという問題点があった。

【0006】本発明は、上述の課題を解決し、屋内設置に適した小型のバッテリー交換装置を提供することを目的とする。

【0007】

【課題を解決するための手段】上記目的を達成するための本発明は、バッテリーを収納する収納部と、前記バッテリーを充電する充電器とを有し、充電済みバッテリーを提供するバッテリー交換装置において、屋内設置され、内部雰囲気が設置雰囲気との換気のみ依存して維持されるとともに、全高が略80～120センチメートルに設定されている点に第1の特徴がある。第1の特徴によれば、バッテリー交換装置は屋内での利用に適したものとされ、特に、全体高さが略80～120cmに設定されているので、収納部に対して人がバッテリーを出入れしやすい上に、交換装置の上面に物を置くなどの有効な利用が図れる。

【0008】また、本発明は、前記バッテリー収納部における上下方向のバッテリーの数よりも左右方向のバッテリーの数を多くした点に第2の特徴がある。第2の特徴によれば、高さを120cm程度と低くしながら、バッテリーの収納数を多くできる。

【0009】また、本発明は、電源装置と、制御装置とを具備し、前記制御装置が、受入れたバッテリーを前記収納部に保持するロック制御手段と、前記収納部に受入れたバッテリーを充電するための充電制御手段と、充電済みバッテリーを収納している収納部の保持を利用者の要求に応じて解除するロック解除制御手段とからなる点に第3の特徴がある。第3の特徴によれば、受入れられたバッテリーは収納部にロックされ、充電済みのバッテリーはロック解除されて利用に供される。

【0010】また、本発明は、前記収納部が複数の有底筒体からなり、前記有底筒体のうち、空いている有底筒体、および充電済みバッテリーを収納している有底筒体をそれぞれ認識可能に表示する表示手段を具備した点に第4の特徴がある。第4の特徴によれば、ユーザは、収納部内のバッテリーの有無および充電済みバッテリーの有無を、表示を通じて認識できる。

【0011】さらに、本発明は、前記電源装置および制御装置を最下段に、前記収納部を中段に、前記表示手段を含む案内手段を最上段に配置した点に第5の特徴がある。第5の特徴によれば、案内手段は見易い位置に、バッテリーは出入しやすい位置に配置される。

【0012】また、さらに、本発明は、内部雰囲気を換気するファンを具備した点に第6の特徴があり、前記屋内が、コンビニエンスストアである点に第7の特徴がある。第6の特徴によれば、バッテリー交換装置が設置された場所の雰囲気で内部が換気される。第7の特徴によれば、当該バッテリー交換装置は高さが120cmに設定されているので、他の商品棚と一緒に並べて設置したときにコンビニエンスストアの店内の見通しが確保される上、交換装置の上面にも物や商品を置くのに好適となる。

【0013】

【発明の実施の形態】以下、図面を参照して本発明を説明する。図1は、本発明の一実施形態に係るバッテリー交換装置を示す正面図、図2は同側面断面図である。図において、バッテリー交換装置1は、外形が直方体をなす筐体からなる。この筐体は、複数のバッテリー2、コントローラ（電源装置および制御装置からなる）3とを収容するスペースを有する本体1aと、本体1aに対して開閉自在な蓋体1bとからなる。なお、バッテリー2は複数のバッテリーセルを樹脂等のケース内に装填したバッテリーパックとして構成される。

【0014】本体1aには、バッテリー2を1つずつ収納した収納部としてのスロット4が設けられており、スロット4はそれぞれ横に6列、縦に5段設けられている。すなわち、本実施形態のバッテリー交換装置1は合計30個のバッテリーを同時に収容可能である。スロット4はバッテリー2の保持機構（詳細は後述）5を有している。スロット4の底部つまり奥の壁面にはバッテリー充電のための端子6が設けられていて、この端子6は充電器7に接

続されている。

【0015】スロット4はバッテリー2が挿入されたことを検出するセンサ手段（後述のリミットスイッチ56）を有していて、バッテリー2の挿入が検出されたならば充電器7を付勢して該バッテリー2の充電を行う。バッテリー2の検出、充電の開始指示等は前記コントローラ3によって実行できる。コントローラ3の制御装置は、バッテリー2の充電が完了した場合、どのスロット4に充電済みバッテリーが収納されているかが認識できるレジスタを含む制御手段を有している。このレジスタの内容によって後述の表示手段による充電バッテリー表示が行われる。なお、充電器7は個々のスロット4にそれぞれ別個に設けるのではなく、例えば、3つのスロットで1つの充電器7を共用することができる。

【0016】本体1aの上部背面には排気用のファン8が設けられている。バッテリー交換装置1に空調手段を設けると、そのために大きいスペースをとることになり、屋内での使用に適しない。そこで、本実施形態では、スペースを大きくとる空調手段を用いず、ファン8で外気（設置場所の雰囲気）との換気をするだけにした。その結果、後述のようにバッテリー交換装置1の小型化が達成されている。

【0017】蓋体1bには、スロット4の配置に対応して横長の窓9が5段設けられていて、この窓9には6列のスロット4の前面を一体的に覆う共通の扉10が設けられている。扉10は透明の樹脂板で形成でき、上部に設けたヒンジ11によって開閉自在に支持されている。窓9の縁には、扉10を閉じたときにこの扉10の下端部裏面が当接するストッパ12が設けられている。ストッパ12は緩衝機能があるゴム等の弾性材料であるのが好ましい。また、窓9には各スロット4に対応して表示灯（例えばLED）13が設けられていて、この表示灯13が点灯または点滅しているスロット4およびこのスロット4に収容されているバッテリー2に関してユーザがアクセス可能である。図1においては図の繁雑を避けるため最下段のスロットについてののみストッパおよび表示灯を示す符号12、13を付している。

【0018】バッテリー2を収容するスロット4は、上述の数に限らないのはもちろんである。また、窓9は横長に限らず、スロット4の列に合わせて縦長としてもよい。この場合、扉10も縦長となり、上下方向に伸びた回転軸を有するヒンジで支持するのがよいのはもちろんである。さらに、スロット4の数に応じて必要な数の窓9だけに開閉自在な扉10を設けることとし、スロット4の数が少ない場合は、使用しない窓9に蓋を取付けて塞いでおくようにしてもよい。そして、スロット4を増設した場合は、これに応じて、塞いであった窓9を開放し、そこに扉10を取付けければよい。

【0019】蓋体1bの上部には表示パネル14が形成され、電源ランプ15、準備中表示器16、操作手順表

示器17、18、19、カード返却ランプ20、およびカード使用残数表示器21が設けられている。準備中表示器16ならびに操作手順表示器17、18、19は、予めメッセージを書込んだ文字板と、この文字板を照射するランプとからなる。準備中表示器16には「準備中」の文字が、操作手順表示器17には「充電電池を点灯の所に入れて下さい」の文字が、操作手順表示器18には「カードを入れて下さい」の文字が、操作手順表示器19には「点滅の所から充電電池を取出して下さい」の文字がそれぞれ表示される。蓋体1bの最上段の窓9の側部にはプリペイドカードを挿入するための挿入口22が形成されている。挿入口22には、開閉自在な透明樹脂カバー22aを設けることができる。

【0020】バッテリー交換装置1の下部には、脚23が設けられている。このバッテリー交換装置1の高さHは120cm、奥行Dは45cm、幅Bは72.5cmである。これらの寸法のうち、特に、高さHは、人間工学的にみたバッテリー2の出し入れ容易性や、コンビニエンスストア等の店舗に設置した場合の見通しの確保ならびに他の商品陳列台と共に配列したときの美観を考慮して決定するのが好ましく、120cmの前後10cmの範囲であるのが好ましく、80～120cm程度の範囲で設定される。

【0021】次に、バッテリー交換装置1の動作について説明する。バッテリー交換装置1は、充電済みのバッテリー2がない場合は準備中表示器16をオンにして「準備中」の文字を表示している。充電済みバッテリー2を貸出しできる場合は、準備中表示器16をオフにして「準備中」の文字を消し、これに代わって操作手順表示器17をオンにして「充電電池を点灯の所に入れて下さい」の文字を表示する。また、この表示と共に、空きスロット4に対応した表示灯13を点灯させる。空きスロット4が複数あるときは、それらのすべての表示灯13を点灯させてもよいし、各スロット4が平均して利用されるようにスロット4のうち1つを選択して表示灯13を点灯させてもよい。

【0022】図3はバッテリー交換の処理を示すフローチャートである。この処理はコントローラ3内の制御装置（マイクロコンピュータを含む）によって実行される。ステップS1では、バッテリー2がスロット4に入ったか否かが判別される。バッテリー2が入れられたならばステップS2に進み、受入れたバッテリー2が純正なものかどうかをチェックする。バッテリー2が純正のものであって、かつ異常がない場合（ステップS3が否定）はステップS4に進む。なお、異常の際に点灯して注意を促す警告ランプを前記蓋体1bに設けることができる。

【0023】ステップS4では操作手順表示器18をオンにして操作手順表示器17をオフにする。これによって、「充電電池を点灯のところに入れて下さい」の文字は消え、代わりに「カードを入れて下さい」の文字が表示

される。ステップS5では、プリペイドカードが前記挿入口22に挿入されたか否かを判断する。カードが挿入されたならばステップS6に進み、挿入されたカードのチェックを行う。具体的には、受入れたカードがバッテリー交換装置1に適合し、予定の貸出し条件に合致した適正なプリペイドカードであるか否かを判断し、正しいカードの場合に料金を減算して残数をカード使用残数表示器21に表示する。

【0024】ステップS7では、操作手順表示器18をオフにし、操作手順表示器19をオンにする。これによって、「カードを入れて下さい」の文字は消え、代わりに「点滅の所から充電電池を取り出して下さい」の文字が表示される。この「点滅の所から充電電池を取り出して下さい」の文字の表示と共に、充電済みバッテリー2が収容されているスロット4に対応した表示灯13を点滅させる。

【0025】充電済みバッテリー2が複数あるときは、それらのすべてに対応するスロット4の表示灯13を点滅させてもよいし、すべてのスロット4がまんべんなく利用されるように、例えばランダムにスロット4の1つを選択して表示灯13を点滅させてもよい。ステップS8では、バッテリー2が取り出されたか否かが判断される。バッテリー2が取出されたならばステップS9に進み、カード返却ランプ20をオンにしてカードを返却する。

【0026】上述の例では、バッテリー交換装置1を利用するためにプリペイドカードを使用するようにしたが、予め登録ユーザにだけ発行されたIDカードが使用された場合にのみバッテリー2の交換をできるようにしてもよい。

【0027】バッテリー交換装置1は複数台を集中して管理するようにしてもよい。図4は複数のバッテリー交換装置1を集中して管理するバッテリー・レンタルシステムの構成図である。バッテリー交換装置1はネットワーク24を介して管理装置25に接続されている。バッテリー交換装置1は、例えばコンビニエンスストア等に配備されており、管理装置25は複数台のバッテリー交換装置1を集中して管理している。ユーザはシステム提供者と契約してユーザ登録し、IDカードの発行を受ける。IDカードが使用された場合、バッテリー交換装置1はIDカードに記述された情報を認識し、管理装置25との通信によりユーザの個人情報をやり取りしてバッテリー2の受け付け（返却）や貸出しを行う。このようなバッテリー・レンタルシステムについては本出願人による先願（特開平10-293874号）に詳述されている。また、プリペイドカードやIDカードに限らず、現金を受付けてバッテリー交換に応じるようにしてもよいのはもちろんである。

【0028】図5は、バッテリー2の斜視図であり、図6はバッテリー2の正面図、図7は同底面図である。これらの図において、バッテリー2は複数のバッテリーセル（図示せず）、およびバッテリーセルを収容した略直方体のバッ

テリパック26を有している。バッテリーパック26は、その長手方向に沿った割面27で2分割されたバック部分26R、26Lからなり、これらバック部分26R、26Lは割面27を境に対称形状に形成されている。バック部分26R、26Lの形状を割面27に対して対称とすることにより、例えば、バック部分26R、26Lを成型するときの型の設計が容易になる。

【0029】バッテリー2の正面には、バッテリーセルの正極および負極にそれぞれ接続される端子28、29が、前記割面27に対して対称位置に露出して配置されている。バッテリーパック26の正面寄り頂部にはスロット4に設けられるロック装置（後述する）に係合する係合穴30が形成されている。また、バッテリー2をスロット4に収容するときのスロット4の壁面との摺動性、および収容した後の安定性を確保するため、バッテリーパック26aの底面には長手方向に延びた2条の筋状凸部31が形成されている。

【0030】バック部分26R、26Lはネジ孔32、33を利用してボルト33A（図7）で一体に組み付けることができる。溝34は持ち運びの際の手掛かりとなり、把持操作性の向上に貢献する。また、バッテリーパック26の横断面形状の寸法は、人が手でつかみ易いように、いわゆる手のひらサイズに設定されているのがよい。例えば、正面から見たときの高さhは約80mmであり、幅bが手のひらサイズの約55mmである。

【0031】バッテリーパック26を横に貫通した孔35は、バッテリー2を電動アシスト自転車に搭載したときに、鍵の一部をなすワイヤまたはロープ部分を通すのに利用できる。また、バッテリーパック26の角に形成された段部分36はバッテリー2を電動アシスト自転車に搭載したときに、バッテリー2を車体に固定するのに利用される引掛部となる。バッテリー2を電動アシスト自転車に搭載した例は図17等に関して後述する。バッテリーパック26の底面には、前記筋状凸部31で挟まれた領域にバッテリー2の種類、製造者名、取扱注意表示等を記載したシール（意匠シール）37が貼付けられている。このシール37は筋状凸部31間に貼ることにより、スロット4内への挿入や取出しの際に筋状凸部31で保護され、傷みにくいという利点がある。

【0032】バッテリーパック26の形状をさらに説明する。なお、バック部分26R、26Lは対称形状であるので、バック部分26で代表して説明する。図8はバッテリーパック26のバック部分26Rの側面図、図9は同内面図、図10は要部断面（図9のA-A断面）図であり、図5と同符号は同一部分を示す。特に、図9および図10において、バック部分26Rの内面にはリブ38が設けられ、バック部分26Rの補強、収容されるバッテリーセル39の位置決め、および緩衝に供することができる。なお、リブ38の形状はこれに限定されない。

【0033】図9において、バッテリーセル39は一部の

みを想像線で示しているが、さらに図示した数以上のものが、例えば熱収縮性チューブ等で一体に形成されてバッテリーパック26に装填されている。バック部分26Rの正面側の壁面には前記端子29を固定するための多段の溝40が形成されている。

【0034】バッテリー2の端子近傍をさらに説明する。図11はバッテリーパック26の要部正面図であり、図12はバッテリーパック26の要部断面図である。端子28、29は樹脂製のアタッチメント41に所定の間隔を保持して組付けられている。端子28、29にはネジ部があり、このネジ部にはバッテリーセル39との接続のためのケーブル39a、39bを締結するためのナット42が螺装されている。

【0035】アタッチメント41はバック部分26R、26Lの多段溝40に嵌合され、両者に挟まれて固定される。端子28、29の端部はバック部分26R、26Lの孔42Aから外側に臨んでいる。なお、バッテリーセル39とバック部分との間にはゴム等の弾性材料からなるクッション39cが配設されている。バッテリーパック26には、スロット4のロックロッド（後述）と係合される係合穴30が形成されるほか、この係合穴30が形成されている面とは反対側の面にもうひとつの係合穴30Aが形成することができる。これら係合穴30、30Aの機能については後述する。

【0036】次に、スロット4の構造を説明する。図13は、バッテリー保持機構を含むスロット4の側面図、図14はスロット4の要部横断面図、図15はスロット4の内面を示す透視図である。これらの図において、スロット4にはバッテリー2の挿入が容易となるようにテーパ43aを施した入口部材43が設けられ、この入口部材43は板金加工によって形成されたスロット本体44に、ボルト43bで固定されている。スロット本体44は、バッテリー2を収容するスペースを確保するための下板44aおよび上板44bからなる。上板44bはバッテリー保持機構5を搭載するベースを兼ねている。上板44b上には上下動自在なロックロッド45と、ロックロッド45を上下動させるアーム46と、アーム46を一方に付勢するソレノイド47と、アーム46をソレノイド47による付勢方向とは逆方向に付勢する引張コイルばね48とを有する。

【0037】ロックロッド45は部材49、50によって上下動自在に支持されており、アーム46はピボット軸51aによって部材51に回動自在に支持されている。アーム46の一端はフォーク状に二分叉になっていて、その二分叉がロックロッド45のピン45aに係合している。アーム46の他端には引張コイルばね48の一端が引掛けられていて、引張コイルばね48の他端は部材52に引掛けられている。ピボット軸51aと引張コイルばね48一端の引掛部との中間部には連結ロッド53の一端が引掛けられていて、連結ロッド53の他端は

ソレノイド47のプランジャ54に引掛けられている。

【0038】部材52にはヒポット軸55aで支持された揺動板55が設けられている。この揺動板55の一端はリミットスイッチ56のアクチュエータ56aに当接可能に設定されており、他端はスロット4に挿入されたバッテリー2の上面に当接可能に設定されている。揺動板55の前記他端はねじりコイルばね57でバッテリー2側に付勢されている。

【0039】上板44bに対して摺動自在なプレート58が設けられていて、このプレート58にはその立板58aを貫通してシャフト59が係合されている。シャフト59の両端は上板44bの側板60に設けられた長孔60aに係合している。シャフト59の、前記長孔60aから外方に突出した部分にはブラケット61の一端が結合されている。ブラケット61の他端には、スロット4を横断するように下板44aを貫通しているプッシュバー62が結合されている。プッシュバー62は下板44aの側板に穿たれたガイド溝63によってバッテリー2の出し入れ方向に移動可能に案内されている。

【0040】上板44bに固定されたプレート64の一方の立板64aには前記リミットスイッチ56が取付けられている。プレート64の他方の立板64bには引張コイルばね65の一端が引掛けられており、引張コイルばね65の他端はシャフト59に引掛けられている。引張コイルばね65の作用によって、プレート58はスロット4の開口側に付勢されている。スロット4の底部つまり奥には端子板66が設けられ、この端子板66には前記充電器7に接続される端子6、6（図15）が埋設されている。なお、バッテリー2が挿入されてバッテリー2の端子28、29が端子6、6に接触する位置に達したとき、ロックロッド45が下方方向に偏倚してバッテリー2の係合穴30に係合できるように、プレート64には落とし孔58cが形成されている。

【0041】動作時、バッテリー2が挿入されていない時は、ソレノイド47が付勢されていて、プランジャ54がソレノイド47内に引き込まれている。そのため、アーム46は図13において時計方向に回転し、ロックロッド45は上方に引き上げられている。ロックロッド45が引き上げられているときは、プレート58とロックロッド45の係合が解除されており、プレート58は引張コイルばね65に引っ張られて図13において左方向に偏倚している。これにより、ブラケット61を介してプレート58に結合されているプッシュバー62は、ガイド溝63内でスロットの開口寄りに偏倚されている。

【0042】バッテリー2がスロット4内に挿入されると、バッテリー2の端面（前記端子28、29が配置されている面）がプッシュバー62に当接して、プッシュバー62はスロット4の奥の方へ押しやられる。一方、バッテリー2が挿入されることにより、バッテリー2の上面がアクチュエータ56aに当接してこれを上方に押し上げ

るため、リミットスイッチ56がオンになる。このリミットスイッチ56のオン動作は前記コントローラ3で認識され、コントローラ3はソレノイド47の付勢を停止する信号を出力する。この信号に応答してソレノイド47の付勢が停止されると、アーム46は引張コイルばね48に引張られて反時計方向に回転し、ロックロッド45は下方に付勢される。但し、プッシュバー62がスロット4の奥へ押しやられ、この動きに伴ってプレート58が所定位置へ偏倚するまでは、プレート58の上面にロックロッド45の下端面が当接するので、ロックロッド45はそのストロークの下端に至らず、途中でとどまっている。

【0043】プッシュバー62がスロット4の奥へ押しやられ、それによってプレート58がプッシュバー62と同方向に偏倚し、バッテリー2の端子28、29が端子6、6にそれぞれ接触したときに前記落とし孔58bを貫通してロックロッド45は下方に落下する。こうしてバッテリー2の係合穴30にロックロッド45の下端が係合してバッテリー2はスロット4内にロックされる。

【0044】バッテリー2がスロット4内に挿入されると、コントローラ3は充電器7を付勢して当該バッテリー2の充電を開始する。バッテリー2が充電され、ユーザがバッテリー2をスロット4から取出す準備ができると、コントローラ3の指示によりソレノイド47が付勢されてロックロッド45が上方に引き上げられ、ロックが解除される。その結果、プッシュバー62は引張コイルばね65で引っ張られてバッテリー2をスロット4から押し出すように作用する。

【0045】図16はスロット4の形状を模式的に示した断面図である。この図のように、スロット4はバッテリー2が支持される奥部分4aと、バッテリー2が突出していて、ユーザが手で掴み易いように形成された膨出部分4bとからなり、この膨出部分4bは入口部材43から前方方向つまり前記扉10寄りへ開口されている。図中鎖線で示したように、バッテリー2はプッシュバー62による押し出し動作によって扉10方向に突出される。

【0046】上記押し出し動作により、バッテリー2の先端つまりスロット4から外に臨んでいる部分が他のスロット4のバッテリー2より前方に突出するのでユーザの取り出し操作は容易になる。また、前記膨出部分4bにより、バッテリー2の断面形状が手のひらサイズであることも相俟ってその端部はをより一層つかみ易くなっている。

【0047】次に、上記バッテリー2を搭載した電動アシスト自転車の説明する。図17、図18および図19は、いずれも電動アシスト自転車の右側面図であり、互いに同符号は同一または同等部分を示す。図17において、車体フレーム67は、その前端のヘッドパイプ68と、ヘッドパイプ68から後下がり延びるダウンパイプ69と、ダウンパイプ69の下端近傍に結合されたり

アフォーク70と、ダウンパイプ69の下端に結合され、後上方に立ち上がるシートポスト71とを有する。前記ヘッドパイプ68にはフロントフォーク72が操舵可能に支承され、フロントフォーク72の下端には前輪73が軸支されている。フロントフォーク72の上端にはハンドル74が結合されている。

【0048】シートポスト71にはこのシートポスト71に対して伸縮自在に嵌合された支持軸75が設けられ、かつ支持軸75の上端にはシート76が装着されている。シートポスト71の上端から後下がりステア77が延び、このステア77とリアフォーク70との交差部は一体的に結合されて後輪78の軸受を形成している。

【0049】シートポスト71とダウンパイプ69との交差部には車体の左右に延びた軸受パイプ（図示せず）が結合されていて、この軸受パイプを貫通したクランク軸にはペダル79および前スプロケット80が設けられている。ペダル79は車体左側にも設けられているのもちろんである。後輪78の中心には後スプロケット81が連結され、前スプロケット80および後スプロケット81間にはチェーン82が架けられている。

【0050】電動アシスト自転車にはペダル79にかかる踏力を補助するための動力を与える電動機を含むパワーユニット86が設けられ、その電動機の出力軸83が前スプロケット80後方に隣接して配置されている。出力軸83に結合されたアシストスプロケット84には、その上部に載るようにチェーン82が架けられている。チェーン82の張力は張力調節スプロケット85の位置を変化させることによって調節される。パワーユニット86はリアフォーク70に溶接等で固定されたブラケット70aとダウンパイプ69の下端に溶接等で固定されたブラケット（図示せず）にボルト締めされて結合されている。

【0051】シートポスト71には、後輪78との間のスペースにバッテリー受87が溶接されている。バッテリー受87は皿状に形成されていてバッテリー2が前記端子28、29を下にしてシートポスト71に沿って縦長で収まっている。シートポスト71には、さらにバックル88とバックル88に連結された止め輪89が設けられている。止め輪89をバッテリー2の上端部角の前記段部分36に引掛け、かつバックル88を回動させることによってバッテリー2の上端がシートポスト71に確実に固定される。

【0052】バッテリー2の下端には前記端子28、29と接触する接点を含む給電部90が設けられていて、この給電部90を通じてパワーユニット86に電力が供給される。チェーン82上側を覆うチェーンカバー91は、さらに前スプロケット80およびアシストスプロケット84を全体的に覆うように形状が設定されている。バッテリー受87にはバッテリーバック26に穿たれた貫通

孔35に適合する孔92が形成されているので、この孔92およびバッテリーバック26の貫通孔35に鍵の一部をなすワイヤまたはロープ部分を通し、それを後輪78にかけ渡して施錠することにより、電動アシスト自転車の盗難だけでなくバッテリー2の盗難防止が図られる。

【0053】図18において、バッテリー受87はシートポスト71の前方に固定されていて、バッテリー2はシートポスト71前方に位置している。このように、シートポスト71後方に設置スペースが確保できない車体フレームにおいてもバッテリー2を搭載することができる。また、チェーンカバー91は前スプロケット80についてはその一部（上部）のみを覆うような形状に設定されている。

【0054】図19においては、ダウンパイプ69はシートポスト71の中間部に端部が突合わされて結合されている。そして、リアフォーク70はシートポスト71の下端部つまりクランク軸付近から後方に延びている。このような車体フレーム67の構造では、パワーユニット86を前スプロケット80の後方に配置するスペースの確保が困難である。そこで、パワーユニット86は前スプロケット80よりも前方に配置して、アシストスプロケット84は前スプロケット80より前方でチェーン82に巻き架けられるようにしている。このようなパワーユニット86の配置を実現するため、電動機86の一部はダウンパイプ69の下部に溶接されたブラケット93を介して車体フレーム67に結合されている。

【0055】車体フレーム67に対するパワーユニット86の取付態様をさらに説明する。図20は電動アシスト自転車の要部を示す図17の要部拡大図であり、図17と同符号は同一部分である。チェーンカバー91は取り除いてある。図20において、パワーユニット86は電動機94を内蔵しており、この電動機94の回転は図示しない伝達機構を介して出力軸23に伝達される。ケーシング95にはボス96、97が外方に張出すようにして形成されている。ボス96はリアフォーク70に設けられたブラケット70aにボルト・ナット98で結合され、ボス97はダウンパイプ69およびシートポスト71を結合している軸受パイプ99から下方に突出したブラケット100にボルト・ナット101で結合されている。

【0056】パワーユニット86は、種々想定される車体フレームの型に対応できることが製造上好ましい。そこで、共通の「型」を使用してケーシング95を製造し、かつ種々の車体フレームに適合して取り付けられるようにした。すなわち、ボス96、97に形成されるボルト孔の距離をSとしたとき、これら双方のボルト孔から距離Sの位置にボルト孔が位置するように第3のボス102を想定する。そして、これらのボスのいずれを成品に残すかは、取り付けられる車体フレームの型に応じて決定する。このように製造の「型」を設定することによ

り、多様な取付け態様にも対応できる種々のケーシングを容易に製造できる。

【0057】張力調節スプロケット85は、ケーシング95にピボット軸103で軸支されたレバー104に取付けられている。レバー104は図示しないばね手段により、図中反時計方向に回動付勢されており、これによって、張力調節スプロケット85が回動し、チェーン82に適当な張力が付与されている。

【0058】上述の実施形態では、バッテリー2を電動アシスト自転車に搭載した。しかし、このバッテリー2はこれに限らず他の電気製品、例えば、ポータブルのカセットデッキやCDプレーヤに使用できる。これらの電気製品の電源として使用する場合、バッテリー2とこれら電気製品の入力端子とを接続するためのアダプタが必要となる。そして、このアダプタをバッテリー2に確実に結合させるときに前記係合穴30、30Aが有用である。

【0059】すなわち、図12において、係合穴30、30Aを利用してアダプタ105をバッテリーパック26に保持させることができる。アダプタ105は、このアダプタ105がバッテリーパック26に結合されたときに前記端子28、29と接触する端子（図示せず）を有していて、この端子から引出されたコード106を通じてバッテリー2を電気製品に接続することができる。

【0060】こうして、バッテリー2は電動アシスト自転車およびその他の電気製品で共用できるので、例えば、電動アシスト自転車を使用したサイクリング先で、電動アシスト自転車からバッテリーを外して音響製品に電力を供給し、野外等で容易に電源が得られないときにも音楽を楽しむことができる。

【0061】

【発明の効果】以上の説明から明らかなように、請求項1ないし請求項7の発明によれば、屋内での利用に適した小型のバッテリー交換装置が提供される。特に、請求項1の発明では、内部雰囲気を設置雰囲気に依存させているので空調装置が不要である。請求項2の発明では、高さを低くしつつも、多くのバッテリー収納数を確保することができる。請求項3の発明では、充電期間中は収納部にバッテリーは確実に保持される。請求項4の発明では、バッテリーの受入状態および充電済みバッテリーの有無を認識でき、利便性が高められている。

【0062】請求項5の発明では、バッテリーの収納部が装置中間高さにあるのでバッテリーの出入が容易であるとともに、案内手段の視認が容易である。請求項6の発明では、設置雰囲気と機内雰囲気がファンによって強制的に換気される。請求項7の発明では、コンビニエンスト

アに設置されることによって、特に、店内の見通しや美観の確保による効果が一層顕著である。

【図面の簡単な説明】

【図1】 本発明の一実施形態に係るバッテリー交換装置の正面図である。

【図2】 本発明の一実施形態に係るバッテリー交換装置の側面断面図である。

【図3】 バッテリー交換のフローチャートである。

【図4】 バッテリー・レンタルシステムの構成図である。

【図5】 バッテリーの斜視図である。

【図6】 バッテリーの正面図である。

【図7】 バッテリーの底面図である。

【図8】 バッテリーパックのバック部分の側面図である。

【図9】 バック部分の内面図である。

【図10】 図9のA-A断面図である。

【図11】 バッテリーパックの要部正面図である。

【図12】 バッテリーパックの要部断面図である。

【図13】 スロットの側面図である。

【図14】 スロットの要部横断面図である。

【図15】 スロットの内面を示す透視図である。

【図16】 スロットの形状を模式的に示した断面図である。

【図17】 電動アシスト自転車の右側面図である。

【図18】 電動アシスト自転車の右側面図である。

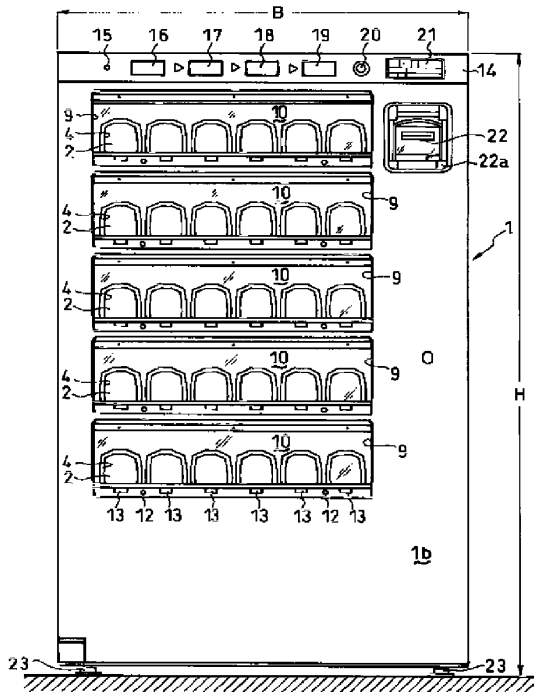
【図19】 電動アシスト自転車の右側面図である。

【図20】 電動アシスト自転車の要部を示す要部拡大図である。

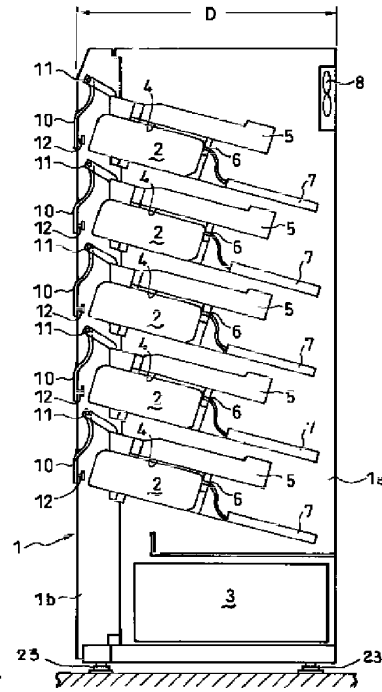
【符号の説明】

1…バッテリー交換装置、 2…バッテリー、 3…コントローラ、 4…スロット、 5…バッテリー保持機構、 6…端子、 7…充電器、 9…窓、 10…扉、 11…ヒンジ、 12…ストッパ、 13…表示灯、 14…表示パネル、 22…カード挿入口、 26…バッテリーパック、 26L、26R…バック部分、 27…割面、 28、29…端子、 30、30A…係合穴、 31…筋状凸部、 35…貫通孔、 36…段部分、 37…意匠シール、 39…バッテリーセル、 40…端子固定溝、 45…ロックロッド、 46…アーム、 47…ソレノイド、 56…リミットスイッチ、 61…ブラケット、 62…プッシュバー、 71…シートポスト、 86…パワーユニット、 87…バッテリー受、 88…バックル、 89…止め輪

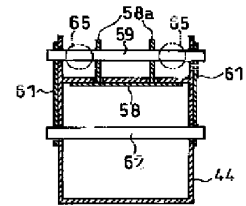
【図1】



【図2】

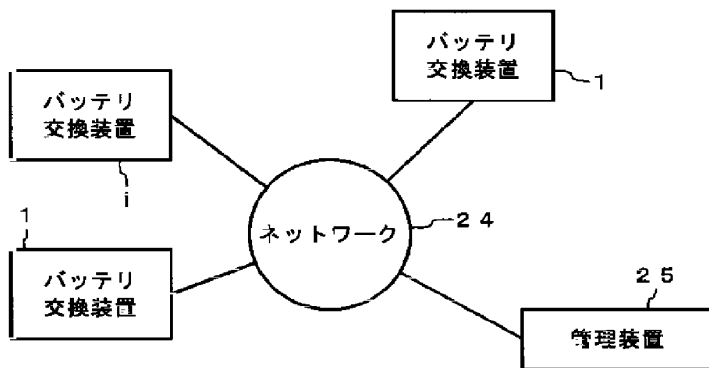
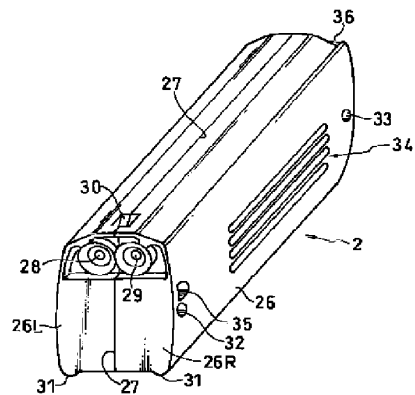


【図14】



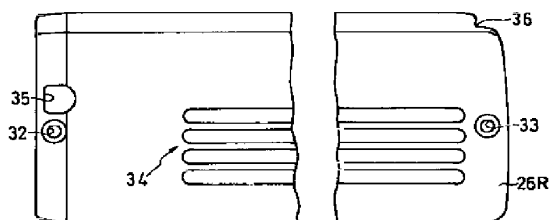
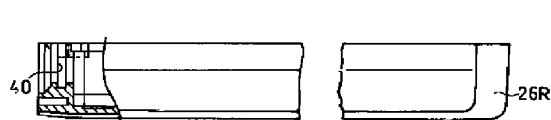
【図4】

【図5】

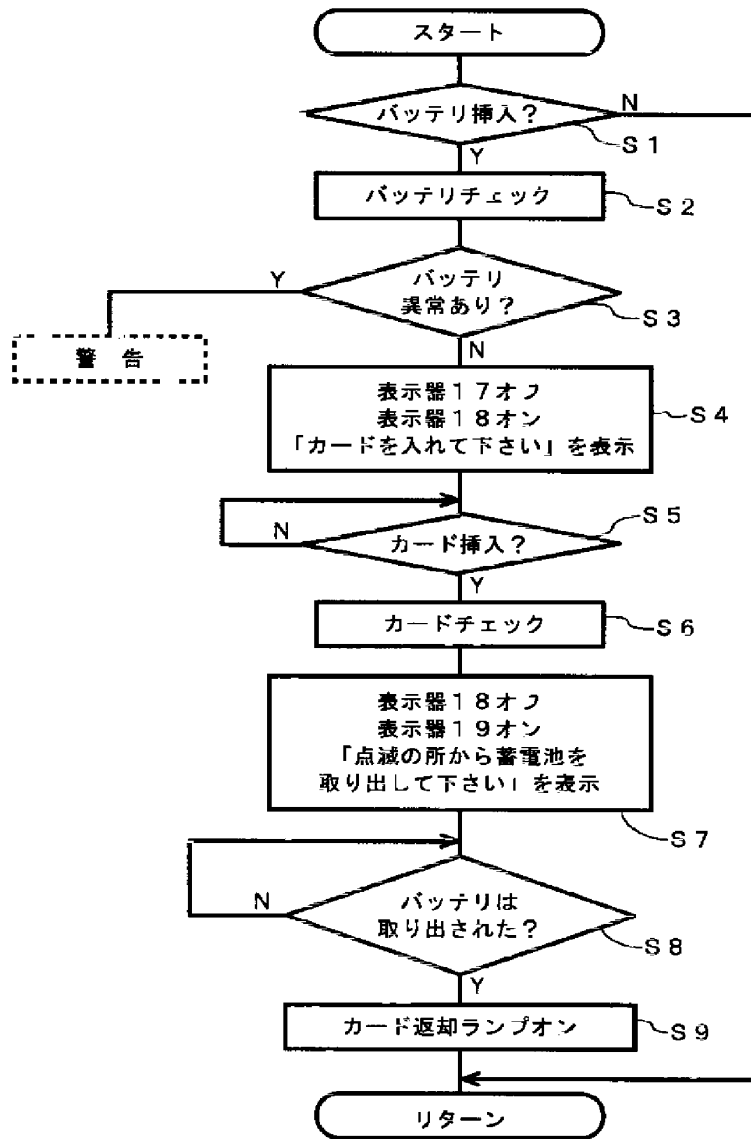


【図8】

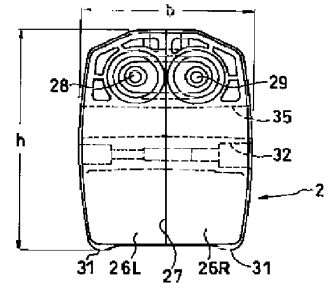
【図10】



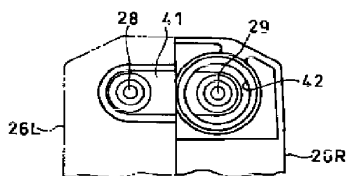
【図3】



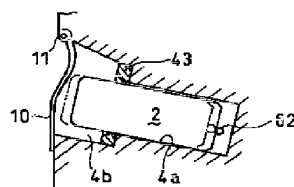
【図6】



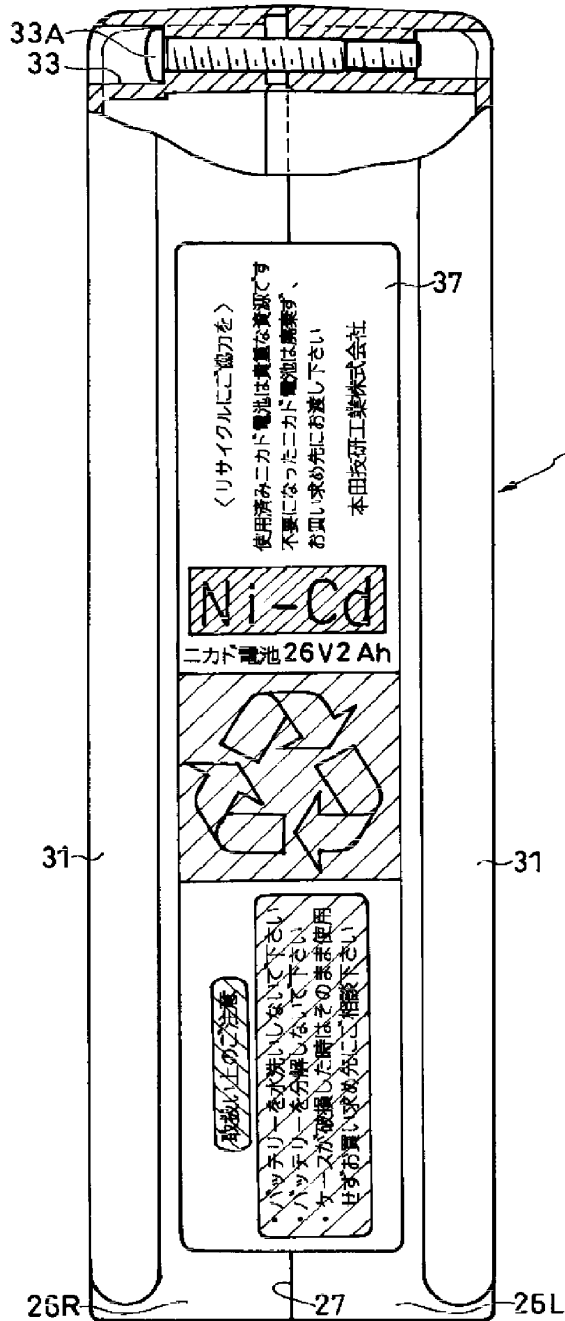
【図11】



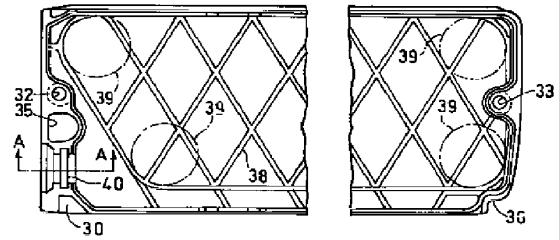
【図16】



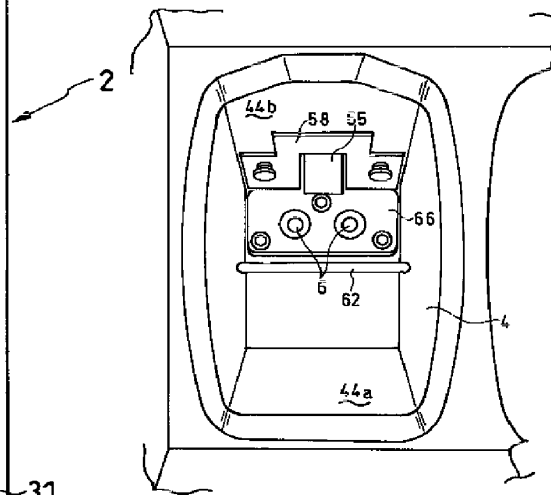
【図7】



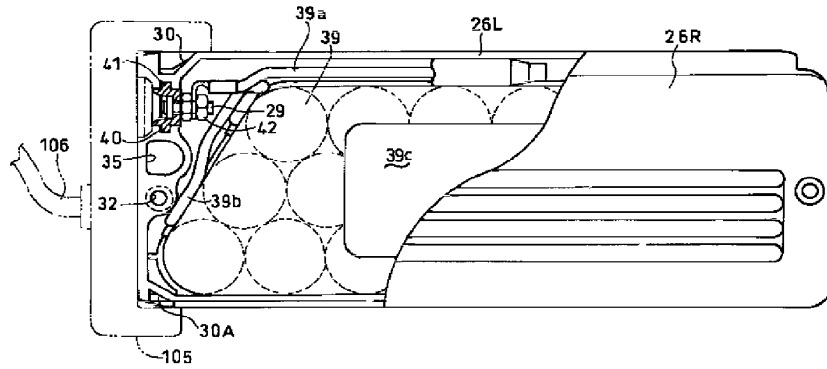
【図9】



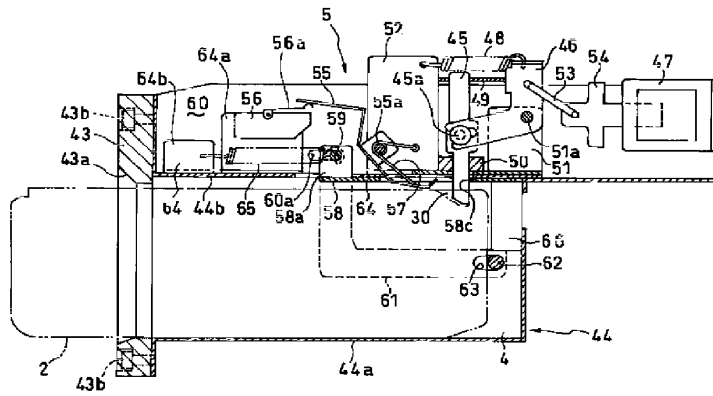
【図15】



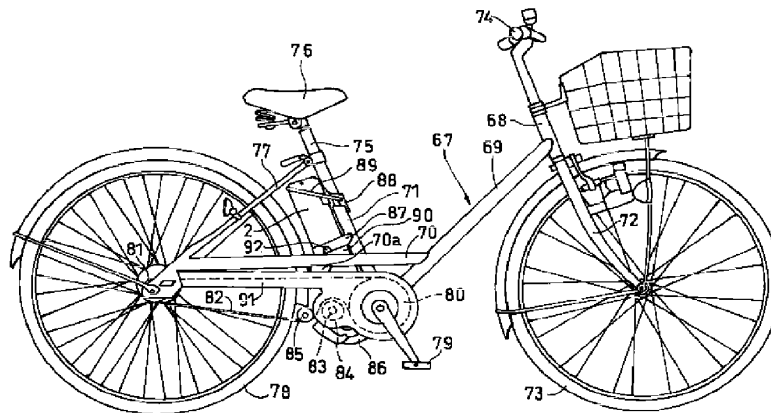
【図12】



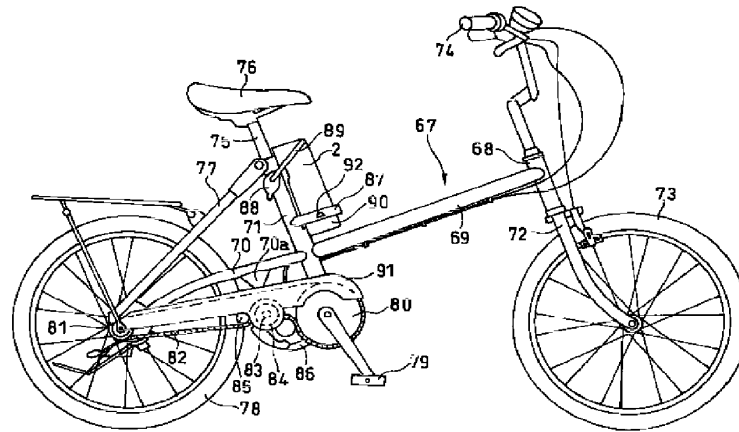
【図13】



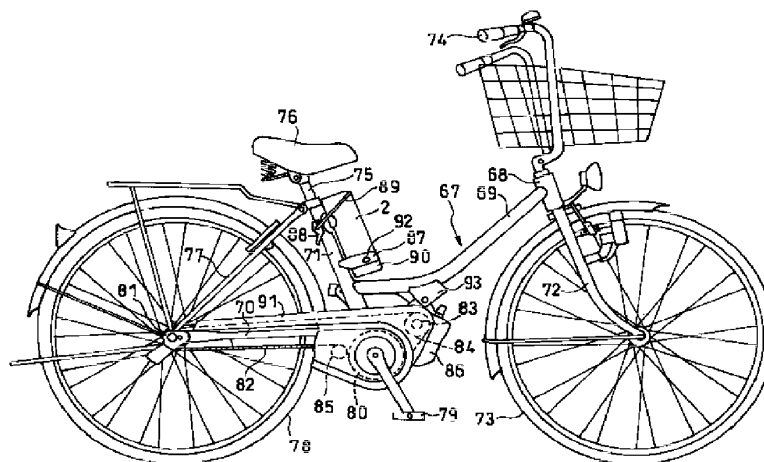
【図17】



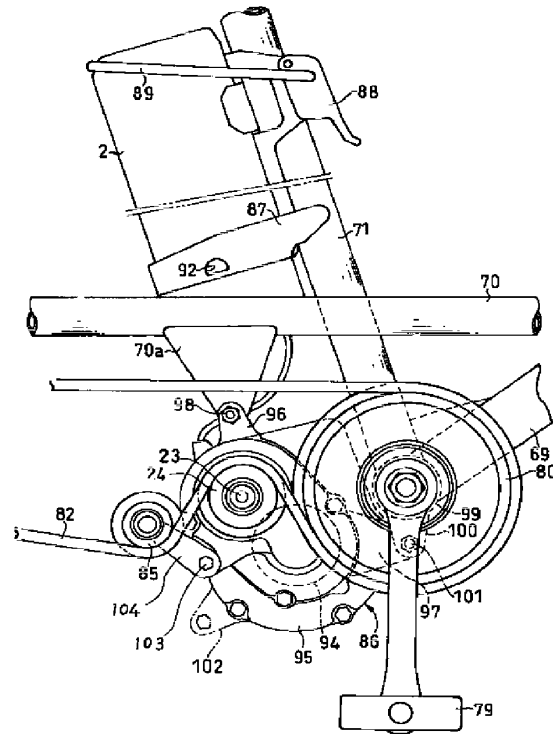
【図18】



【図19】



【圖20】



Thomson Innovation Patent Export, 2013-05-09 18:30:28 -0500

Record 16/25 JP2010191636A BATTERY REPLACEMENT SYSTEM FOR ELECTRIC DEVICE

Publication Number: JP2010191636A

Publication Date: 2010-09-02

Title: BATTERY REPLACEMENT SYSTEM FOR ELECTRIC DEVICE

Application Number: JP200934569A

Application Date: 2009-02-17

Abstract (English):

PROBLEM TO BE SOLVED: To facilitate data processing or charging processing accompanied by battery replacement for an electric device such as a battery-assisted bicycle.

SOLUTION: The battery replacement system 10 of an electric device includes: an IC chip 13a which is mounted on a battery and into which history data are written; a value determination device (controller 19) for, on the basis of the history data of each of a battery removed from an electric device through a data reading device and a battery to be replaced, determining the value index difference of both of them; and a payment/reception processor (controller 19) for performing settlement processing or payment/reception processing accompanied by battery replacement on the basis of the value index difference.

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Abstract - DWPI:

Abstract - DWPI Novelty:

The system (10) has an integrated circuit (IC) chip (13a) attached to a battery (13) for storing the log data of charging possible frequency of battery, number of use dates, usage time limit of battery, residual electric charge of battery, etc. The value index differences are determined based on each log data of the battery which is removed from the electric-power-assisted bicycle (11) and which is replaced, and the payment process and the receipt-and-payment process accompanying battery replacement are carried out based on the value index differences.

Abstract - DWPI Use:

Battery replacement system of electrically-driven apparatus such as mobile phone or music player and vehicles such as hybrid vehicle, motor vehicle, electric-power-assisted bicycle, etc.

Abstract - DWPI Advantage:

The data processing and fee-charging process accompanying battery replacement with respect to the apparatus can be made easily, and the apparatus can be utilized efficiently.



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5G503 AA01 BA02 EA05 FA06 GD04
5H115 PA14 PC06 PG10 PI16 PI29
P008 P011 QN03 TI02 TI07
UF01

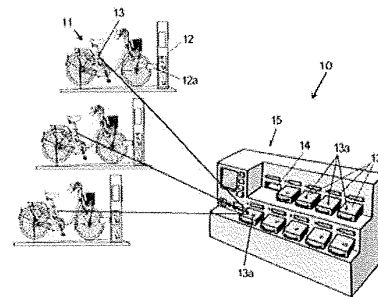
(54) 【発明の名称】 電動装置のバッテリー交換システム

(57) 【要約】

【課題】 電動自転車などの電動装置に対するバッテリー交換に伴うデータ処理や課金処理を容易にする。

【解決手段】 バッテリーに取り付けられ履歴データが書き込まれる IC チップ 13a と、データ読書装置を介して電動装置から取り外されたバッテリーと交換されるバッテリーとのそれぞれの履歴データに基づいて双方の価値指数差を判定する価値判定装置 (制御装置 19) と、前記価値指数差に基づいてバッテリー交換に伴う精算処理や受け払い処理を行なう受払処理装置 (制御装置 19) と、を有するように電動装置のバッテリー交換システム 10 を構成する。

【選択図】 図 1



【特許請求の範囲】**【請求項 1】**

電動装置に着脱可能に搭載されその駆動源となるバッテリーを予め充電されたバッテリーに交換するバッテリーステーションを備えた電動装置のバッテリー交換システムであって、前記バッテリーにそれぞれ取り付けられその充電可能回数、使用年月日数、使用可能期限、残存電気量などの履歴データが書き込まれる I C チップと、前記バッテリーステーションに設けられバッテリーから取得された履歴データを I C チップに読み書きするデータ読書装置と、前記データ読書装置を介して前記電動装置から取り外されたバッテリーと交換されるバッテリーとのそれぞれの履歴データに基づいて双方の価値指数差を判定する価値判定装置と、前記価値指数差に基づいてバッテリー交換に伴う精算処理や受け払い処理を行なう受払処理装置と、を有することを特徴とする電動装置のバッテリー交換システム。

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【請求項 2】

前記電動装置が、電動自転車であって、前記バッテリーステーション又は前記バッテリーには、電動自転車から取り外されたバッテリーの端子部に装着されてその残存電気量などの履歴データを取得するデータ取得装置が設けられていることを特徴とする請求項 1 記載の電動装置のバッテリー交換システム。

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【請求項 3】

前記受払処理装置が、電動装置から取り外されたバッテリー A が装入される使用済電池ボックスと、充電済のバッテリー B が収納される交換用電池ボックスとを備え、前記交換用電池ボックスは、内蔵するバッテリー B の取り出しを禁止するロック機構を有し、前記価値判定装置により判定された各電池ボックスに収納されたバッテリー A と B との価値指数差に対応した手数料などを含む代金の納入によりバッテリー B のロック状態を解除することを特徴とする請求項 1 又は 2 記載の電動装置のバッテリー交換システム。

【発明の詳細な説明】**【技術分野】**

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【0001】

本発明は、電動自転車（電動アシスト二輪車という場合がある）やハイブリッド車、携帯電話などの電動装置に搭載されたバッテリーの交換に際して、そのバッテリー情報に基づいて精算などの受払処理を簡単適切に行なうことのできる電動装置のバッテリー交換システムに関する。

【背景技術】**【0002】**

従来より、電動自転車や電動自動車などの電動式車両は排出ガスの少ないことや、エネルギー資源の多様化への対応性などの面において、ガソリンエンジンなどを搭載した車両に比較して優位にある。このような電動式車両においては、搭載されたバッテリーに対してその充電を迅速に行う必要があり、ガソリンスタンドと同形態の充電スタンドを設置し、該充電スタンドによりバッテリーを充電するようにしたシステムが提案されている。

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【0003】

例えば、特許文献 1 には、充電情報及び電動車両の識別情報を通信回線を介して取得する管理装置を備え、充電スタンドには電動車両に取付けられた識別情報記録担体に記録されている電動車両の識別情報を取得する情報取得手段と、充電用電力を供給する電力供給手段と、前記管理装置と通信回線を介して情報を送受信する通信手段と、を備えた充電スタンド管理システムが記載されている。

【先行技術文献】**【特許文献】**

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【 0 0 0 4 】

【特許文献 1】特開 2 0 0 8 - 6 5 6 3 5 号公報

【発明の概要】

【発明が解決しようとする課題】

【 0 0 0 5 】

しかしながら、従来の充電システムでは、高性能のバッテリーチャージャを備えた充電スタンドであっても、そのバッテリーへの充電に数分間以上を要するため、利用者にとって使い勝手のよいものとはいえず、普及の妨げとなっていた。

また、特許文献 1 に記載の技術は、ユーザの識別情報に基づいて充電の可否を判断すると共に、その充電量に応じた課金をユーザ毎に記録することによって充電処理を容易にするものと考えられる。しかし、この技術は、本来、識別データなどを入出力する通信機能に依存しているものであり、通信機能を持たないバッテリーステーションや電動自転車などにおけるバッテリー交換や充電に際して、その使用可能時間などバッテリー情報の入出力処理に労力がかかるとともに迅速な課金処理が困難であるという問題点があった。

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【 0 0 0 6 】

本発明は、前記従来の問題点を解決するためになされたものであり、電動自転車などの電動装置におけるバッテリー交換に伴うデータ処理や課金処理を容易にして、バッテリーにより駆動される電動自転車やハイブリッド車、携帯電話、音楽プレイヤーなどを含む電動装置の利用、普及に寄与することを目的とする。

【課題を解決するための手段】

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【 0 0 0 7 】

(1) 本発明の電動装置のバッテリー交換システムは、電動装置に着脱可能に搭載されその駆動源となるバッテリーを予め充電されたバッテリーに交換するバッテリーステーションを備えた電動装置のバッテリー交換システムであって、前記バッテリーにそれぞれ取り付けられその充電可能回数、使用年月日数、使用可能期限、残存電気量などの履歴データが書き込まれる I C チップと、前記バッテリーステーションに設けられバッテリーから取得された履歴データを I C チップに読み書きするデータ読書装置と、前記データ読書装置を介して前記電動装置から取り外されたバッテリーと交換されるバッテリーとのそれぞれの履歴データに基づいて双方の価値指数差を判定する価値判定装置と、前記価値指数差に基づいてバッテリー交換に伴う精算処理や受け払い処理を行なう受払処理装置と、を有することを特徴とする。

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【 0 0 0 8 】

(2) 本発明の電動装置のバッテリー交換システムは、前記 (1) の電動装置のバッテリー交換システムにおいて、前記電動装置が電動自転車であって、前記バッテリーステーション又は前記バッテリーには電動自転車から取り外されたバッテリーの端子部に装着されてその残存電気量などの履歴データを取得するデータ取得装置を設けることもできる。

【 0 0 0 9 】

(3) 本発明の電動装置のバッテリー交換システムは、前記 (1) 又は (2) の電動装置のバッテリー交換システムにおいて、前記受払処理装置が、電動装置から取り外されたバッテリー A が装入される使用済電池ボックスと、充電済のバッテリー B が収納される交換用電池ボックスとを備え、前記交換用電池ボックスには内蔵するバッテリー B の取り出しを禁止するロック機構を有し、前記価値判定装置により判定された各電池ボックスに収納されたバッテリー A と B との価値指数差に対応した手数料などを含む代金の納入によりバッテリー B のロック状態を解除するように構成されている。

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【発明の効果】

【 0 0 1 0 】

本発明によれば、電動装置から取り外されたバッテリーと交換されるバッテリーとのそれぞれの I C チップに保持された履歴データに基づいて双方の価値指数差を判定して、この価値指数差に基づいて受け払い処理を行なうので、電動装置に対するバッテリー交換に伴うデータ処理や課金処理を容易にすることができる。こうして、バッテリーにより駆動される電動自転車やハイブリッド車、携帯電話、音楽プレイヤーなどを含む電動装置の利用、普及に

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貢献することができる。

【図面の簡単な説明】

【0011】

【図1】実施例1に係る電動装置のバッテリー交換システムの概略説明図である。

【図2】同交換システムのバッテリーステーションの拡大斜視図である。

【図3】同交換システムにおける制御系のブロック構成図である。

【図4】実施例2に係る電動装置のバッテリー交換システムの概略説明図である。

【発明を実施するための形態】

【0012】

本実施形態に係る電動装置のバッテリー交換システムは、電動自転車やハイブリッド車、携帯電話機などの電動装置に着脱可能に搭載され、消耗したバッテリーを予め充電されたバッテリーに交換するバッテリーステーションを備えた電動装置のバッテリー交換システムであって、バッテリーにそれぞれ取り付けられその充電可能回数、使用年月日数、使用可能期限、残存電気量などの履歴データが書き込まれるＩＣチップと、バッテリーステーションに設けられバッテリーから取得された履歴データをＩＣチップに読み書きするデータ読書装置と、データ読書装置を介して電動装置から取り外されたバッテリーと交換されるバッテリーとのそれぞれの履歴データに基づいて双方の価値指数差を判定する価値判定装置と、価値指数差に基づいてバッテリー交換に伴う精算処理や受け払い処理を行なう受払処理装置と、を有する。

これによって、電動自転車などの電動装置に対するバッテリー交換に伴う交換される双方のバッテリー価値指数に応じたデータ処理や課金処理を容易にすることができる。

【0013】

電動装置は、電力を補助動力源または主動力源として駆動する自転車や自動車、携帯電話などであって、着脱して交換可能なバッテリーユニットなどを備えている。電動自転車の場合においては、ペダル、前後輪、チェーン等の一般的な自転車の構成に加え、使用者がペダルを踏み込むときの踏力を測定するトルクセンサや、補助駆動力を発生させるモータ、モータ出力を制御する制御部、モータ等に電力を供給する二次電池となるバッテリー等を備えている。

このような電動自転車では、使用者の踏力をトルクセンサで検出し、この踏力に応じた補助駆動力をモータで発生させるようにモータの制御が行なわれている。

【0014】

充電により繰り返し使用が可能なバッテリーは、バッテリーユニットなどを介して電動自転車などの電動装置のバッテリー装着部に着脱可能に搭載される。バッテリーからモータに供給される電力とモータから出力される動力とは、モータの最大定格値の範囲内で実質的に比例し、バッテリーの充電により一定のバッテリー電圧が維持される。そして、そのバッテリーの充電可能回数、使用年月日数、使用可能期限、残存電気量、バッテリーの履歴、廃棄処分料金、これらの一部あるいは複数を、数値化したデータが、バッテリー毎に付設されたＩＣチップやＩＣタグなどの電子メモリに記録され、このデータに基づいてバッテリーが管理されるようになっている。

【0015】

ＩＣチップは、近距離の無線通信によって情報をやりとりする電子メモリの機能を有した小型デバイスであり、データ読書装置となるＩＣタグリーダから発射される電波によって微量な電力が回路内に発生し、その電力で情報を処理し、リーダに送信する。

ＩＣチップ（ＩＣタグ）には複数の電子素子が乗った回路基板で構成されたものや、ワンチップＩＣ（集積回路）タイプのものがある。

なお、電池パックなどに実装して使用する電池残量をリアルタイムに計測可能とする電池残量管理ＩＣをこのようなＩＣチップに付設することもできる。このような電池残量管理ＩＣには、バッテリーの内部インピーダンスを算出するためのアルゴリズムが実現されており、電池の劣化や温度、充放電のパターンなどによって変動する内部インピーダンスをその電池電圧を基にしてリアルタイムに計測して記憶することが可能である。

【0016】

データ読書装置はバッテリステーションに設けられてＩＣタグリーダとしての機能を備え、ＩＣチップに記憶されたバッテリーの充電可能回数、使用年月日数、使用可能期限、残存電気量などのデータを読み書きするための装置である。なおＩＣチップには、バッテリー交換や充電に伴って発生する充電料金、廃棄処分料金、手数料などのデータも保持されており、これらの管理用データの処理もデータ読書装置を介して行なうことができる。データ読書装置は、ＲＦＩＤタグなどの電子メモリに記憶されたバッテリーの個別情報を、無線通信によってデータ呼び出し、登録、削除、更新などの読み書きを行なうための自動認識システムの構成要素である。ＩＣチップにデータ読書装置の読み取り部をかざすことによって、バッテリー情報（製造年月、検査データなど）がその液晶パネルなどの表示機器に表示され、さらに新しい情報を書き込むことで、バッテリーの流通情報などを一元管理することもできるようになっている。

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【0017】

価値判定装置は、バッテリー価値指数の判定プログラムがロードされたパソコンなどのコンピュータにその機能が担われた装置であって、データ読書装置とともにバッテリステーションに設けられる。この価値判定装置は、データ読書装置を介して電動装置から取り外されたバッテリーと交換されるバッテリーとのそれぞれの履歴データに基づいて双方の価値指数差を判定する機能を有している。

【0018】

受払処理装置は、前記価値判定装置により取得された価値指数差に基づいてバッテリー交換に伴う精算処理や受け払い処理を行なうための装置である。このような受払処理装置は例えば、電動装置から取り外されたバッテリーや充電済のバッテリーを収納するためのバッテリー収納部、バッテリー価値指数を表示するための価値指数表示部、バッテリー交換に伴う代金を収納精算するための代金挿入口などを備えた精算部、などの他に、前記価値判定装置を含めて各部を制御するためのコンピュータ制御部を備えて構成されている。

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【0019】

また、本実施形態の電動装置のバッテリー交換システムは、前記電動装置が電動自転車であって、前記バッテリステーション又は前記バッテリーには電動自転車から取り外されたバッテリーの端子部に装着されてその残存電気量などの履歴データを取得するデータ取得装置を設けることもできる。これによって、電池劣化状態や温度、充放電のパターンなどによって変動するバッテリーの内部インピーダンスなどのデータをリアルタイムに計測記憶して、バッテリー管理を直接的かつ効率的に行なうことができる。

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【0020】

データ取得装置は前記バッテリステーションに配置されたセンサ類などであり、電動装置から取り外されたバッテリーや交換されるバッテリーの端子部や、キーボードなどの外部入力装置に接続される。これによって、バッテリーの残存電気量などの履歴データが、受払処理装置のコンピュータ制御部に送信されて、バッテリー交換に伴う精算処理を効率的に行なうことを可能にしている。

【0021】

本実施形態の電動装置のバッテリー交換システムは、前記受払処理装置が電動装置から取り外されたバッテリーＡが装入される使用済電池ボックスと、充電済のバッテリーＢが収納される交換用電池ボックスとを備え、前記交換用電池ボックスには内蔵するバッテリーＢの取り出しを禁止するロック機構を有し、前記価値判定装置により判定された各電池ボックスに収納されたバッテリーＡ、Ｂとの価値指数差に対応した手数料などを含む代金の納入によりバッテリーＢのロック状態を解除することができる。これによって、バッテリー交換に伴う費用や、これらの一部あるいは複数を数値化し、バッテリーに電子メモリとして記録を持たせた交換しようとするバッテリーの数値を読み取り、そのバッテリーの数値差を対価として表し、その対価を支払い、あるいは受領することで、バッテリーの対価を精算させ、バッテリー交換の要求を満たすことができる。

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【0022】

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使用済電池ボックス及び交換用電池ボックスには、挿入されたバッテリーのＩＣチップからその情報を読み取るためのデータ読書装置や、バッテリーに接続されてその残存電気量、充電料金、廃棄処分料金、手数料などのデータを取得するためのデータ取得装置、バッテリー充電装置、バッテリーのロック機構が配置される。なお、使用済電池ボックス及び交換用電池ボックスはそれぞれの機能を共用した同一構成のものとして、複数のものをバッテリーステーションに配置することもできる。

【００２３】

（実施例１）

以下、本発明の電動装置のバッテリー交換システムの実施例について図面を参照して説明する。図１は実施例１に係る電動装置のバッテリー交換システムの概略説明図であり、図２は実施例１のバッテリー交換システムにおけるバッテリーステーションの拡大斜視図である。

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実施例１の電動装置のバッテリー交換システム１０は、図示するように複数の電動自転車１１が係止される係止ポイント１２と、電動自転車１１に着脱可能に搭載され消耗したバッテリー１３を予め充電されたバッテリーに交換するための複数のバッテリー収納部１４などを備えたバッテリーステーション１５により構成されている。なお、バッテリーが着脱されるバッテリー収納部１４は、適用される電動自転車の車種やメーカーなどに応じて複数種類のものが配置されており、利用者が適宜選択して利用できるようになっている。

【００２４】

係止ポイント１２は、電動自転車１１や通常の自転車に応じて複数のものが配置されており、自転車を必要に応じて施錠して係止するための施錠機構１２ａや、バッテリー１３の使用状態を判定するデータ取得装置などが設けられている。こうして使用者は、この電動自転車１１に搭載されたバッテリー１３の電源状態などに応じて、消耗したバッテリー１３の電動自転車１１から取り外して、係止ポイント１２に隣接したバッテリーステーション１５のバッテリー収納部１４のバッテリー差し込み口に挿入する。

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バッテリー１３には電子メモリとなるＩＣチップ１３ａが取り付けられており、そのバッテリー１３の充電可能回数、使用年月日数、使用可能期限、残存電気量などの履歴データが書き込まれており、ＩＣタグリーダなどを介して必要に応じてこれらのデータを参照できるようになっている。

【００２５】

バッテリーステーション１５は、図２に示すように、電動自転車１１から取り外されたバッテリーや充電済みのバッテリーが挿入されて複数配列されるバッテリー収納部１４を備えるとともに、バッテリー交換処理における操作方法や代金などを表示するための液晶パネルなどのディスプレイ装置１５ａや、ブザー１５ｂ、精算ボタン１５ｃ、キャンセルボタン１５ｄ、領収書発行口１５ｅ、返金口１５ｆ、コインなどの貨幣投入口１５ｇ、充電完了ランプ１５ｈ、金額表示パネル１５ｉなどが配置されている。

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さらに、制御系のブロック構成図（図３）に示すように、台形スタンド状に形成されたバッテリーステーション１５のバッテリー収納部１４には、ディスプレイ装置１５ａや充電完了ランプ１５ｈなどの入出力装置１６に加えて、バッテリー１３に取り付けられたＩＣチップ１３ａを介して、その充電可能回数、使用年月日数、使用可能期限、残存電気量などの履歴データを取得するためのＩＣタグリーダライタなどのデータ読書装置１７と、バッテリー収納部１４にセットされたバッテリー１３を充電するためのバッテリー充電装置１８と、バッテリーステーション１５におけるバッテリー充電や交換処理などを制御するための制御装置１９とを備えている。

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なお、コンピュータやシーケンサなどからなる制御装置１９は、電動自転車１１から取り外されたバッテリーと交換されるバッテリーとからデータ取得装置などを介して取得されたそれぞれの履歴データに基づいて双方の価値指数差を判定する価値判定装置と、価値指数差に基づいてバッテリー交換に伴う精算処理やバッテリーの受け払い処理を行なうための受払処理装置としての機能を有している。

【００２６】

バッテリーの受払処理においては、電動自転車１１から取り外されたバッテリーＡをバッテ

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り収納部 14 に挿入することによって、バッテリー A と交換対象となる充電済のバッテリー B の価値指数、充電料、手数料の差額を受領あるいは支払することによりバッテリー B を受け取ることができる。

このような新品バッテリーの価値指数を 100% として設定して、これから例えば減価償却した残りの価値を以下のような項目別に価値指数として数値化する。

- (1) バッテリー充電可能回数 (最初を 100 として、残り回数を%表示)
- (2) 使用年月日数 (最初を 100 として、残り日数を%表示)
- (3) 残存電気量 (完全充電を 100 として、残りを%表示)
- (4) バッテリー履歴: バッテリーの経時劣化があるため、製造年月日から賞味期限までの期間を 100% として、残り日数を%表示)
- (5) 充電料金: バッテリー B の充電に要する料金
- (6) バッテリーの廃棄処分料金: 予め新品バッテリーの段階で廃棄処分費用または買取金を盛り込んだもの。

【0027】

こうして、バッテリー A がバッテリー充電装置 18 に接続されると、データ取得装置を介してそのバッテリーの IC チップ 13a に記録された情報データが制御装置 19 に読み込まれ、精算処理がなされる。バッテリーステーション 15 では、大型のカセットテープ差込口と同じような形状の空いている差込口にバッテリー A を入れることで、バッテリー A の充電前の価値指数がディスプレイ装置 15a に表示される。そして利用者は他の差込口に差し込まれているバッテリー Bの中からその表示されている価値指数を参照して好みのものを選択する。こうして、バッテリー B が収納されているバッテリー収納部 14 の金額表示パネル 15i には充電後の料金表示がされ、精算ボタン 15c の操作によってバッテリー A と B との交換に伴う精算処理が実行される。最後にバッテリーステーション 15 の前面に設けられたロックボタン 15j を操作することによりバッテリー B をそのバッテリー収納部 14 から取り外すことができる。

【0028】

以上説明したように、実施例 1 の電動装置のバッテリー交換システム 10 は、バッテリーを充電したい場合、その使用者は充電時間を待つことなく、既充電のバッテリーと交換することでバッテリーを充電することができる。

さらに、バッテリーの充電可能回数、使用年月日数、使用可能期限、残存電気量、バッテリーの履歴、充電料金、バッテリーの廃棄処分料金、などこれらの一部あるいは複数をバッテリー価値指数として、価値判定装置として機能する制御装置により数値化することができる。こうして、バッテリーに電子メモリとして記録を持たせた交換しようとする互いのバッテリーの価値指数を読み取り、お互いのバッテリーの価値指数差を対価として表し、その対価を支払い、あるいは受領することで、かかるバッテリーの対価を精算させ、バッテリー充電の要求を満たすことを可能にするものである。

したがって、電動自転車などの電動装置に対するバッテリー交換に伴うデータ処理や課金処理を容易にして、バッテリーにより駆動される電動自転車やハイブリッド車、携帯電話、音楽プレイヤーなどを含む電動装置におけるバッテリーの使い回しを有効化するとともにその利用、普及に資することができる。

【0029】

(実施例 2)

図 4 は、実施例 2 に係る電動装置のバッテリー交換システムの概略説明図である。

実施例 2 の電動装置のバッテリー交換システム 20 は、電動アシスト自転車 21 などがフック係止機構 22 などを介して係止される自転車係止スタンド 23 と、電動アシスト自転車 21 から取り外されたバッテリー 24 を収納するための使用済電池ボックス 25 と、予め充電されたバッテリー 26 を保持する交換用電池ボックス 27 とを備えている。

そして、交換用電池ボックス 27 には、内蔵されたバッテリーの取り出しを禁止する開閉扉などのロック機構を有するとともに、各ボックスに内蔵されたそれぞれのバッテリー 24、26 に付設された IC チップ 28 からデータ取得装置 29 を介してそれぞれの情報デー

タが読み出される。こうして、各電池ボックス 25、27 に収納されたバッテリー 24、26 の価値指数差に対応した手数料などを含む所定の代金が表示部 30 に表示されて、貨幣投入口 31 に貨幣が投入されると、自転車係止スタンド 23 の図示しない実施例 1 と同様の制御装置 32 によりこの料金が判定されて、充電済みとなっているバッテリー 26 のロック状態が解除され、これによって交換対象となるバッテリー 26 の取り出しが可能となるようになっている。

【0030】

なお、バッテリーの充電処理は、自転車係止スタンド 23 に内蔵された図示しない充電器もしくはこれとは別体に設けられた充電スタンドにおいてなされる。また、利用者により充電済みバッテリーがその電池ボックスから取り出されると、使用済電池ボックス 25 と交換用電池ボックス 27 の機能が逆転して他方の使用済みバッテリーの充電操作が開始されるようにしてもよい。これによって、使用済みバッテリーの充電に伴う負荷を軽減して、電動装置のバッテリー交換システムの効率的な運営が可能になる。

10

【0031】

以上説明したように、本発明の電動装置のバッテリー交換システムは、バッテリーの履歴データを IC チップに記録してこのデータに基づいてバッテリー交換に伴う精算処理や受け払い処理を効率的に行なうようにしたことを要旨とするものであり、これに該当するものは本発明の権利範囲に属する。例えば、本発明のバッテリー交換システムは、電動自転車のみならずハイブリッド自動車、携帯電話機、音楽プレイヤーなどを含む電動装置に対して広く適用することが可能である。

20

【符号の説明】

【0032】

- 10 実施例 1 の電動装置のバッテリー交換システム
- 11 電動自転車
- 12 係止ポイント
- 12 a 施錠機構
- 13 バッテリー
- 13 a IC チップ
- 14 バッテリー収納部
- 15 バッテリステーション
- 15 a ディスプレー装置
- 15 b ブザー
- 15 c 精算ボタン
- 15 d キャンセルボタン
- 15 e 領収書発行口
- 15 f 返金口
- 15 g 貨幣投入口
- 15 h 充電完了ランプ
- 15 i 金額表示パネル
- 15 j ロックボタン
- 16 入出力装置
- 17 データ読書装置
- 18 バッテリー充電装置
- 19 制御装置
- 20 実施例 2 の電動装置のバッテリー交換システム
- 21 電動アシスト自転車
- 22 フック係止機構
- 23 自転車係止スタンド
- 24 バッテリー
- 25 使用済電池ボックス

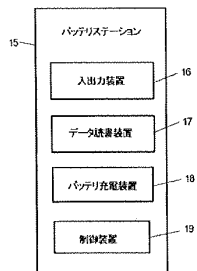
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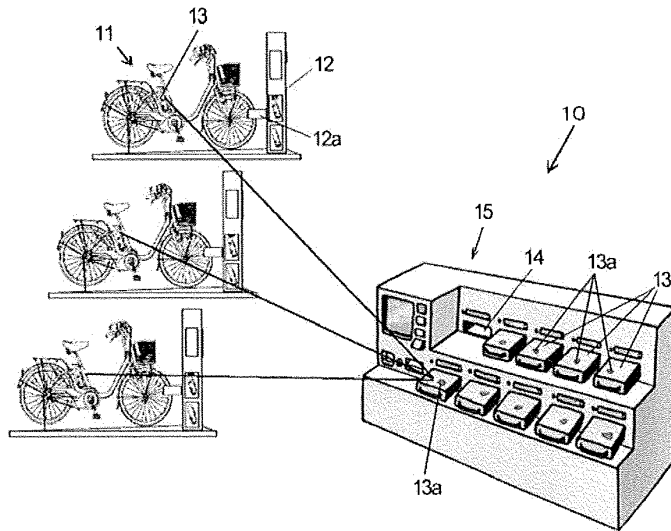
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- 2 6 バッテリ
- 2 7 交換用電池ボックス
- 2 8 I C チップ
- 2 9 データ取得装置
- 3 0 表示部
- 3 1 貨幣投入口
- 3 2 制御装置

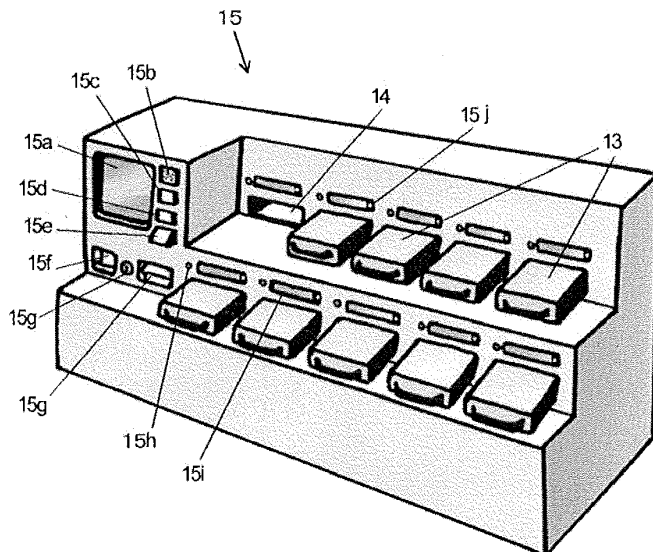
【図 3】



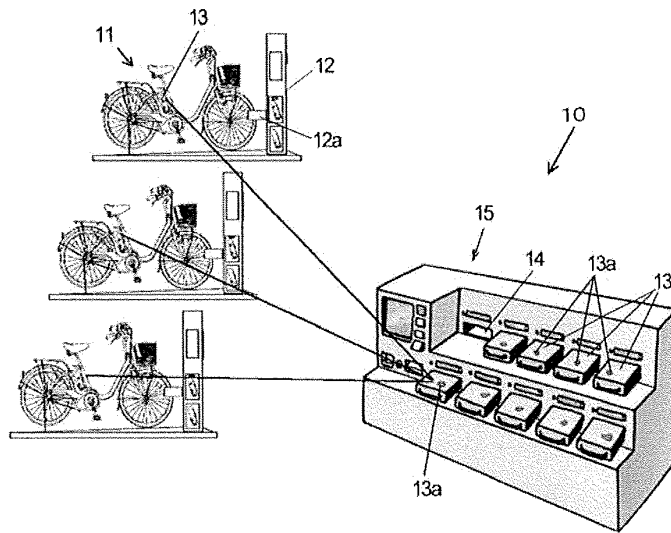
【図 1】



【図 2】



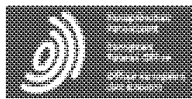
【図 4】



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Bibliographic data: JP2010200405 (A) — 2010-09-09

HOUSE WITH CHARGER

Inventor(s): SUGIYAMA KANAKO; SOGA SHINJI; NARITA KAZUHIRO +
(SUGIYAMA KANAKO, ; SOGA SHINJI, ; NARITA KAZUHIRO)

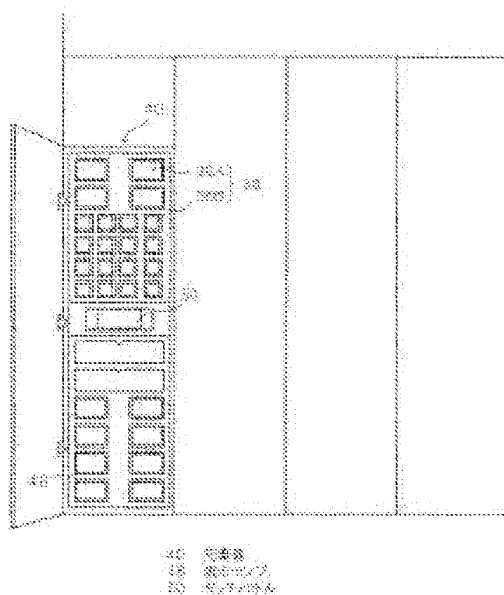
Applicant(s): TOYOTA MOTOR CORP ± (TOYOTA MOTOR CORP)

Classification: - international: *H01M10/44; H02J7/02*
- cooperative: *Y02E60/12*

Application number: JP20090039484 20090223

Priority number (s): JP20090039484 20090223

Abstract of JP2010200405 (A)



PROBLEM TO BE SOLVED: To charge and use a storage battery according to its purpose. ; SOLUTION: A house includes a plurality of storage battery receptacles 38 for housing plural kinds of storage batteries which are different in size, capacity, and application, etc. The storage battery receptacles 38 differ in size, according to the dimensions of storage batteries for charge. Moreover, each storage battery receptacle 38 includes an indicator lamp which selectively indicates a storage battery according to its purpose and application, and also includes a touch panel 50 for performing the display of various input screens or the input to the input screen. Then, when using a storage battery 26 for automobiles, for example, its operating time and its destination are input, using the touch panel 50, whereby electric energy according to the operating time or the destination is computed, and a storage battery, which is charged with electricity more than or equal to the computed electric energy, is selectively indicated by lighting an indicator lamp 48. ; COPYRIGHT: (C)2010,JPO&INPIT

Last updated: 19.12.2012 Worldwide Database 5.8.4; 92p

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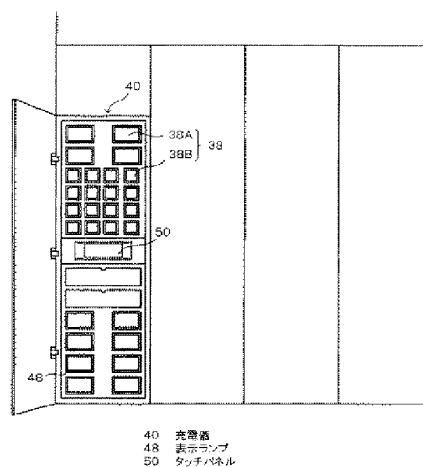
(54) 【発明の名称】 充電器付建物

(57) 【要約】

【課題】 目的に応じた蓄電池を充電して使用することができるようにすることを目的とする。

【解決手段】 サイズや容量、用途等がそれぞれ異なる複数種類の蓄電池を収納するための蓄電池収納部38を複数設ける。蓄電池収納部38は、サイズに応じてそれぞれ異なる大きさとして、各蓄電池を収納して充電する。また、目的や用途に応じた蓄電池を選択表示する表示ランプを各蓄電池収納部38に設けると共に、各種入力画面の表示や、該入力画面に対する入力を行うためのタッチパネル50を設ける。そして、例えば、自動車用蓄電池26を使用する場合に、タッチパネル50を操作して、使用時間や目的地を入力することにより、使用時間や目的地に応じた電力量を算出して、算出した電力量以上充電されている蓄電池を表示ランプ48を点灯することにより選択表示する。

【選択図】 図2



【特許請求の範囲】

【請求項1】

サイズ、用途、及び容量がそれぞれ異なる複数種類の蓄電池を収納する蓄電池収納部と、
前記蓄電池収納部に収納された前記蓄電池を充電する充電手段と、
を有する充電器を備えた充電器付建物。

【請求項2】

前記充電器は、前記蓄電池収納部に収納された各蓄電池の充電状態を検出する充電状態検出手段と、前記充電状態検出手段の検出結果を表示する表示手段と、を更に有し、前記充電器を建物の壁面または床下収納に設けた請求項1に記載の充電器付建物。

【請求項3】

前記充電手段は、商用電力及び自然エネルギーを用いて前記蓄電池を充電する請求項1又は請求項2に記載の充電器付建物。

【請求項4】

前記充電手段は、夜間は深夜電力を電源とし、昼間は自然エネルギーを電源として、前記蓄電池を充電する請求項3に記載の充電器付建物。

【請求項5】

前記充電器は、前記蓄電池の使用条件を入力するための入力手段と、前記入力手段によって入力された前記使用条件に対応する充電量の蓄電池を選択する選択手段と、前記選択手段の選択結果を表示する選択結果表示手段と、を更に有する請求項1～4の何れか1項に記載の充電器付建物。

【請求項6】

前記選択手段は、最適容量の蓄電池の充電量が不十分な場合に、最適容量の蓄電池より容量が多い使用条件を満たす充電量の蓄電池を選択する請求項5に記載の充電器付建物。

【請求項7】

前記選択手段は、前記入力手段によって使用目的及び使用時間を前記使用条件として入力することによって、前記使用条件に合う前記蓄電池を選択する請求項5又は請求項6に記載の充電器付建物。

【請求項8】

前記蓄電池収納部に収納された前記蓄電池は、持ち出し可能とされ、使用しない場合には、建物で使用する機器の電力として使用する請求項1～7の何れか1項に記載の充電器付建物。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、充電器付建物にかかり、特に、携帯機器用蓄電池、家電機器用蓄電池、自動車用蓄電池等の各種蓄電池を充電可能な充電器付建物に関する。

【背景技術】

【0002】

近年、蓄電池は充電すれば何度でも使用可能であるため、携帯機器、家電機器、自動車などの様々な装置で使用されるようになっており、様々な蓄電池を充電するための充電器が必要とされている。

【0003】

蓄電池を充電するための充電器の技術としては、例えば、特許文献1に記載の技術が提案されている。特許文献1に記載の技術では、複数種類の携帯電話及び複数種類の2次電池に対応した複数の充電ブロックから装置利用者自身の保持する携帯電話にあった充電ブロックを見つけ、その充電ブロックに携帯電話を取り付け、硬貨投入口から適当な金額の硬貨を投入し、選択ボタンから所望の充電時間を指示し、キーによって充電ブロックの扉を施錠すると、受け入れられた硬貨の金額を計算し、その計算された金額と指示された充電時間とに従って、充電ブロックに備えられた急速充電器を制御し、その充電ブロックの

充電ホルダに取り付けられた携帯電話の2次電池の充電を行うことが提案されている。

【図面の簡単な説明】

【0015】

【図1】本発明の実施の形態に係わる充電器付建物の概略構成を示す図である。

【図2】本発明の実施の形態に係わる充電器付建物の玄関に設置された充電器の概略を示す図である。

【図3】本発明の実施の形態に係わる充電器付建物の制御系の構成を示すブロック図である。

【図4】本発明の実施の形態に係わる充電器付建物の充電器で行われる処理の流れの一例を示すフローチャートである。

【図5】目的毎の蓄電池選択処理の流れの一例を示すフローチャートである。

【図6】蓄電池充電処理の流れの一例を示すフローチャートである。

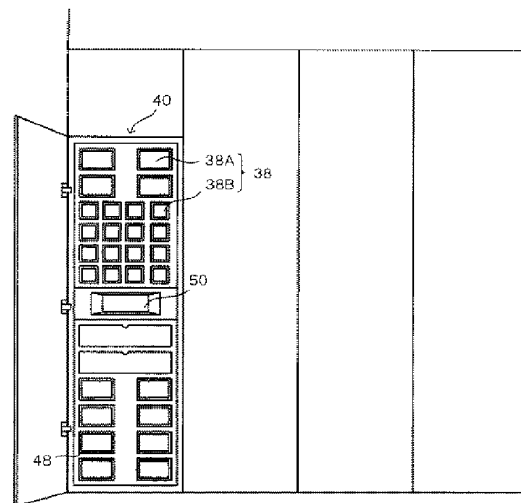
【符号の説明】

【0065】

- | | |
|-----|---------|
| 1 0 | 充電器付建物 |
| 3 8 | 蓄電池収納部 |
| 4 0 | 充電器 |
| 4 2 | 充電器制御部 |
| 4 4 | 供給電力制御部 |
| 4 6 | 蓄電池接続部 |
| 4 8 | 表示ランプ |
| 5 0 | タッチパネル |

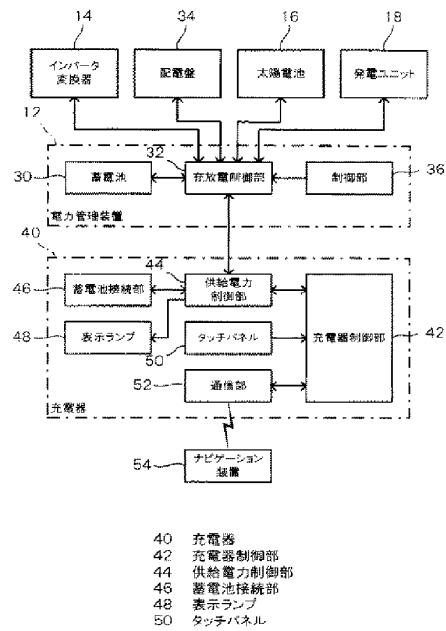
- | | |
|----|--------|
| 10 | 建物 |
| 12 | 電力管理装置 |
| 40 | 充電器 |

【図2】

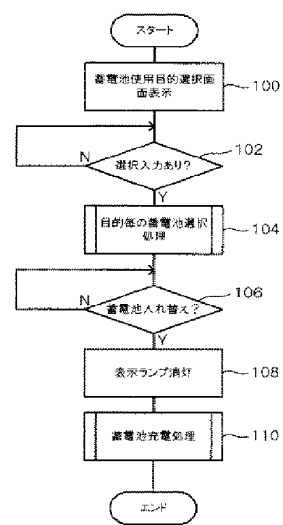


- 40 充電器
- 48 表示ランプ
- 50 タッチパネル

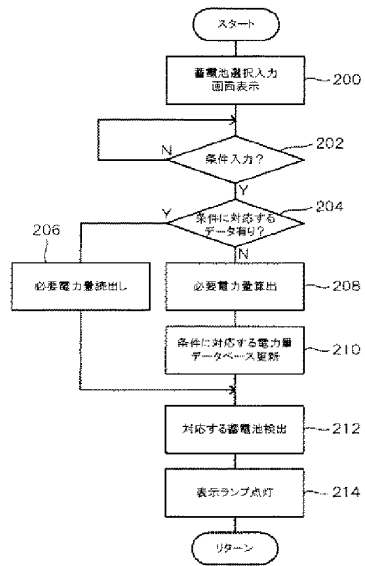
【図3】



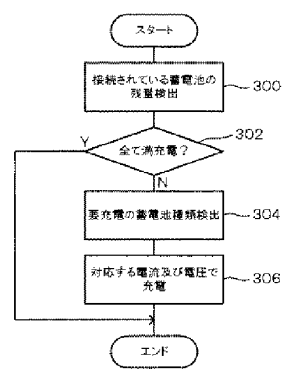
【図4】



【図5】



【図6】



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(71)Applicant : **NISSAN MOTOR CO LTD**

(22)Date of filing : **18.12.2009**

(72)Inventor : **TAKAGI HIDEO**
MATSUMOTO SHIGERU

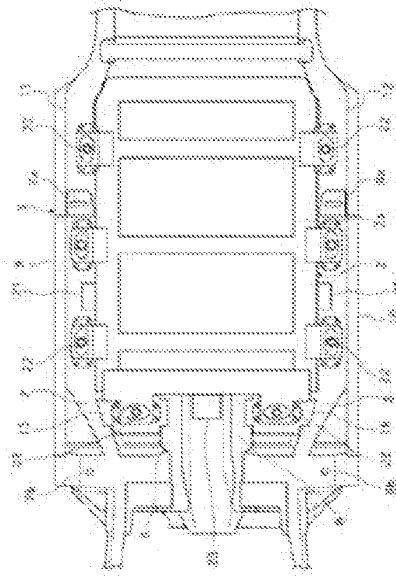
(54) STRUCTURE FOR MOUNTING BATTERY FOR ELECTRIC VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To stabilize a supporting posture of a battery by improving an accuracy of a face for mounting a battery to a vehicle body floor and facilitating automation of mounting a battery.

SOLUTION: Six locking mechanisms 22 for mounting a battery 2 to a vehicle body floor 5 are installed in front of a side member coupling part 7a between a left front side member 7 and a left rear side member 11 and a side member coupling part 8a between a right front side member 8 and a right rear side member 12, and two locking mechanism 22 are installed after the coupling parts. Among the six front locking mechanisms 22, two mechanisms each, four mechanisms in total are arranged on both side of a vehicle width direction in front of the battery 2, and the two mechanisms are arranged at a front end of the battery 2. The two rear locking mechanisms 22 are arranged on both sides of a vehicle width direction on a rear side of the battery 2.

Accordingly, the battery 2 has a mounting strength sharing proportion to the front portion of the vehicle body floor 5 of high strength higher than that to the rear portion of the vehicle body floor 5 of low strength.



CLAIMS

[Claim(s)]

[Claim 1]

Cross direction both sides are equipped with a right-and-left front side member and a right-and-left rear side member, Below a body floor used as a skeleton member, a right-and-left side member which combines a vehicles forward/rearward direction front of solvent of a right-and-left rear side member with the vehicles forward/rearward direction back end of a right-and-left front side member, respectively, In an electric motor furnished with a battery which extends in vehicles forward/rearward direction ranging over the aforementioned right-and-left front side member and a right-and-left rear side member,

An order side-member bond part between the aforementioned right-and-left front side member and a right-and-left rear side member is inserted, Fitting structure of a battery for electric motors making body floor attachment mark of a battery in a vehicles forward/rearward direction front side more rather than a this order side-member bond part than body floor attachment mark of a battery [in / from a side-member bond part before and after the above / a vehicles forward/rearward direction rear side].

[Claim 2]

In fitting structure of a battery for electric motors described in Claim 1,

Fitting structure of a battery for electric motors attaching a battery to a corresponding near front side member and a rear side member in a point in cross direction both sides of the aforementioned battery attaching [body floor].

[Claim 3]

In fitting structure of a battery for electric motors described in Claim 1 or 2,

Fitting structure of a battery for electric motors having arranged at least one attaching point to a vehicles forward/rearward direction front of solvent of a battery rather than a side-member bond part before and after the above among points of a battery in a vehicles forward/rearward direction front side attaching [body floor].

[Claim 4]

Between the aforementioned right-and-left front side members, it has a tunnel component which extends to vehicles forward/rearward direction in the middle of the cross direction, In fitting structure of a battery for electric motors which a tunnel component also uses as a body floor skeleton member by combining a tunnel component with a right-and-left front side member via this tunnel component and a right-and-left bridge component which extends between right-and-left front side members, respectively and which was described in Claim 3,

Said at least one attaching point arranged to a vehicles forward/rearward direction front of solvent of a battery is made into two attaching points,

Fitting structure of a battery for electric motors attaching a battery to the corresponding near aforementioned right-and-left bridge component in these two attaching points.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Field of the Invention]

[0001]

In the electric motor in which the present invention carried the electric motor like an electric vehicle or a hybrid vehicle,

It is related with the fitting structure for attaching the battery for electric motors to a body floor.

[Background of the Invention]

[0002]

If it is in an electric motor like an electric vehicle or a hybrid vehicle, a large-sized battery (what connected mutually and carried out unitization of many batteries) is required for electric motors at large scale.

[0003]

this battery is attachment and detachment to a vehicle body being not only large-sized but heavily (in for example, the case of an electric vehicle about 400 kg) -- when attaching free or permanently, the device which avoids that the center of gravity of a vehicle body becomes high, and becomes unstable, and the device which maintains the weight-of-vehicle balance of the cross direction are required.

Therefore, in attaching a large-sized and heavy battery to a vehicle body, it is common to allot and attach so that this battery may be arranged below a body floor and the center of the cross direction of a battery may be placed in the middle of the cross direction of a vehicle body substantially.

[0004]

** -- from [that it cannot permit also beginning to see the dimension (width of a battery) in the cross direction of a battery from the ability of thickness (vehicles vertical direction dimension) of a battery not to be carried out largely if a battery exceeds breadth of a car when attaching a battery below a body floor like]

If it is going to realize large scale-ization of a battery so that the demand of an electric motor may be satisfied, it is unavoidable that the dimension (the length of a battery) in the vehicles forward/rearward direction of a battery becomes largely.

[0005]

** -- a thing like the description to the former, for example, a Patent document 1, as technology which arranges the battery which became huge like for large-scale-izing below a body floor, and attaches it is proposed.

This proposal technology is constituted so that a battery may be attached to a body floor in the many part in cross direction both sides.

[Citation list]

[Patent literature]

[0006]

[Patent document 1] JP,H08-150841,A (Fig.6)

[Summary of Invention]

[Problem to be solved by the invention]

[0007]

However, since the above-mentioned conventional proposal technology is what carries out division-into-equal-parts arrangement of the many point of a battery attaching [body floor] in the cross direction both sides of a battery, respectively, it produces the following problems.

[0008]

That is, a body floor is although cross direction both sides are equipped with a right-and-left front side member and a right-and-left rear side member and the right-and-left side member which combines the vehicles forward/rearward direction front of solvent of a right-and-left rear side member with the vehicles forward/rearward direction back end of a right-and-left front side member, respectively is used as a main body floor skeleton member,

The left-hand side order side-member bond part between the left front side member and a left rear side member and the right-hand side order side-member bond part between the right front side member and a right rear side member are inserted, In view of crew member protection, from an order side-member bond part, the strength of a front body floor front side portion consists of these right-and-left order side-member bond parts so that it may become largely rather than the strength of a back body floor rear side portion.

It is for avoiding that the Reason for not carrying out strength of a body floor rear side portion largely incidentally gains a body floor rear side portion in a body weight by carrying out largely more than needed.

[0009]

As described above, when the battery which became huge for large-scale-izing is arranged below a body floor and attached, a battery will extend in vehicles forward/rearward direction ranging over the both sides of a high strength body floor front side portion and a low strength body floor rear side portion.

By the way, it is if division-into-equal-parts arrangement of the point of a battery attaching [body floor] is carried out in the cross direction both sides of a battery, respectively like the above-mentioned proposal technology,

It is in charge of arrangement of the point concerned attaching [body floor], and the consideration about the intensity difference between a body floor front side portion and a body floor rear side portion is not made.

[0010]

Therefore, the fixing strength share rate of the battery to a low strength body floor rear side portion may become largely rather than the fixing strength share rate of the battery to a high strength body floor front side portion.

In this case, from a low strength body floor rear side portion being weak to the deformation in a vehicles vertical direction, It becomes difficult to secure the clamp face accuracy of the battery to a body floor, and evils, like it not only becomes hindrance when automating attachment of a

battery, but deformation load is added to a battery or the supporting position of a battery becomes unstable also reach.

[0011]

The present invention is making suitable the fixing strength share rate of the battery to a body floor front side portion and a body floor rear side portion, It aims at providing the fitting structure of the battery for electric motors which makes clamp face accuracy of a battery easy to secure, and enabled it to eliminate the above-mentioned problem by this.

[Means for solving problem]

[0012]

The fitting structure of the battery for electric motors by the present invention constitutes this as the following for this purpose.

First, it is this for describing the electric motor which will be the basic requisite for the summary composition of the present invention,

Cross direction both sides are equipped with a right-and-left front side member and a right-and-left rear side member, Below the body floor used as a skeleton member, the right-and-left side member which combines the vehicles forward/rearward direction front of solvent of a right-and-left rear side member with the vehicles forward/rearward direction back end of a right-and-left front side member, respectively, The battery which extends in vehicles forward/rearward direction ranging over a right-and-left front side member and a right-and-left rear side member is attached.

[0013]

The fitting structure of the battery used for this electric motor is characterized by the present invention at the point especially considered as the following composition.

That is, the order side-member bond part between the above-mentioned right-and-left front side member and a right-and-left rear side member is inserted, The body floor attachment mark of the battery in a vehicles forward/rearward direction front side are made more rather than a this order side-member bond part than the body floor attachment mark of a battery [in / from the side-member bond part before and after the above / a vehicles forward/rearward direction rear side].

[Effect of the Invention]

[0014]

If it is in the fitting structure of the battery for electric motors of this present invention, the following operation effects may be generated.

[0015]

That is, it is having made the body floor attachment mark of the battery in a front side more rather than an order side-member bond part than the body floor attachment mark of the battery in a rear side,

The fixing strength share rate of the battery to a high strength body floor front side portion becomes largely rather than the fixing strength share rate of the battery to a low strength body floor rear side portion.

For this reason, it becomes easy to secure the clamp face accuracy of a battery, and attachment of

a battery can be automated easily, and the evil in which deformation load is added to a battery can also be abolished.

[Brief Description of the Drawings]

[0016]

[Drawing 1] It is the perspective view seen from the method upper part of the forward left of the vehicles in which the example of arrangement of the battery to the vehicle body of the electric vehicle which can apply the battery installing structure of the present invention is shown.

[Drawing 2] It is a plan view of the example of battery arrangement seeing and showing the electric vehicle of Fig.1 from the vehicles upper part.

[Drawing 3] It is a side view of the example of battery arrangement seeing and showing the electric vehicle of Fig.1 from the vehicles side.

[Drawing 4] It is a perspective view showing the car body floor structure of the electric vehicle shown in Fig.1.

[Drawing 5] It is a bottom view seeing and showing the electric vehicle provided with the battery installing structure which becomes one working example of the present invention from a vehicles lower part.

[Drawing 6] It is a perspective view seeing and showing the battery guide means in the electric vehicle shown in Fig.5 from the lower part of a body floor.

[Drawing 7] It is a cross sectional view making the battery guide means of Fig.6 a section on the VII-VII line of the figure, and looking at and showing it in the direction of an arrow.

[Drawing 8] It is an exploded perspective view of Fig.6 and the battery guide means shown in 7.

[Drawing 9] It is the whole perspective view showing the screw type locking mechanism in the electric vehicle shown in Fig.5 in an unlocked position seen from the lock nut side.

[Drawing 10] It is the whole perspective view showing the screw type locking mechanism in the electric vehicle shown in Fig.5 in a locking position seen from the lock nut side.

[Drawing 11] It is an essential part exploded perspective view of a screw type locking mechanism decomposing and showing lock nut compulsion companion ***** of the screw type locking mechanism in the electric vehicle shown in Fig.5.

[Drawing 12] It is an expansion detailed exploded perspective view expanding and showing lock nut compulsion companion ***** in Fig.11.

[Drawing 13] With the perspective view for [at the time of the lock of Fig.9 - the screw type locking mechanism in 12] carrying out a lock nut compulsion companion time, and describing operation, (a), Perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a front unlocked position, (b) is a perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a next locking position.

[Drawing 14] With the front view for Fig.9 - the screw type locking mechanism in 12 carrying out a lock nut compulsion companion time, and describing operation, (a), The same front view as Fig.13 (b) that carries out a lock nut compulsion companion time, and is shown in a next locking position, and (b) are front views shown where it carried out the lock nut compulsion companion

time of the screw type locking mechanism and a lock nut is stroked in the direction of a bell and spigot in a screw type locking mechanism in the back.

[Drawing 15] In the explanatory view for describing operation when Fig.9 - the screw type locking mechanism in 12 shift to the state of the figure (b) from the state of Fig.14 (a), in case a lock nut compulsion companion time is carried out and a component releases lock nut compulsion companion *****,(a) is an explanatory view of operation showing the state before it carries out a lock nut compulsion companion time and a component releases lock nut compulsion companion *****,(b) is an explanatory view of operation showing a state when a lock nut compulsion companion time is carried out and a component releases lock nut compulsion companion *****.

[Drawing 16] It is a front view for describing the lock release operation of Fig.9 - the screw type locking mechanism in 12, (a) is a front view showing a screw type locking mechanism in the state before a lock release start, (b) is a transverse plane which shows a screw type locking mechanism in the state immediately after a lock release start.

[Drawing 17] With the perspective view for [at the time of the lock release of Fig.9 - the screw type locking mechanism in 12] carrying out a lock nut compulsion companion time, and describing operation, (a), Perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a front locking position, (b) is a perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a next unlocked position.

[Drawing 18] [when Fig.9 - the screw type locking mechanism in 12 shift to the state of the figure (b) from the state of Fig.16 (a)], With the explanatory view for describing operation in case a lock nut compulsion companion time is carried out and a component may come to generate lock nut compulsion companion *****,(a), Explanatory view of operation showing the state before it carries out a lock nut compulsion companion time and a component may come to generate lock nut compulsion companion *****,(b) is an explanatory view of operation showing a state when a lock nut compulsion companion time is carried out and a component may have comes to generate lock nut compulsion companion *****.

[Drawing 19] It is a vertical section front view showing as a section the connector unit in the electric vehicle shown in Fig.5 in respect of orthogonal to a vehicle body floor tunnel part.

[Drawing 20] It is a perspective view making a section the connector unit shown in Fig.19 on the XX-XX line of the figure, and looking at and showing it in the direction of an arrow.

[Description of Embodiments]

[0017]

Hereafter, an embodiment of the invention is described in detail based on one working example shown in Drawings.

<Entire configuration>

Fig.1 - 3 show the example of arrangement of the battery to the vehicle body of the electric vehicle which can apply the battery installing structure of the present invention,

The plan view and Fig.3 which look at the perspective view and Fig.2 which look at Fig.1 from

the method upper part of the forward left of vehicles, and are shown from the upper part of vehicles, and are shown are a side view seen and shown from the method of left-hand side of vehicles.

the vehicle body of the electric vehicle whose 1 is an electric motor in these figures, and 2 -- an electric motor (not shown) -- the battery of business is shown, respectively.

[0018]

An illustrated electric vehicle is carried in the motor room of a vehicle front by making the above-mentioned electric motor (not shown) into the source of power, drives the right-and-left front wheels 3L and 3R with this electric motor, and makes them that it can run.

In Fig.1 -3, 4L and 4R showed the right-and-left rear wheel as a coupled driving wheel, respectively.

[0019]

An electric vehicle needs the large-sized battery 2 with large scale for electric motors, and this battery 2 connects many battery shell mutually, and usually constitutes it to one unit.

therefore -- the battery 2 being not only large-sized, but receiving the vehicle body 1 heavily (for example, about 400 kg) -- attachment and detachment -- when attaching free or permanently, a safe top also has a device which avoids that the center of gravity of a vehicle body becomes high, and becomes run instability, and an important device which maintains the weight-of-vehicle balance of the cross direction.

[0020]

Therefore, in attaching the large-sized and heavy battery 2 to the vehicle body 1, it is good to allot and attach so that it may allot below the body floor 5 as this battery 2 is shown in Fig.1 - 3, and the center of the cross direction of the battery 2 may be placed in the middle of the cross direction of a vehicle body substantially.

6 in Fig.1 - 3 is a vehicle body floor tunnel part (tunnel component) which extends in vehicles forward/rearward direction in the middle of the cross direction of the body floor 5.

[0021]

Hereafter, based on Fig.4 and 5, the approximate account of the body floor 5 is carried out.

The perspective view which Fig.4 looks at the body floor 5 from the method of the diagonal left of vehicles, and is shown, and Fig.5 are the bottom views in which being in the state where it was attached to the battery 2 by the bottom, and seeing and showing the body floor 5 from the lower part of vehicles.

[0022]

The tunnel component 6 which provides the tunnel part of the junior-and-senior-high-schools form which extends in vehicles forward/rearward direction in the middle of the cross direction so that the body floor 5 may be specified in Fig.4,

Fig.4 and the right-and-left front side members 7 and 8 which extend in vehicles

forward/rearward direction so that it may show clearly in 5, and may be on cross direction both sides and may become substantially parallel to the tunnel component 6,

The right-and-left side sills 9 and 10 which extend in vehicles forward/rearward direction so that

it may be along the vehicle width direction outside of these right-and-left front side members 7 and 8 as similarly clearly shown in Fig.4 and 5,

The right-and-left rear side members 11 and 12 which are combined with the vehicles forward/rearward direction back end of the right-and-left front side members 7 and 8 via the order side-member bond parts 7a and 8a, respectively, and extend to empty vehicle [here] both forward/rearward direction back so that it may show clearly in Fig.5,

It has the bridge components 15 and 16 which extend in the cross direction so that between the tunnel component 6 and the right-and-left front side member 7 and 8 may be combined as a main body floor skeleton member.

[0023]

Although a vehicle body assembling jig (not shown) performs mutual positioning between the car body skeleton members 6-12, and 15 and 16 first on the occasion of an assembly of the body floor 5, The ROKETO hole as a reference position provided to these car body skeleton members 6-12, 15, and 16 at that time (to Fig.5) The gage pin in which a vehicle body assembling jig corresponds for the ROKETO holes 7b and 8b of the right-and-left front side members 7 and 8 showing is inserted, and mutual positioning of the car body skeleton members 6-12, 15, and 16 is performed.

[0024]

Next, this mutual positioning state is maintained and between the car body skeleton members 6-12, and 15 and 16 is mutually combined by welding etc.

And the body floor 5 is assembled with high precision like Fig.4 by attaching the front floor panel 13 and the rear floor panel 14 so that the gap between the body floor skeleton members 6-12, and 15 and 16 may be closed.

In order to realize the starting highly precise assembly, the ROKETO hole (the ROKETO holes 7b and 8b of the right-and-left front side members 7 and 8 show to Fig.5) which assembles and serves as a reference position at the time is arranged so that what accomplish a pair may be placed at cross direction both sides.

[0025]

It faces allotting and attaching so that the battery 2 may be arranged below the body floor 5 as mentioned above per Fig.1 -3, and the center of the cross direction of the battery 2 may be placed in the middle of the cross direction of a vehicle body substantially,

The battery 2 is made to be placed at a forward/rearward direction relative position at the time shown in Fig.5 to the body floor 5. It excels in [portion / vehicle body rear side] strength so that this may explain most batteries 5 in full detail later, And it makes as [support / it / by the tunnel component 6, the right-and-left front side members 7 and 8, and the bridge components 15 and 16 which constitute a vehicle body front side portion advantageous to maintenance of battery attaching accuracy].

[0026]

As shown in Fig.5, the battery 2 stored many battery shell (not shown) in the battery frame 2a, electrical connection should be carried out to both the battery shell of these large number, and it

should constitute it to one unit, and should realize large scale-ization sufficient as an object for electric motors.

Arrange this battery 2 below the body floor 5 as above-mentioned, and are in charge of attachment, In this example, the battery 2 concerned is raised under the vehicles vertical direction guidance by the guide means 21 shown in Fig.5, At the time eventually shown in Fig.1-3 and Fig.5, in the fixing position in the body floor 5 bottom, and nothing and this position, the battery 2 shall be locked below the body floor 5 according to the screw type locking mechanism 22, and shall be attached.

[0027]

On the other hand, at the time of the above-mentioned vehicle body attachment, the battery 2 has the indispensable connector structure which needs to carry out electrical connection to the vehicle body side electrical systems, such as an electric motor, and manages this electrical connection.

Then, as this example is shown in Fig.5, the connector unit 23 which comprises the connector component by the side of the vehicle body connected to the above-mentioned vehicle body side electrical system and the connector component by the side of the battery connected to the battery 2 is provided.

[0028]

When this battery 2 is attached below the body floor 5 by the screw type locking mechanism 22 as mentioned above after raising the battery 2 under the vehicles vertical direction guidance by the guide means 21,

The connector unit 23 which comprises the connector component by the side of a vehicle body and the connector component by the side of a battery, When constituting and arranging so that it may change fitting of the connector component by the side of a battery into an electrical connection state to the connector component by the side of a vehicle body during the rise stroke of the battery 2 automates attachment of the battery 2, it is dramatically advantageous.

[0029]

<Guide means>

While raising the battery 2 on the occasion of vehicle body attachment, the guide means 21 for showing a vehicles vertical direction is explained in full detail.

This guide means 21 positions the battery 2 under rise in the vehicles forward/rearward direction position and cross direction position which aligned to the downward battery storage blank in the lower surface of the body floor 5, and constitutes it with the locator pin etc. which are later mentioned per Fig.6-8.

[0030]

In the light of the above-mentioned installation purpose, though natural, it is necessary to provide the guide means 21 which comprises this locator pin as a two-piece lot.

And if the guide means 21 does not align the battery 2 with high precision to the downward battery storage blank in the lower surface of the body floor 5, the battery 2 interferes with the opening edge of a battery storage blank during a rise stroke, when the worst, the battery 2 will

attach it and it will become impossible.

[0031]

In order to align the battery 2 with high precision to the downward battery storage blank in the lower surface of the body floor 5, The battery guide means 21 of a two-piece lot provided in order to make the business, It is necessary to arrange near the ROKETO hole (they are 7b and 8b about the ROKETO hole of the front side members 7 and 8 shown in Fig.5) of the two-piece lot in the cross direction both sides of the vehicle body front side portion which was a highly precise reference position at the time of the aforementioned body floor assembly.

[0032]

The Reason is for the following.

So that the distance of the battery guide means 21 and the ROKETO hole (they are 7b and 8b about the ROKETO hole of the front side members 7 and 8 shown in Fig.5) of the body floor 5 is far, The accumulated of the body floor assembly error in the installation place of the battery guide means 21 becomes largely, the battery guide means 21 comes to have a big relative-position gap to the body floor 5, and the aligning accuracy of the battery [as opposed to a battery storage blank only in the part] 2 is deteriorated.

However, if the battery guide means 21 is arranged near the body floor ROKETO hole, the accumulated of the above-mentioned vehicle body assembly error will be small, the relative-position gap of the battery guide means 21 to the body floor 5 will also be small, and the aligning accuracy of the battery to a battery storage blank will become high.

[0033]

If the battery guide means 21 of a two-piece lot is arranged from this Reason near the body floor ROKETO holes 7b and 8b of the two-piece lot in the cross direction both sides of the vehicle body front side portion which was a high precision reference position at the time of a body floor assembly,

The battery guide means 21 of a two-piece lot may align the battery 2 with high precision to the downward battery storage blank in the lower surface of the body floor 5,

The battery 2 can avoid the opening edge of a battery storage blank, and the inconvenience in which it interferes during a rise stroke.

[0034]

** -- in [make it face the battery guide means 21 of a two-piece lot like to arrange similarly near the ROKETO holes 7b and 8b of the body floor 5 of a two piece lot, and] this example

Since these ROKETO holes 7b and 8b are placed at cross direction both sides in the front side portion of the body floor 5, as the battery guide means 21 is shown in Fig.5, it installs in the cross direction both sides in the part near the front of solvent of the battery 2.

[0035]

** -- the locator pin of composition of showing clearly in Fig.6 - 8 constitutes the battery guide means 21 arranged like, respectively.

That is, the main part 25 of a locator pin is provided via the bracket 24 on the battery frame 2a of the battery 2, and this main part 25 of a locator pin is made to project upwards from the bracket

24.

The ROKE toss reeve 26 which the main part 25 of a locator pin intrudes is provided to the front side member 7 (8) during a rise of the battery 2.

[0036]

According to this battery guide means 21, as the main part 25 of a locator pin provided to this shows Fig.6 and 7 during a rise of the battery 2, it intrudes in the ROKE toss reeve 26 provided to the front side member 7 (8), and the battery 2 under rise is restrained to vehicles forward/rearward direction and the cross direction.

Therefore, where the battery 2 is aligned with high precision to the downward battery storage blank in the lower surface of the body floor 5, it can show the guide means 21 to a vehicles vertical direction, and the inconvenience to which the battery 2 interferes with the opening edge of a battery storage blank during a rise stroke can be avoided.

[0037]

Since close arrangement was carried out to the ROKETO holes 7b and 8b of the body floor front side portion which was a high precision reference position at the time of an assembly of the body floor 5 by providing on the cross direction both sides in the part near the front of solvent of the battery 2 in this example again as the battery guide means 21 was shown in Fig.5,

The battery 2 can be aligned much more with high precision to the downward battery storage blank in the lower surface of the body floor 5, and the above-mentioned operation effect can be made still more remarkable.

[0038]

<Composition of a screw type locking mechanism>

The screw type locking mechanism 22 for locking and attaching the battery 2 raised to the fixing position in the body floor 5 bottom at the time shown in Fig.1 -3 and Fig.5 below the body floor 5 under guidance by the above-mentioned locator pin type battery guide means 21 is explained in full detail below.

[0039]

In this example this screw type locking mechanism 22, As shown in Fig.5, the left-hand side order side-member bond part 7a of the left-hand side front side member 7 and the left-hand side rear side member 11, And ahead [vehicles forward/rearward direction], it provides rather than the right-hand side order side-member bond part 8a of the right-hand side front side member 8 and the right-hand side rear side member 12, and two pieces are provided in vehicles forward/rearward direction back, respectively rather than six pieces and the side-member bond parts 7a and 8a of these right and left.

[0040]

The six screw type locking mechanisms 22 in a front side are nothing so that it may arrange four of them two pieces at a time, respectively on cross direction both sides in the front side of the battery 2 (battery frame 2a) and the cross direction both sides in the front side of the battery 2 may be attached to the front side members 7 and 8,

The vehicles forward/rearward direction front of solvent of the battery 2 (battery frame 2a) is

made to carry out mutual alienation to the cross direction, the two remaining pieces are arranged, and it makes as [attach / to the bridge components 15 and 16 between the front side members 7 and 8 and the tunnel component 6 / the front of solvent of the battery 2].

The two screw type locking mechanisms 22 in a rear side are arranged, respectively on cross direction both sides in the vehicles forward/rearward direction rear side of the battery 2 (battery frame 2a), and are made as [attach / to the rear side members 11 and 12 / the cross direction both sides in the rear side of the battery 2].

[0041]

Here, the Reason which has arranged more [ahead] (six pieces) screw type locking mechanisms 22 than the right and left order side-member bond parts 7a and 8a, and has arranged them few (two pieces) back from the right and left order side-member bond parts 7a and 8a is described.

[0042]

When attaching the battery 2 below the body floor 5 like this example, the thickness (vehicles vertical direction dimension) of the battery 2 due to the secured space in the direction, From the ability not to permit that the battery 2 protrudes also from the dimension (width of the battery 2) in the cross direction of the battery 2 exceeding breadth of a car from the ability not to carry out not much largely,

If it is going to realize large scale-ization of the battery 2 so that the demand of an electric motor may be satisfied, the dimension (the length of the battery 2) in the vehicles forward/rearward direction of the battery 2 will become largely inevitably.

[0043]

**, if the battery 2 which became huge like for large-scale-izing is arranged below the body floor 5 and attached, The left-hand side [battery / 2] order side-member bond part 7a between the left front side member 7 and the left rear side member 11 as shown in Fig.5, And ranging over the both sides for right-hand side order side-member bond part 8 a minutes between the right front side member 8 and the right rear side member 12, it will extend in vehicles forward/rearward direction.

[0044]

by the way, the purpose of crew member protection into the front side portion of the body floor [in / the right and left order side-member bond parts 7a and 8a are inserted, and / from this / the front] 5, etc. -- *****, although sufficient strength is given, Since the strength like body floor front side partial is not required, the rear side portion of the body floor 5 in back is constituted from the right and left order side-member bond parts 7a and 8a by low strength rather than the body floor front side portion for the vehicle body weight saving.

[0045]

If division-into-equal-parts arrangement of the attaching point over the body floor 5 of the battery 2 is carried out in the cross direction both sides of the battery 2 like before, respectively, without taking into consideration the intensity difference between this body floor front side portion and a body floor rear side portion,

The fixing strength share rate of the battery 2 to a low strength body floor rear side portion may

become the same as the fixing strength share rate of the battery 2 to a high strength body floor front side portion, or may become largely rather than this.

[0046]

Thus, when the fixing strength share rate of the battery 2 to a low strength body floor rear side portion becomes more than the fixing strength share rate of the battery 2 to a high strength body floor front side portion,

From a low strength body floor rear side portion being weak to the deformation in a vehicles vertical direction, It becomes difficult to secure the clamp face accuracy of the battery 2 to the body floor 5, and evils, like it not only becomes hindrance when automating attachment of the battery 2, but deformation load is added to the battery 2, or the supporting position of the battery 2 becomes unstable also reach.

[0047]

Then, make it make the front side portion of the body floor 5 high strength than a low strength body floor rear side portion share many fixing strength of the battery 2 in this example, and by this, It becomes easy to secure the clamp face accuracy of the battery 2 to the body floor 5, and it makes as [automate / attachment of the battery 2 / easily], and makes as [produce / problems, like deformation load is added to the battery 2, or the supporting position of the battery 2 becomes unstable].

[0048]

Therefore, as having mentioned above per Fig.5 the screw type locking mechanism 22 which manages attachment of the battery 2 to the body floor 5 in this example, It arranges more mostly [the front] (six pieces) than the right and left order side-member bond parts 7a and 8a, and arranges few (two pieces) back from the right and left order side-member bond parts 7a and 8a. This attaches the battery 2 to the front side portion of the high strength body floor 5 by the six screw type locking mechanisms 22 in the front from the right and left order side-member bond parts 7a and 8a, It will attach to the rear side portion of the low strength body floor 5 by the two screw type locking mechanisms 22 in back from the right and left order side-member bond parts 7a and 8a.

[0049]

In order to consider the eight screw type locking mechanisms 22 as the same composition altogether, they describe below its detailed structure per [which has been arranged on cross direction both sides in the front end part of the battery 2 (battery frame 2a)] screw type locking mechanism 22.

Fig.9 and 10 show the entire structure of the screw type locking mechanism 22, respectively, Fig.9 is an unlocked state about this screw type locking mechanism 22, and Fig.10 shows this screw type locking mechanism 22 in a locked state, respectively.

And Fig.11 and 12 are the perspective views decomposing and showing the essential part of Fig.9 and the screw type locking mechanism 22 shown in 10, respectively.

[0050]

Fig.9 and the screw type locking mechanism 22 which shows the whole to 10 lock the battery 2

in the bottom fixing position of the body floor 5 by having two incomes with the lock plate 27 fixed to the body floor 5 (front side members 7 and 8), enabling free attachment and detachment, Therefore, the rectangular opening 27a is drilled, and it allots in the center and the circular opening 27b is drilled in the lock plate 27.

It faces fixing the lock plate 27 to the body floor 5, and the lock plate 27 is attached in the front side member 7 of a corresponding side (8) by binding implements, such as a bolt inserted in the buttock hole 27c in the four corners of the lock plate 27.

[0051]

The screw type locking mechanism 22 makes a main component the lock base 31 attached in the battery 2 (battery frame 2a), the bolt 32 attached to this, and the lock nut 33 screwed in this.

The bolt 32 is rotatably inserted in the lock base 31, and is the bolt head (not shown) formed integrally to the lower end of Fig.9 - the bolt 32 in 11, and is locked to Fig.9 - the upper part of 11.

[0052]

The bolt 32 which was locked to the lock base 31 and provided rotatably screws and equips the above-mentioned slip off stop end and the end of an opposite side with the lock nut 33 like the above.

This lock nut 33 is seen in that direction of a bell and spigot, is used as the nut of a quadrangle section, such as a rectangle, and is considered as the composition which has an internal thread for thrusting into the bolt 32 in that center.

[0053]

And as shown in Fig.9 - 11, to the center circle form boss section 31a of the lock base 31, The two stoppers 31b and 31c which restrict rotation of the lock nut 33 to locking position Hazama who is an unlocked position which is the relaxation direction limit position shown in Fig.9 and Fig.10, and the tightening direction limit position shown in 11 are provided.

[0054]

The former rectangular hole 27a among the rectangular holes 27a and the circular holes 27b which were provided to the lock plate 27, Passage of the lock nut 33 in the unlocked position shown in Fig.9 shall be permitted in the state where it positioned correctly in all the directions orthogonal to the passing direction, and the latter circular hole 27b shall permit fitting of the center circle form boss section 31a provided to the lock base 31.

However, let the diameter of the circular hole 27b be a size which does not permit passage of the lock nut 33 in Fig.10 and the locking position shown in 11.

[0055]

The long side side buttock at the tip of an insertion passing direction is cuted off the corners in the lock nut 33, respectively, the shorter side side buttock is cuted off the corners for the tapered surface 33a to it again, respectively, and the tapered surface 33b is formed in it.

These tapered surfaces 33a and 33b function as follows, respectively.

[0056]

That is, as described above, the battery guide means 21 positions the battery 2 in a transverse

direction during the rise stroke, and is aligned to a battery storage blank, Only by this alignment, the core broth of the fitting part of the vehicle body side connector component which constitutes the connector unit 23, and the battery side connector component cannot be carried out mutually correctly.

If there is this poor core broth, the horizontal load of the direction which crosses a fitting direction will be applied to the mutual fitting part of both the connector component, and it will become a cause which it not only makes the durability of the connector unit 23 be deteriorated, but makes the mutual fitting part of a connector component produce a gap partially, and a spark generates.

[0057]

By the way, when it is going to make the rectangular hole 27a of the lock plate 27 pass the lock nut 33 to the path of insertion in this example, The tapered surfaces 33a and 33b of the lock nut 33 collide with the opening edge of the rectangular hole 27a, and fitting is carried out into this rectangular hole 27a by having two incomes with the opening edge of the rectangular hole 27a concerned, leading the lock nut 33 in the rectangular hole 27a of the lock plate 27.

[0058]

At this time, since fitting of the lock nut 33 is carried out densely [there is no gap in the rectangular hole 27a of the lock plate 27, and], the battery 2 can be positioned so that the core broth of the battery side connector component of the connector unit 23 may be correctly carried out to a vehicle body side connector component,

The horizontal load of the direction which crosses a fitting direction cannot act on the mutual fitting part of both the connector component, and the problem that the durability of the connector unit 23 is deteriorated, or a gap arises partially in the mutual fitting part of a connector component, and a spark occurs can be avoided.

[0059]

Therefore, the tapered surfaces 33a and 33b of the lock nut 33 and the rectangular hole 27a (the opening edge) of these and the lock plate 27 which has two incomes, The business of the positioning part which positions the battery 2 horizontally to the body floor 5 so that the core broth of the battery side connector component and vehicle body side connector component of the connector unit 23 may be carried out mutually is made,

As a result, the connector area wood core broth means for carrying out the core broth of between the battery side connector component of the connector unit 23 and a vehicle body side connector component is constituted.

[0060]

Next, referring to [Fig.11](#) and 12, at the time of the tightening direction (in this example, it is considered as right-handed screw) rotation of the bolt 32, and relaxation direction rotation, take the lock nut 33 in the direction forcibly, and a time is carried out, A lock nut companion time is carried out for rotating the relaxation direction limit position (unlocked position) shown in the tightening direction limit position (locking position) and Fig.9 which are shown in [Fig.10](#) and 11, and a mechanism is explained in full detail.

[0061]

The point of the bolt 32 concerned is made with noncircular-section form by forming two or more axial direction slots 32a in the point periphery of the bolt 32 which screws in the lock nut 33 at circumferential direction regular intervals so that it may show clearly in Fig.11 and 12. It attaches in the point of this bolt 32 like Fig.9 and 10, a lock nut compulsion companion time is carried out to it, and the component 34 is provided.

[0062]

It constitutes from these two legs 34b that carried out the lock nut compulsion companion time, and formed the component 34 integrally to this with the plate-like member 34a.

34 d of this non-circular hole by fitting into the point of the bolt 32 slidably by digging 34 d of non-circular holes corresponding to the above-mentioned point noncircular-section form of the bolt 32 at the center of the plate-like member 34a, A lock nut compulsion companion time is carried out, rotating engagement of clutch of the component 34 is carried out to the point of the bolt 32, and it is provided so that an axial direction slide is possible.

[0063]

A lock nut compulsion companion time is carried out, and for this reason, it energizes towards the lock nut 33 by elastic means which fitted loosely into the point of the bolt 32, such as the spring 35, and the component 34 engages with the point of the bolt 32, and provides the spring seat 36 in which a lock nut compulsion companion time is carried out, and the end of the spring 35 far from the component 34 sits down.

The flat cam surface 34c which occurs the following cam operations by having two incomes with the long side side tapered surface 33a which is energized towards the lock nut 33 by elastic means, such as the spring 35, and which carried out the lock nut compulsion companion time, and the lock nut 33 described above to the leg 34b of the component 34, respectively is set up.

[0064]

Carry out a lock nut compulsion companion time, and the component side flat cam surface 34c, It is made to incline so that the lock nut 33 may be taken about, when [which this and really rotate at the time of rotation of the bolt 32] a lock nut compulsion companion time is carried out and the component 34 is pressed by the lock nut long side side tapered surface 33a for the elasticity of the spring 35 in the flat cam surface 34c. Also let the following operations be the angles of inclination which become possible.

That is, after the lock nut 33 is prevented by the correspondence direction limit position with the stopper 31b or 31c, Carrying out a lock nut compulsion companion time, and the component 34 getting over the lock nut long side side tapered surface 33a in the flat cam surface 34c. Stroking in this direction that keeps away from the lock nut 33 following on getting over and compressing the spring 35, a lock nut compulsion companion time is carried out, and the angle of inclination of the component side flat cam surface 34c is determined so that relative rotating may be carried out to the lock nut 33 and lock nut companion ***** can be released.

[0065]

The length of the axial direction [which is energized towards the lock nut 33 by elastic means,

such as the spring 35,] slot 32a which provided the stroke limit position of the component 34 on the point periphery of the bolt 32 by carrying out a lock nut compulsion companion time prescribes.

It faces determining the length of the axial direction slot 32a, After the lock nut 33 being made Fig.10 and the locking position of 11 by the tightening direction rotation of the bolt 32 and starting the tightening direction stroke, immediately, When carry out a lock nut compulsion companion time, the component 34 serves as the above-mentioned stroke limit position, it stops here and the lock nut 33 performs the tightening direction stroke further, the length of the axial direction slot 32a is determined so that the lock nut 33 may carry out a lock nut compulsion companion time and may separate from the leg 34b of the component 34.

[0066]

<An operation of a screw type locking mechanism>

It uses by attaching in the battery 2 (battery frame 2a) the screw type locking mechanism 22 which becomes the above-mentioned composition, providing it to the battery 2 side as the lock base 31 was described above, attaching the lock plate 27 in the body floor 5, and providing to the vehicle body side,

Facing storing the battery 2 in the battery storage blank with a downward opening in the body floor 5 bottom, enabling free attachment and detachment, and locking it, the screw type locking mechanism 22 performs the lock function concerned as follows by having two incomes with the lock plate 27.

[0067]

First, the lock operation at the time of battery attachment is described based on Fig.13 - 15.

On the occasion of attachment of the battery 2, by rotation to the relaxation direction shown in the Fig.13 (a) of the bolt 32 by an arrow, the lock nut 33, a lock nut companion time is carried out and it is taken about by the component 34 so that it may explain in full detail later, and the stopper 31b shows to Fig.9 and Fig.13 (a) -- the relaxation direction limit position (unlocked position) is carried out.

[0068]

When the battery 2 is raised here in the battery storage blank with a downward opening in the lower surface of the body floor 5, the lock nut 33 by the above-mentioned having two incomes with the tapered surfaces 33a and 33b and the lock plate rectangular hole 27a, A core broth being carried out to the lock plate rectangular hole 27a, as shown in Fig.9 and Fig.13 (a), pass to the lock plate rectangular hole 27a, and.The center circle form boss section 31a of the lock base 31 carries out invagination to the lock plate circular hole 27b, the lock nut 33 is placed in a battery storage blank, and the lock base 31 sits down on the external exposure lower surface of the lock plate 27.

[0069]

If the bolt 32 is rotated in the tightening direction shown in Fig.13 (b) by an arrow by a nut runner etc. in this state, it rotates with the bolt 32 -- a lock nut compulsion companion time being carried out, and the component 34 taking the lock nut 33 about via the flat cam surface 34c and

the tapered surface 33a, and this lock nut 33 by collision for the stopper 31c, It makes with the tightening direction limit position (locking position) shown in Fig.10, Fig.13 (b), and Fig.14 (a). However, the lock nut compulsion companion time of the lock nut 33 is carried out across this tightening direction limit position (locking position), and it is not taken about by the component 34, and as shown in Fig.10, Fig.13 (b), and Fig.14 (a), it stops at the rotary place concerned.

[0070]

By the way, carry out a lock nut compulsion companion time, and the component 34, Resisting the spring 35 in the flat cam surface 34c, and getting over the lock nut long side side tapered surface 33a, as shown in the figure (b) from the state of Fig.15 (a). Stroking in this direction that keeps away from the lock nut 33 following on getting over and compressing the spring 35, relative rotating can be carried out to the lock nut 33, and lock nut companion ***** can be released.

[0071]

For this reason, a lock nut compulsion companion time is carried out, and the bolt 32 does not have the further rotation to the tightening direction barred by existence of the component 34. If it is made to rotate in the tightening direction further, as shown in Fig.14 (b), the lock nut 33 the bolt 32. The tightening direction limit position (locking position) is maintained, and it is thrust into the arrow direction of the figure, and it strokes in the direction close to the lock base 31, the lower limit position shown in the figure carrying out a lock nut compulsion companion time, and separating from the component 34 (leg 34b).

Thereby, the lock nut 33 and the lock base 31 can compress the lock plate 27 among both, and can lock and hold it in the position which stored the battery 2 in the battery storage blank.

[0072]

Next, the unlocking operation at the time of battery removal is described based on Fig.16 - 18. It faces carrying out lock release, in order to take out the battery 2 from a battery storage blank, and makes it rotate the bolt 32 in the above-mentioned locked state in the relaxation direction shown in Fig.16 (a) by an arrow by a nut runner etc. it.

[0073]

Since it is in the same bell-and-spigot stroke position for a lock as Fig.14 (b), the lower limit position carried out the lock nut compulsion companion time and the lock nut 33 is separated from the component 34 (leg 34b) at the beginning, as shown in Fig.16 (a), A lock nut compulsion companion time is rotated and carried out in the relaxation direction with the bolt 32, to the lock nut 33, relative rotating is possible for the component 34 to the direction, and it does not bar the above-mentioned relaxation direction rotation of the bolt 32 at all.

[0074]

The relaxation direction rotation of this bolt 32 is made to stroke in the direction of slack which carries out the lock nut 33 and is shown in Fig.16 (b) and Fig.17 (b) by an arrow, and as promptly shown in Fig.18 (a), a lower limit position carries out the lock nut compulsion companion time of it, and it is contacted to the component 34 (leg 34b).

However, since it is on the how Kogo end face carry out a lock nut compulsion companion time,

and the component 34 (leg 34b) still screws in the lock nut 33 in the contact state shown in Fig.18 (a) and lock nut companion ***** must have been generated, A lock nut compulsion companion time is carried out, and relative rotating of the component 34 (leg 34b) is carried out in the relaxation direction to the lock nut 33 with the bolt 32.

[0075]

As a lock nut compulsion companion time is carried out by this relative rotating and the component 34 is shown in Fig.18 (b), the flat cam surface 34c of the leg 34b serves as the lock nut long side side tapered surface 33a and a rotary place which opposes.

At this time, the spring 35 carries out a lock nut compulsion companion time, and energizes and carries out the lock nut compulsion companion time of the component 34 to the arrow direction of Fig.18 (b), and the component 34 is made with the stroke position where that flat cam surface 34c opposed to the lock nut long side side tapered surface 33a.

As shown in Fig.16 (b) and Fig.17 (a) by the above, a lock nut compulsion companion time is carried out to the lock nut 33 with the same tightening direction limit position as the time of a lock, and the component 34 will be in the state where rotating engagement of clutch was carried out by having two incomes of the tapered surface 33a and the flat cam surface 34c.

[0076]

if the bolt 32 is further rotated in the relaxation direction in this state, it will rotate with the bolt 32 -- a lock nut compulsion companion time being carried out, and the component 34 taking the lock nut 33 about, and it via the flat cam surface 34c and the tapered surface 33a, Rotating force is carried out to the relaxation direction limit position (unlocked position) which collides with the stopper 31b as this lock nut 33 is shown in Fig.17 (b).

However, the lock nut compulsion companion time of the lock nut 33 is carried out across this relaxation direction limit position (unlocked position), and it is not taken about by the component 34, and as shown in Fig.17 (b), it stops at the rotary place concerned.

[0077]

By the way, carry out a lock nut compulsion companion time, and the component 34, Resisting the spring 35 in the flat cam surface 34c, and getting over the lock nut long side side tapered surface 33a, as shown in the figure (a) from the state of Fig.18 (b). Stroking in this direction that keeps away from the lock nut 33 following on getting over and compressing the spring 35, relative rotating can be carried out to the lock nut 33, and lock nut companion ***** can be released.

[0078]

For this reason, a lock nut compulsion companion time is carried out, and the bolt 32 does not have the further rotation to the relaxation direction barred by existence of the component 34.

If it is made to rotate the bolt 32 further in the relaxation direction, the lock nut 33 will stroke by maintaining the relaxation direction limit position (unlocked position) of Fig.17 (b), and loosening to the arrow direction of the figure, It strokes in the direction which keeps away from the lock base 31, carrying out a lock nut compulsion companion time, and displacing the component 34 (leg 34b) in the direction compressing the spring 35.

[0079]

The compression power (lock) of the lock plate 27 by the lock nut 33 and the lock base 31 being released, and making the rectangular hole 27a of the lock plate 27 pass the lock nut 33 by this. The battery 2 can be removed from the inside of a battery storage blank, extracting the center circle form boss section 31a of the lock base 31 from the circular hole 27b of the lock plate 27.

[0080]

<Connector unit>

The battery 2 has the indispensable connector structure which manages the electrical connection between the vehicle body side electrical systems, therefore as it mentioned above per Fig.5 in this example, it provides the connector unit 23.

This connector unit 23 consists of the connector component 41 by the side of the vehicle body connected to the vehicle body side electrical system, and the connector component 42 by the side of the battery connected to the battery 2, as shown in Fig.19 and 20.

[0081]

By the way, the battery 2 is raised to the fixing position in the body floor 5 bottom like this example at the time shown in Fig.1 -3 and Fig.5 under guidance by the above-mentioned locator pin type battery guide means 21, When it locks in the battery storage blank in the body floor 5 bottom according to the screw type locking mechanism 22 which described the battery 2 above and attaches in this position,

The connector unit 23 which comprises the connector component 41 by the side of a vehicle body and the connector component 42 by the side of a battery, In the electrical connection state so that fitting of the battery side connector component 42 may be carried out to the vehicle body side connector component 41 during the rise stroke of the battery 2 Composition, it being dramatically advantageous when arranging automates attachment of the battery 2, and also setting to this example -- the connector unit 23 -- Fig.19 -- it constitutes such so that it may mention later per 20.

[0082]

Also when separated distantly [when the connector unit 23 is distantly / from the both sides of the battery guide means 21 (refer to Fig.5) of a two piece lot / separated then / not to mention / one side / of these battery guide means 23],

By accumulation of the above-mentioned vehicle body assembly error, the relative-position gap with the battery side connector component 42 which accomplishes the connector unit 23, and the vehicle body side connector component 41 occurs, and a core gap is produced in the mutual fitting part of the battery side connector component 42 and the vehicle body side connector component 41.

[0083]

The core gap between this battery side connector component 42 and the vehicle body side connector component 41, It applies the horizontal load of the direction which crosses a fitting direction to the mutual fitting part of both the connector components 41 and 42, and it makes the mutual fitting part of the connector components 41 and 42 produce a gap partially, and it not

only makes the durability of the connector unit 23 be deteriorated, but becomes a generation cause of a spark.

[0084]

Then, in this example, as shown in Fig.5, the connector unit 23 constituted by the battery side connector component 42 and the vehicle body side connector component 41. It arranges from the near position 21, i.e., these battery guide means, to the equidistant mid-position to the both sides of the battery guide means 21 provided on cross direction both sides of the battery 2.

[0085]

The position of the neighborhood, the vehicle body side connector component 41, and the battery side connector component 42 is made into the minimum in the influence by accumulation of a vehicle body assembly error to the both sides of the battery guide means 21, and the connector unit 23 of this arrangement is highly precise.

Therefore, most core gaps in the mutual fitting part of these connector components 41 and 42 can be lost, The horizontal load of the direction which crosses a fitting direction cannot act on the mutual fitting part of both the connector components 41 and 42, and the problem that the durability of the connector unit 23 is deteriorated, or a gap arises partially in the mutual fitting part of the connector components 41 and 42, and a spark occurs can be eliminated.

[0086]

If it compares with the above-mentioned meaning, the connector unit 23 will be arranged in the middle of the cross direction of the body floor 5.

By the way, in the middle of the cross direction of the body floor 5, for the reason for wire harness cabling of a vehicle body side electrical system etc., the tunnel component 6 is provided and the tunnel part of the junior-and-senior-high-schools form which extends in vehicles forward/rearward direction is set to strength reservation of the body floor 5.

Therefore, in this example, the connector unit 23 is arranged in the tunnel component 6 (tunnel part) of Fig.5 and the junior-and-senior-high-schools form which extends in vehicles forward/rearward direction in the middle of the cross direction of the body floor 5 as shown in 19 and 20.

[0087]

It is good to arrange the connector unit 23 in the tunnel component 6 (tunnel part) of the part where the tunnel component 6 (tunnel part) of the body floor 5 and the front end surface of the battery 2 (battery frame 2a) cross so that it may show clearly in Fig.5 in this arrangement.

[0088]

And the inside of the vehicle body side connector component 41 which constitutes the connector unit 23 as shown in Fig.19 and 20, and the battery side connector component 42, In the above-mentioned part, the vehicle body side connector component 41 is attached via the bracket 43 in the tunnel component 6 (tunnel part) of the body floor 5, and the battery side connector component 42 is attached to the front end surface of the battery 2 (battery frame 2a) via the bracket 44 in the above-mentioned part.

[0089]

The vehicle body side connector component 41 and the battery side connector component 42 are although it is considered as a fixing position which changes mutual fitting into an electrical connection state during the rise stroke of the battery 2 (with rise stroke edge [Preferably]) of course,

It is good after attachment of the battery 2 by the screw type locking mechanism 22 to determine the attachment level of the vehicle body side connector component 41 and the battery side connector component 42 so that the battery side connector component 42 in the bottom may not jut out of the tunnel component 6 (tunnel part) to a lower part.

[0090]

<The effect of an working example>

According to the above-mentioned battery installing structure of this example, the screw type locking mechanism 22 for locking and attaching the battery 2 below the body floor 5, As shown in Fig. 5, ahead [vehicles forward/rearward direction], rather than the left-hand side order side-member bond part 7a and the right-hand side order side-member bond part 8a Six pieces, In vehicles forward/rearward direction back, rather than these right-and-left order side-member bond parts 7a and 8a, two pieces, It provides, respectively, and from the order side-member bond parts 7a and 8a, more vehicle body attachment mark (six pieces) of the battery 2 in the front than the vehicle body attachment mark (two pieces) of the battery 2 in back are written from these order side-member bond parts 7a and 8a, and the following operation effects may be generated.

[0091]

That is, the fixing strength of the battery [as opposed to / according to the above-mentioned composition / the body floor 5] 2, It is made to assign rather than a body floor rear side portion [low strength / back] from the order side-member bond parts 7a and 8a more mostly [in the front side portion of the front high strength body floor 5] than the order side-member bond parts 7a and 8a.

With this battery 2 order fixing strength share rate, the front side portion of the high strength body floor 5 can raise the clamp face accuracy of the battery 2 to the body floor 5, Attachment of the battery 2 can be easily automated with this high clamp face accuracy, and problems, like deformation load is added to the battery 2, or the supporting position of the battery 2 becomes unstable are avoidable.

[0092]

By every two screw type locking mechanisms 22 arranged among the six screw type locking mechanisms 22 in a front side on cross direction both sides in the front side of the battery 2 (battery frame 2a), In order to attach the cross direction both sides in the front side of the battery 2 to the front side members 7 and 8 of a corresponding side,

This attachment turns into attachment to the strong front side members 7 and 8 which are the skeleton members of the body floor 5, and the above-mentioned operation effect can be made still more remarkable.

[0093]

Two [remaining] among the six screw type locking mechanisms 22 in a front side. In order to

make the vehicles forward/rearward direction front of solvent of the battery 2 (battery frame 2a) carry out mutual alienation to the cross direction, to arrange and to attach the front of solvent of the battery 2 to the bridge components 15 and 16 between the front side members 7 and 8 and the tunnel component 6, the following operation effects are obtained.

That is, these [in the front of solvent of the battery 2] two screw type locking mechanisms 22, The fixing strength to the body floor front side portion of the battery 2 by the four screw type locking mechanisms 22 which it has arranged at a time on two cross direction both sides of the front part of the battery 2 (battery frame 2a) is assisted, It can function as raising further the fixing strength share rate of the battery 2 to a high strength body floor front side portion, and the aforementioned operation effect can be made still more remarkable.

[0094]

And the attachment by the two screw type locking mechanisms 22 in the front of solvent of the battery 2, It is attachment to the bridge components 15 and 16 between the strong front side members 7 and 8 which are the skeleton members of the body floor 5, and the tunnel component 6, and the aforementioned operation effect can be made much more remarkable.

[0095]

<Other working examples>

Although it was considered as a total of eight pieces, and it has arranged ahead rather than the order side-member bond part 7a and 8a and the point of the battery 2 by the screw type locking mechanism 22 attaching [body floor] has been arranged to two back in the illustrated working example, respectively rather than six pieces and the order side-member bond parts 7a and 8a, The total number of the point of the battery 2 by the screw type locking mechanism 22 attaching [body floor] may be arbitrary, and in short, If the order side-member bond part 7a and the body floor attachment mark of the battery [in / from 8a / the front] 2 are made more from the order side-member bond parts 7a and 8a than the body floor attachment mark of the battery 2 in back, the above-mentioned operation effect can be attained.

[0096]

It is although provided the screw type locking mechanism 22 on cross direction both sides of the front part of the battery 2, and the point of the battery 2 attaching [body floor] was set up here, and the screw type locking mechanism 22 was provided to the front of solvent of the battery 2 and the point of the battery 2 attaching [body floor] was set up also here in the illustrated example,

It is not necessary to necessarily provide the screw type locking mechanism 22 to the both sides of the cross direction both sides of the front part of the battery 2, and the front of solvent of the battery 2. It is also possible to take into consideration the fixing strength demand of the battery 2, to provide the screw type locking mechanism 22 only to either, and to set up the point of the battery 2 attaching [body floor].

[0097]

It is although it attached and described when the battery 2 connected many battery shell mutually and consisted of illustrated examples to one unit,

Also when the batteries 2 are things of what kind of form, such as what is called a battery module in addition to this, it cannot be overemphasized that the same operation effect can be generated with the application of the idea of the above-mentioned present invention.

[Explanations of letters or numerals]

[0098]

1 Vehicle body

2 Battery

2a battery frame

3L, 3R right-and-left front wheel (driving wheel)

4L, 4R right-and-left rear wheel

5 Body floor

6 Tunnel component

7 and 8 Right-and-left front side member

7a, 8a right-and-left order side-member bond part

7b, 8b ROKETO hole

9 and 10 Right-and-left side sill

11 and 12 Right-and-left rear side member

13 Front floor panel

14 Rear floor panel

15 and 16 Bridge component

21 Battery guide means

22 Screw type locking mechanism

23 Connector unit

24 Bracket

25 The main part of a locator pin

26 ROKE toss reeve

27 Lock plate

27a rectangular opening

27b circular opening

31 Lock base

31b, 31c stopper

32 Bolt

33 Lock nut

33a lock nut long side side tapered surface

33b lock nut shorter side side tapered surface

34 Carry out a lock nut compulsion companion time, and it is a component.

34a plate-like member

34b leg

34c flat cam surface

35 Spring

36 Spring seat
41 Vehicle body side connector component
42 Battery side connector component
43 and 44 Bracket

TECHNICAL FIELD

[Field of the Invention]

[0001]

In the electric motor in which the present invention carried the electric motor like an electric vehicle or a hybrid vehicle,

It is related with the fitting structure for attaching the battery for electric motors to a body floor.

PRIOR ART

[Background of the Invention]

[0002]

If it is in an electric motor like an electric vehicle or a hybrid vehicle, a large-sized battery (what connected mutually and carried out unitization of many batteries) is required for electric motors at large scale.

[0003]

this battery is attachment and detachment to a vehicle body being not only large-sized but heavily (in for example, the case of an electric vehicle about 400 kg) -- when attaching free or permanently, the device which avoids that the center of gravity of a vehicle body becomes high, and becomes unstable, and the device which maintains the weight-of-vehicle balance of the cross direction are required.

Therefore, in attaching a large-sized and heavy battery to a vehicle body, it is common to allot and attach so that this battery may be arranged below a body floor and the center of the cross direction of a battery may be placed in the middle of the cross direction of a vehicle body substantially.

[0004]

** -- from [that it cannot permit also beginning to see the dimension (width of a battery) in the cross direction of a battery from the ability of thickness (vehicles vertical direction dimension) of a battery not to be carried out largely if a battery exceeds breadth of a car when attaching a battery below a body floor like]

If it is going to realize large scale-ization of a battery so that the demand of an electric motor may be satisfied, it is unavoidable that the dimension (the length of a battery) in the vehicles forward/rearward direction of a battery becomes largely.

[0005]

** -- a thing like the description to the former, for example, a Patent document 1, as technology which arranges the battery which became huge like for large-scale-izing below a body floor, and attaches it is proposed.

This proposal technology is constituted so that a battery may be attached to a body floor in the many part in cross direction both sides.

EFFECT OF THE INVENTION

[Effect of the Invention]

[0014]

If it is in the fitting structure of the battery for electric motors of this present invention, the following operation effects may be generated.

[0015]

That is, it is having made the body floor attachment mark of the battery in a front side more rather than an order side-member bond part than the body floor attachment mark of the battery in a rear side,

The fixing strength share rate of the battery to a high strength body floor front side portion becomes largely rather than the fixing strength share rate of the battery to a low strength body floor rear side portion.

For this reason, it becomes easy to secure the clamp face accuracy of a battery, and attachment of a battery can be automated easily, and the evil in which deformation load is added to a battery can also be abolished.

TECHNICAL PROBLEM

[Problem to be solved by the invention]

[0007]

However, since the above-mentioned conventional proposal technology is what carries out division-into-equal-parts arrangement of the many point of a battery attaching [body floor] in the cross direction both sides of a battery, respectively, it produces the following problems.

[0008]

That is, a body floor is although cross direction both sides are equipped with a right-and-left front side member and a right-and-left rear side member and the right-and-left side member which combines the vehicles forward/rearward direction front of solvent of a right-and-left rear side member with the vehicles forward/rearward direction back end of a right-and-left front side member, respectively is used as a main body floor skeleton member,

The left-hand side order side-member bond part between the left front side member and a left rear side member and the right-hand side order side-member bond part between the right front side member and a right rear side member are inserted, In view of crew member protection, from an order side-member bond part, the strength of a front body floor front side portion consists of

these right-and-left order side-member bond parts so that it may become largely rather than the strength of a back body floor rear side portion.

It is for avoiding that the Reason for not carrying out strength of a body floor rear side portion largely incidentally gains a body floor rear side portion in a body weight by carrying out largely more than needed.

[0009]

As described above, when the battery which became huge for large-scale-izing is arranged below a body floor and attached, a battery will extend in vehicles forward/rearward direction ranging over the both sides of a high strength body floor front side portion and a low strength body floor rear side portion.

By the way, it is if division-into-equal-parts arrangement of the point of a battery attaching [body floor] is carried out in the cross direction both sides of a battery, respectively like the above-mentioned proposal technology,

It is in charge of arrangement of the point concerned attaching [body floor], and the consideration about the intensity difference between a body floor front side portion and a body floor rear side portion is not made.

[0010]

Therefore, the fixing strength share rate of the battery to a low strength body floor rear side portion may become largely rather than the fixing strength share rate of the battery to a high strength body floor front side portion.

In this case, from a low strength body floor rear side portion being weak to the deformation in a vehicles vertical direction, It becomes difficult to secure the clamp face accuracy of the battery to a body floor, and evils, like it not only becomes hindrance when automating attachment of a battery, but deformation load is added to a battery or the supporting position of a battery becomes unstable also reach.

[0011]

The present invention is making suitable the fixing strength share rate of the battery to a body floor front side portion and a body floor rear side portion, It aims at providing the fitting structure of the battery for electric motors which makes clamp face accuracy of a battery easy to secure, and enabled it to eliminate the above-mentioned problem by this.

MEANS

[Means for solving problem]

[0012]

The fitting structure of the battery for electric motors by the present invention constitutes this as the following for this purpose.

First, it is this for describing the electric motor which will be the basic requisite for the summary composition of the present invention,

Cross direction both sides are equipped with a right-and-left front side member and a right-and-

left rear side member, Below the body floor used as a skeleton member, the right-and-left side member which combines the vehicles forward/rearward direction front of solvent of a right-and-left rear side member with the vehicles forward/rearward direction back end of a right-and-left front side member, respectively, The battery which extends in vehicles forward/rearward direction ranging over a right-and-left front side member and a right-and-left rear side member is attached.

[0013]

The fitting structure of the battery used for this electric motor is characterized by the present invention at the point especially considered as the following composition.

That is, the order side-member bond part between the above-mentioned right-and-left front side member and a right-and-left rear side member is inserted, The body floor attachment mark of the battery in a vehicles forward/rearward direction front side are made more rather than a this order side-member bond part than the body floor attachment mark of a battery [in / from the side-member bond part before and after the above / a vehicles forward/rearward direction rear side].

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[0016]

[Drawing 1]It is the perspective view seen from the method upper part of the forward left of the vehicles in which the example of arrangement of the battery to the vehicle body of the electric vehicle which can apply the battery installing structure of the present invention is shown.

[Drawing 2]It is a plan view of the example of battery arrangement seeing and showing the electric vehicle of Fig.1 from the vehicles upper part.

[Drawing 3]It is a side view of the example of battery arrangement seeing and showing the electric vehicle of Fig.1 from the vehicles side.

[Drawing 4]It is a perspective view showing the car body floor structure of the electric vehicle shown in Fig.1.

[Drawing 5]It is a bottom view seeing and showing the electric vehicle provided with the battery installing structure which becomes one working example of the present invention from a vehicles lower part.

[Drawing 6]It is a perspective view seeing and showing the battery guide means in the electric vehicle shown in Fig.5 from the lower part of a body floor.

[Drawing 7]It is a cross sectional view making the battery guide means of Fig.6 a section on the VII-VII line of the figure, and looking at and showing it in the direction of an arrow.

[Drawing 8]It is an exploded perspective view of Fig.6 and the battery guide means shown in 7.

[Drawing 9]It is the whole perspective view showing the screw type locking mechanism in the electric vehicle shown in Fig.5 in an unlocked position seen from the lock nut side.

[Drawing 10]It is the whole perspective view showing the screw type locking mechanism in the electric vehicle shown in Fig.5 in a locking position seen from the lock nut side.

[Drawing 11]It is an essential part exploded perspective view of a screw type locking mechanism decomposing and showing lock nut compulsion companion ***** of the screw type locking mechanism in the electric vehicle shown in Fig.5.

[Drawing 12]It is an expansion detailed exploded perspective view expanding and showing lock nut compulsion companion ***** in Fig.11.

[Drawing 13]With the perspective view for [at the time of the lock of Fig.9 - the screw type locking mechanism in 12] carrying out a lock nut compulsion companion time, and describing operation, (a), Perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a front unlocked position, (b) is a perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a next locking position.

[Drawing 14]With the front view for Fig.9 - the screw type locking mechanism in 12 carrying out a lock nut compulsion companion time, and describing operation, (a), The same front view as Fig.13 (b) that carries out a lock nut compulsion companion time, and is shown in a next locking position, and (b) are front views shown where it carried out the lock nut compulsion companion time of the screw type locking mechanism and a lock nut is stroked in the direction of a bell and spigot in a screw type locking mechanism in the back.

[Drawing 15]In the explanatory view for describing operation when Fig.9 - the screw type locking mechanism in 12 shift to the state of the figure (b) from the state of Fig.14 (a), in case a lock nut compulsion companion time is carried out and a component releases lock nut compulsion companion *****,(a) is an explanatory view of operation showing the state before it carries out a lock nut compulsion companion time and a component releases lock nut compulsion companion *****,(b) is an explanatory view of operation showing a state when a lock nut compulsion companion time is carried out and a component releases lock nut compulsion companion *****.

[Drawing 16]It is a front view for describing the lock release operation of Fig.9 - the screw type locking mechanism in 12, (a) is a front view showing a screw type locking mechanism in the state before a lock release start, (b) is a transverse plane which shows a screw type locking mechanism in the state immediately after a lock release start.

[Drawing 17]With the perspective view for [at the time of the lock release of Fig.9 - the screw type locking mechanism in 12] carrying out a lock nut compulsion companion time, and describing operation, (a), Perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a front locking position, (b) is a perspective view which carries out the lock nut compulsion companion time of the screw type locking mechanism, and is shown in a next unlocked position.

[Drawing 18][when Fig.9 - the screw type locking mechanism in 12 shift to the state of the figure (b) from the state of Fig.16 (a)],With the explanatory view for describing operation in case a lock nut compulsion companion time is carried out and a component may come to generate lock nut compulsion companion *****,(a), Explanatory view of operation showing the condition of Saki in whom a lock nut compulsion companion time is carried out, and a

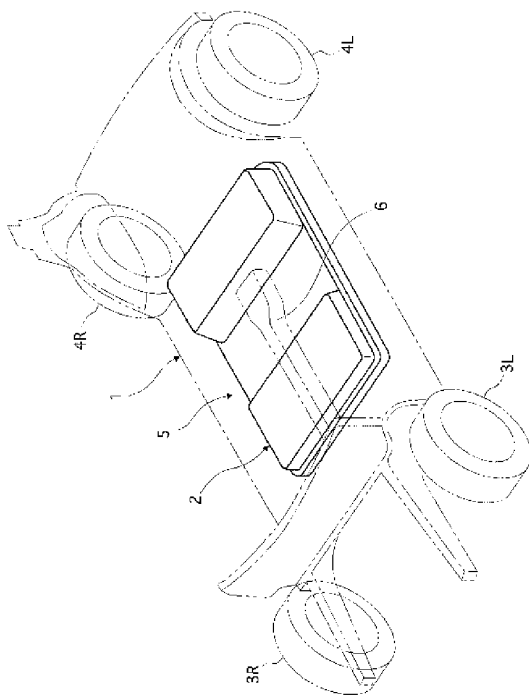
component may come to generate lock nut compulsion companion ***** , (b) is an explanatory view of operation showing a state when a lock nut compulsion companion time is carried out and a component may have comes to generate lock nut compulsion companion ***** .

[Drawing 19]It is a vertical section front view showing as a section the connector unit in the electric vehicle shown in Fig.5 in respect of orthogonal to a vehicle body floor tunnel part.

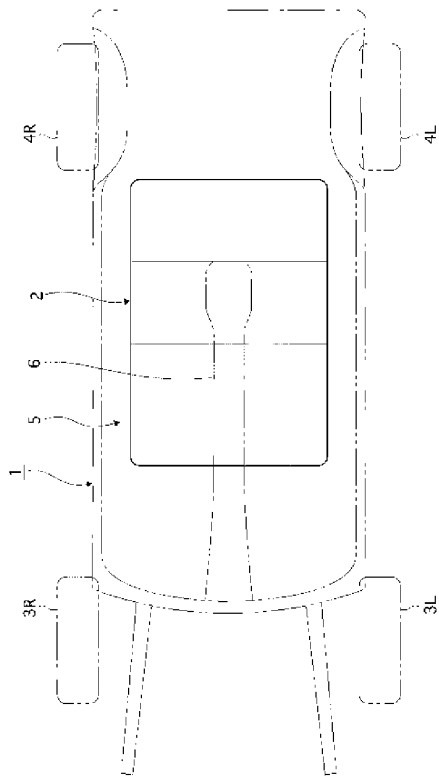
[Drawing 20]It is a perspective view making a section the connector unit shown in Fig.19 on the XX-XX line of the figure, and looking at and showing it in the direction of an arrow.

DRAWINGS

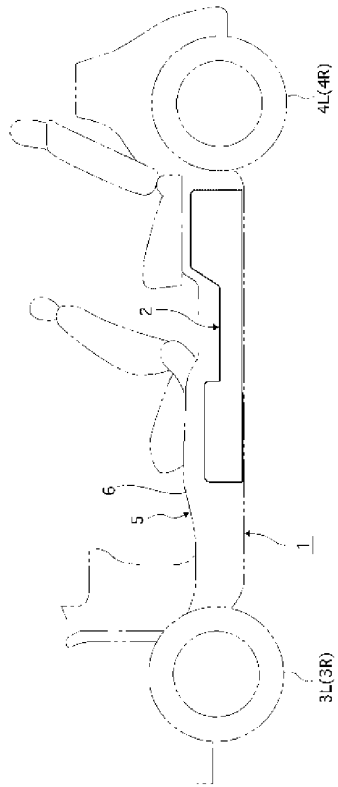
[Drawing 1]



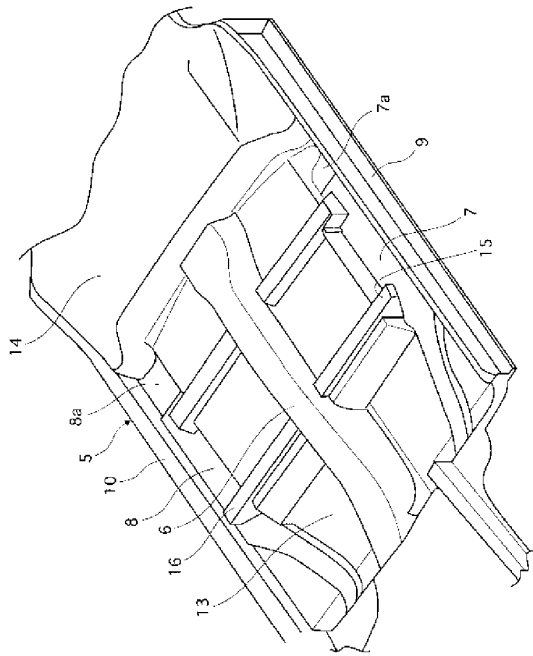
[Drawing 2]



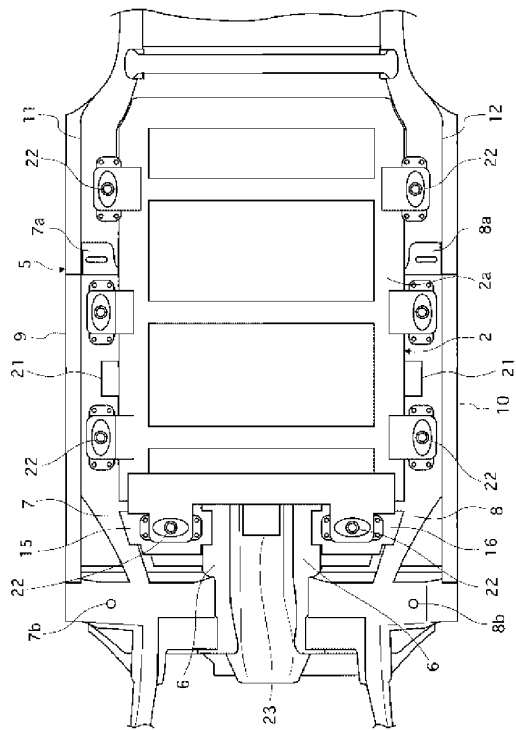
[Drawing 3]



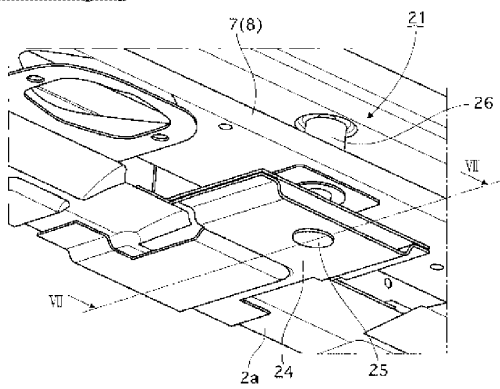
[Drawing 4]



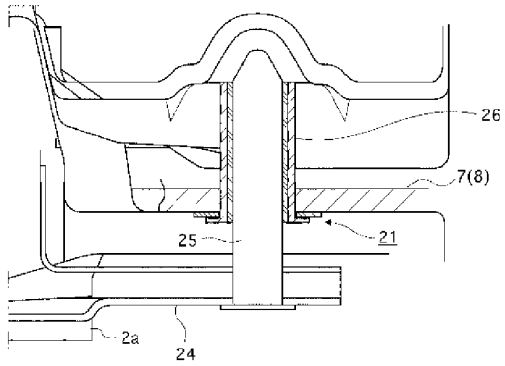
[Drawing 5]



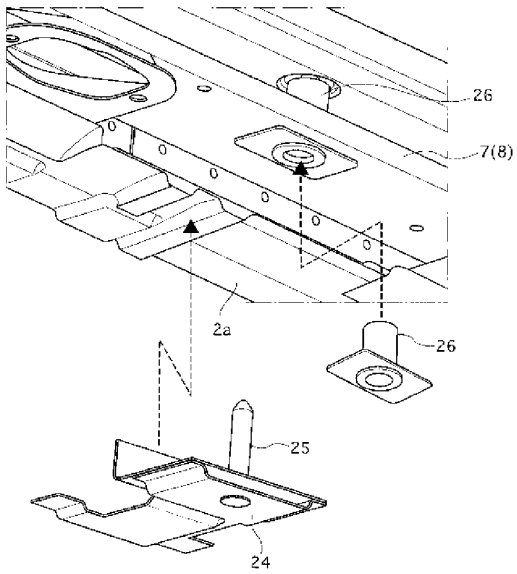
[Drawing 6]



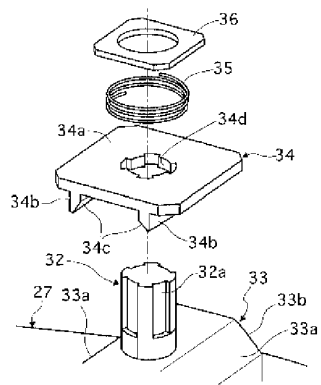
[Drawing 7]



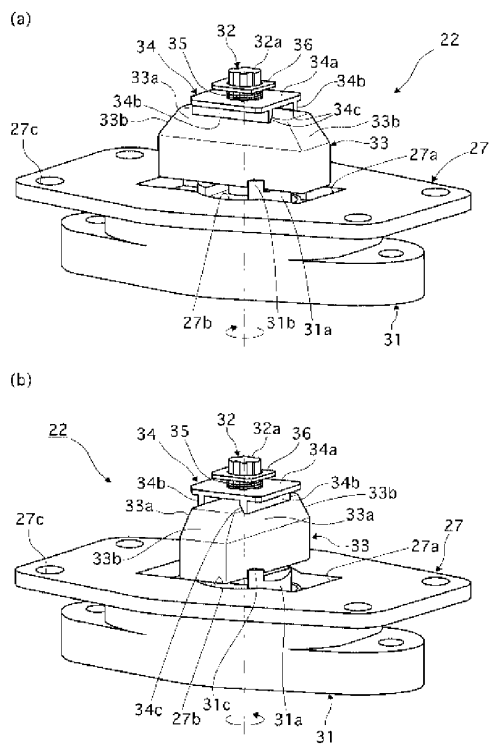
[Drawing 8]



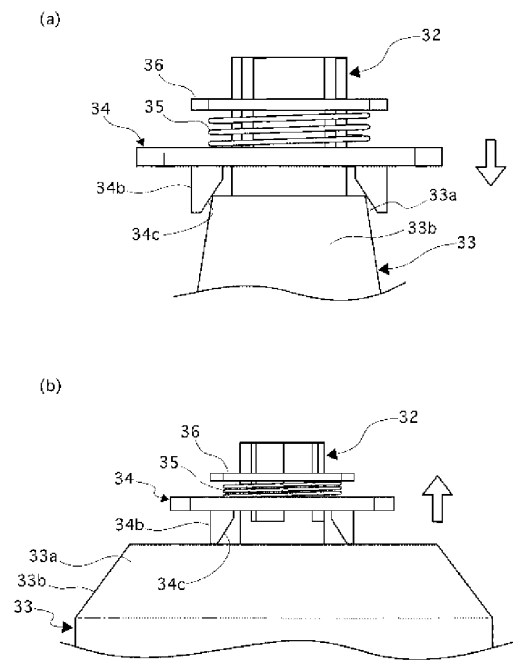
[Drawing 9]



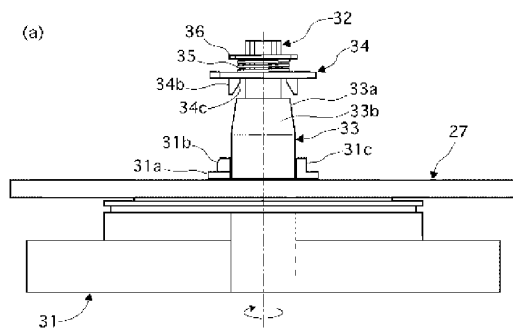
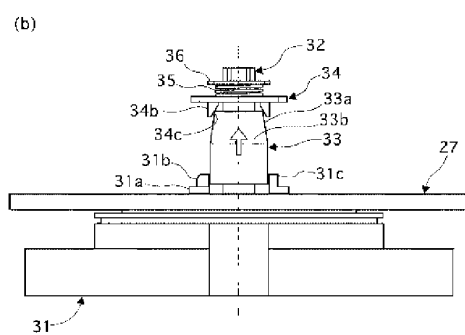
[Drawing 13]



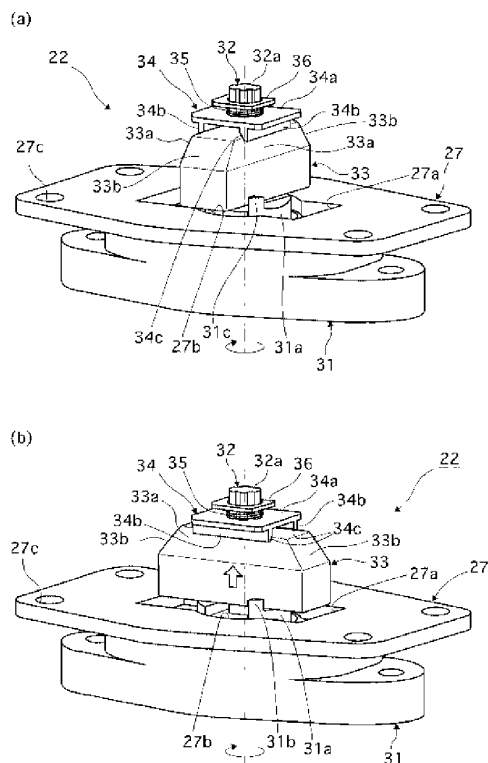
[Drawing 14]



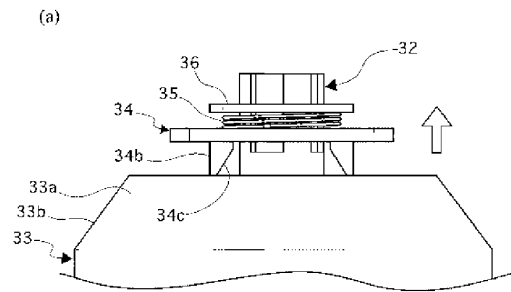
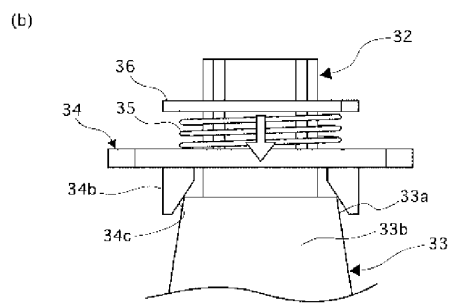
[Drawing 16]



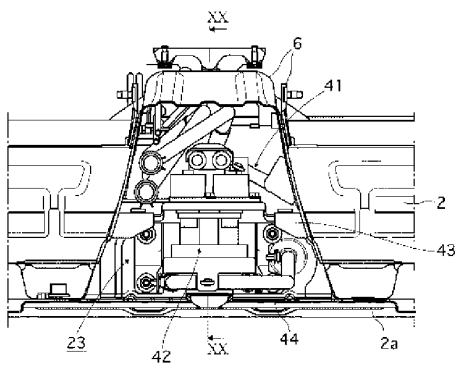
[Drawing 17]



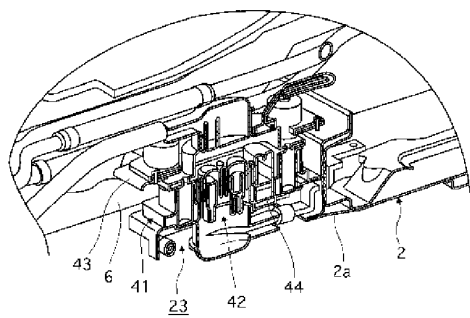
[Drawing 18]



[Drawing 19]



[Drawing 20]



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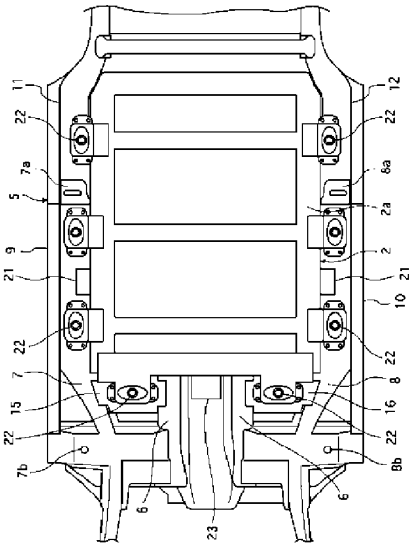
(54) 【発明の名称】 電動車両用バッテリーの取り付け構造

(57) 【要約】

【課題】 車体フロアに対するバッテリーの取り付け面精度を高めて、バッテリーの取り付けを自動化し易くし、バッテリーの支持姿勢を安定させる。

【解決手段】 バッテリー2を車体フロア5に取り付けるためのロック機構22を、左側のフロントサイドメンバ7およびリヤサイドメンバ11間のサイドメンバ結合部7a、および右側のフロントサイドメンバ8およびリヤサイドメンバ12間のサイドメンバ結合部8aよりも前方に6個、後方に2個、設ける。前側における6個のロック機構22は、そのうちの4個を、バッテリー2の前側における車幅方向両側にそれぞれ2個ずつ配置し、残りの2個を、バッテリー2の前端に配置し、後側における2個のロック機構22は、バッテリー2の後側における車幅方向両側に配置する。よってバッテリー2は、高強度な車体フロア5の前側部分に対する取り付け強度分担割合を、低強度な車体フロア5の後側部分に対する取り付け強度分担割合よりも高くされる。

【選択図】 図5



【特許請求の範囲】

【請求項1】

車幅方向両側に左右フロントサイドメンバおよび左右リヤサイドメンバを具え、左右フロントサイドメンバの車両前後方向後端にそれぞれ左右リヤサイドメンバの車両前後方向前端を結合して成る左右サイドメンバを骨格部材とする車体フロアの下側に、前記左右フロントサイドメンバおよび左右リヤサイドメンバに跨って車両前後方向に延在するバッテリーを取り付けた電動車両において、

前記左右フロントサイドメンバおよび左右リヤサイドメンバ間の前後サイドメンバ結合部を挟んで、該前後サイドメンバ結合部よりも車両前後方向前側におけるバッテリーの車体フロア取り付け点数を、前記前後サイドメンバ結合部よりも車両前後方向後側におけるバッテリーの車体フロア取り付け点数より多くしたことを特徴とする電動車両用バッテリーの取り付け構造。

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【請求項2】

請求項1に記載された電動車両用バッテリーの取り付け構造において、

前記バッテリーの車幅方向両側における車体フロア取り付け点では、バッテリーを、対応する側におけるフロントサイドメンバおよびリヤサイドメンバに取り付けたことを特徴とする電動車両用バッテリーの取り付け構造。

【請求項3】

請求項1または2に記載された電動車両用バッテリーの取り付け構造において、

前記前後サイドメンバ結合部よりも車両前後方向前側におけるバッテリーの車体フロア取り付け点のうち、少なくとも1個の取り付け点をバッテリーの車両前後方向前端に配置したことを特徴とする電動車両用バッテリーの取り付け構造。

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【請求項4】

前記左右フロントサイドメンバ間に、車幅方向中程で車両前後方向へ延在するトンネル部材を具え、該トンネル部材と左右フロントサイドメンバの間にそれぞれ延在する左右橋絡部材を介しトンネル部材を左右フロントサイドメンバに結合することにより、トンネル部材も車体フロア骨格部材として用いる、請求項3に記載された電動車両用バッテリーの取り付け構造において、

バッテリーの車両前後方向前端に配置する前記少なくとも1個の取り付け点を2個の取り付け点とし、

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これら2個の取り付け点では、バッテリーを、対応する側における前記左右橋絡部材に取り付けたことを特徴とする電動車両用バッテリーの取り付け構造。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、電気自動車やハイブリッド車両のように電動モータを搭載した電動車両において、

電動モータ用のバッテリーを車体フロアに対し取り付けるための取り付け構造に関するものである。

【背景技術】

40

【0002】

電気自動車やハイブリッド車両のような電動車両にあっては、電動モータ用に大容量で大型のバッテリー（多数のバッテリーを相互に接続してユニット化したもの）が必要である。

【0003】

かかるバッテリーは大型であるだけでなく、重く（例えば、電気自動車の場合400kg程度）、車体に着脱自在または永続的に取り付けるとき、車体の重心が高くなって不安定になるのを回避する工夫、および車幅方向の車両重量バランスをとる工夫が必要である。

そのため、大型で重いバッテリーを車体に取り付けるに当たっては、このバッテリーを車体フロアの下側に配して、またバッテリーの車幅方向中央がほぼ車体の車幅方向中程に位置するように配して取り付けるのが一般的である。

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【0004】

かようにバッテリーを車体フロアの下側に取り付ける場合、バッテリーの厚さ（車両上下方向寸法）を大きくすることができないことから、また、バッテリーの車幅方向における寸法（バッテリーの幅）も、バッテリーが車幅を越えてはみ出すのを許容し得ないことから、

電動車両の要求が満足されるようバッテリーの大容量化を実現しようとする、バッテリーの車両前後方向における寸法（バッテリーの長さ）が大きくなるのを避けられない。

【0005】

かように大容量化のため長大となったバッテリーを車体フロアの下側に配して取り付ける技術としては従来、例えば特許文献1に記載のようなものが提案されている。

この提案技術は、バッテリーを車幅方向両側における多数の箇所で車体フロアに取り付けるよう構成したものである。

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【先行技術文献】

【特許文献】

【0006】

【特許文献1】特開平08-150841号公報（図6）

【発明の概要】

【発明が解決しようとする課題】

【0007】

しかし上記従来の提案技術は、バッテリーの多数の車体フロア取り付け点を、バッテリーの車幅方向両側においてそれぞれ等分配置するものであるため、以下のような問題を生ずる。

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【0008】

つまり車体フロアは、車幅方向両側に左右フロントサイドメンバおよび左右リヤサイドメンバを具え、左右フロントサイドメンバの車両前後方向後端にそれぞれ左右リヤサイドメンバの車両前後方向前端を結合して成る左右サイドメンバを主たる車体フロア骨格部材とするが、

左フロントサイドメンバと左リヤサイドメンバとの間における左側の前後サイドメンバ結合部、および、右フロントサイドメンバと右リヤサイドメンバとの間における右側の前後サイドメンバ結合部を挟んで、これら左右の前後サイドメンバ結合部より前方の車体フロア前側部分の強度は乗員保護の観点から、前後サイドメンバ結合部より後方の車体フロア後側部分の強度よりも大きくなるよう構成する。

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ちなみに、車体フロア後側部分の強度を大きくしない理由は、車体フロア後側部分を必要以上に大きくすることで車体重量が増すのを回避するためである。

【0009】

前記したごとく大容量化のため長大となったバッテリーを車体フロアの下側に配して取り付けると、バッテリーが高強度な車体フロア前側部分および低強度な車体フロア後側部分の双方に跨って車両前後方向に延在することになる。

ところで前記した提案技術のように、バッテリーの車体フロア取り付け点を、バッテリーの車幅方向両側においてそれぞれ等分配置するのでは、

当該車体フロア取り付け点の配置に当たり、車体フロア前側部分および車体フロア後側部分間における強度差についての考慮がなされていない。

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【0010】

そのため、低強度な車体フロア後側部分に対するバッテリーの取り付け強度分担割合が、高強度な車体フロア前側部分に対するバッテリーの取り付け強度分担割合よりも大きくなることがある。

この場合、低強度な車体フロア後側部分が、車両上下方向における変形に弱いことから、車体フロアに対するバッテリーの取り付け面精度を確保し難くなつて、バッテリーの取り付けを自動化するときの妨げになるだけでなく、バッテリーに変形荷重が加わったり、バッテリーの支持姿勢が不安定になるなどの弊害も及ぶ。

【0011】

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本発明は、車体フロア前側部分および車体フロア後側部分に対するバッテリーの取り付け強度分担割合を適切にすることで、バッテリーの取り付け面精度を確保し易くし、これにより上記の問題を解消し得るようにした、電動車両用バッテリーの取り付け構造を提供することを目的とする。

【課題を解決するための手段】

【0012】

この目的のため、本発明による電動車両用バッテリーの取り付け構造は、以下のごとくにこれを構成する。

先ず、本発明の要旨構成の基礎前提となる電動車両を説明するに、これは、

車幅方向両側に左右フロントサイドメンバおよび左右リヤサイドメンバを具え、左右フロントサイドメンバの車両前後方向後端にそれぞれ左右リヤサイドメンバの車両前後方向前端を結合して成る左右サイドメンバを骨格部材とする車体フロアの下側に、左右フロントサイドメンバおよび左右リヤサイドメンバに跨って車両前後方向に延在するバッテリーを取り付けたものである。

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【0013】

本発明は、かかる電動車両に用いるバッテリーの取り付け構造を、特に以下のような構成とした点に特徴づけられる。

つまり、上記左右フロントサイドメンバおよび左右リヤサイドメンバ間の前後サイドメンバ結合部を挟んで、該前後サイドメンバ結合部よりも車両前後方向前側におけるバッテリーの車体フロア取り付け点数を、上記前後サイドメンバ結合部よりも車両前後方向後側におけるバッテリーの車体フロア取り付け点数より多くしたものである。

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【発明の効果】

【0014】

かかる本発明の電動車両用バッテリーの取り付け構造にあつては、以下の作用効果が奏し得られる。

【0015】

つまり、前後サイドメンバ結合部よりも前側におけるバッテリーの車体フロア取り付け点数を、後側におけるバッテリーの車体フロア取り付け点数より多くしたことで、

高強度な車体フロア前側部分に対するバッテリーの取り付け強度分担割合が、低強度な車体フロア後側部分に対するバッテリーの取り付け強度分担割合よりも大きくなる。

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このため、バッテリーの取り付け面精度を確保し易くなって、バッテリーの取り付けを容易に自動化することができると共に、バッテリーに変形荷重が加わるという弊害もなくすることができる。

【図面の簡単な説明】

【0016】

【図1】本発明のバッテリー取り付け構造を適用可能な電気自動車の車体に対するバッテリーの配置例を示す、車両の左前方上方から見た斜視図である。

【図2】図1の電気自動車を車両上方から見て示すバッテリー配置例の平面図である。

【図3】図1の電気自動車を車両側方から見て示すバッテリー配置例の側面図である。

【図4】図1に示す電気自動車の車体フロア構造を示す斜視図である。

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【図5】本発明の一実施例になるバッテリー取り付け構造を具えた電気自動車を車両下方から見て示す底面図である。

【図6】図5に示す電気自動車におけるバッテリーガイド手段を、車体フロアの下方から見て示す斜視図である。

【図7】図6のバッテリーガイド手段を、同図のVII-VII線上で断面とし、矢の方向に見て示す断面図である。

【図8】図6,7に示すバッテリーガイド手段の分解斜視図である。

【図9】図5に示した電気自動車におけるねじ式ロック機構をアンロック位置で示す、ロックナット側から見た全体斜視図である。

【図10】図5に示した電気自動車におけるねじ式ロック機構をロック位置で示す、ロッ

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クナット側から見た全体斜視図である。

【図11】図5に示した電気自動車におけるねじ式ロック機構のロックナット強制連れ回し部を分解して示す、ねじ式ロック機構の要部分解斜視図である。

【図12】図11におけるロックナット強制連れ回し部を拡大して示す拡大詳細分解斜視図である。

【図13】図9～12におけるねじ式ロック機構のロック時におけるロックナット強制連れ回し動作を説明するための斜視図で、(a)は、ねじ式ロック機構をロックナット強制連れ回し前のアンロック位置で示す斜視図、(b)は、ねじ式ロック機構をロックナット強制連れ回し後のロック位置で示す斜視図である。

【図14】図9～12におけるねじ式ロック機構のロックナット強制連れ回し動作を説明するための正面図で、(a)は、ねじ式ロック機構を図13(b)と同じロックナット強制連れ回し後のロック位置で示す正面図、(b)は、ねじ式ロック機構をロックナット強制連れ回し後、ロックナットがねじ込み方向にストロークされた状態で示す正面図である。

【図15】図9～12におけるねじ式ロック機構が図14(a)の状態から同図(b)の状態へ移行する時において、ロックナット強制連れ回し部材がロックナット強制連れ回し力を解放する場合の動作を説明するための説明図で、(a)は、ロックナット強制連れ回し部材がロックナット強制連れ回し力を解放する前の状態を示す動作説明図、(b)は、ロックナット強制連れ回し部材がロックナット強制連れ回し力を解放した時の状態を示す動作説明図である。

【図16】図9～12におけるねじ式ロック機構のロック解除動作を説明するための正面図で、(a)は、ねじ式ロック機構をロック解除開始前の状態で示す正面図、(b)は、ねじ式ロック機構をロック解除開始直後の状態で示す正面図である。

【図17】図9～12におけるねじ式ロック機構のロック解除時におけるロックナット強制連れ回し動作を説明するための斜視図で、(a)は、ねじ式ロック機構をロックナット強制連れ回し前のロック位置で示す斜視図、(b)は、ねじ式ロック機構をロックナット強制連れ回し後のアンロック位置で示す斜視図である。

【図18】図9～12におけるねじ式ロック機構が図16(a)の状態から同図(b)の状態へ移行する時において、ロックナット強制連れ回し部材がロックナット強制連れ回し力を発生し得るようになる場合の動作を説明するための説明図で、(a)は、ロックナット強制連れ回し部材がロックナット強制連れ回し力を発生し得るようになる前の状態を示す動作説明図、(b)は、ロックナット強制連れ回し部材がロックナット強制連れ回し力を発生し得るようになった時の状態を示す動作説明図である。

【図19】図5に示した電気自動車におけるコネクタユニットを、車体フロアトンネル部と直交する面で断面として示す縦断正面図である。

【図20】図19に示したコネクタユニットを、同図のXX-XX線上で断面とし、矢の方向に見て示す斜視図である。

【発明を実施するための形態】

【0017】

以下、本発明の実施の形態を、図面に示す一実施例に基づき詳細に説明する。

<全体構成>

図1～3は、本発明のバッテリー取り付け構造を適用可能な電気自動車の車体に対するバッテリーの配置例を示し、

図1は、車両の左前方上方から見て示す斜視図、図2は、車両の上方から見て示す平面図、図3は、車両の左側方から見て示す側面図である。

これらの図において、1は、電動車両である電気自動車の車体、2は、電動モータ（図示せず）用のバッテリーをそれぞれ示す。

【0018】

図示の電気自動車は、上記の電動モータ（図示せず）を動力源として車両前方のモータールーム内に搭載し、この電動モータにより左右前輪3L, 3Rを駆動して走行可能なものとする。

なお図1～3では、従動輪としての左右後輪をそれぞれ4L, 4Rにより示した。

【0019】

電気自動車は、電動モータ用に大容量で大型のバッテリー2を必要とし、このバッテリー2は通常、多数のバッテリーセルを相互に接続して1ユニットに構成する。

従ってバッテリー2は、大型であるだけでなく、重く（例えば400kg程度）、車体1に対し着脱自在または永続的に取り付けるとき、車体の重心が高くなって走行不安定になるのを回避する工夫、および車幅方向の車両重量バランスをとる工夫が、安全上も肝要である。

【0020】

そのため、大型で重いバッテリー2を車体1に取り付けるに当たっては、このバッテリー2を図1～3に示すごとく車体フロア5の下側に配して、またバッテリー2の車幅方向中央がほぼ車体の車幅方向中程に位置するように配して取り付けのが良い。

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なお図1～3における6は、車体フロア5の車幅方向中程で車両前後方向に延在する車体フロアトンネル部（トンネル部材）である。

【0021】

以下、車体フロア5を図4, 5に基づき概略説明する。

図4は、車体フロア5を車両の左斜め上方から見て示す斜視図、図5は、車体フロア5を、その下側にバッテリー2が取り付けられた状態で、車両の下方から見て示す底面図である。

【0022】

車体フロア5は、図4に明示するごとく車幅方向中程で車両前後方向に延在する中高形状のトンネル部を提供するトンネル部材6と、

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図4, 5に明示するごとく車幅方向両側にあつてトンネル部材6に対しほぼ平行となるよう車両前後方向に延在する左右フロントサイドメンバ7, 8と、

同じく図4, 5に明示する通り、これら左右フロントサイドメンバ7, 8の車幅方向外側に沿うよう車両前後方向に延在する左右サイドシル9, 10と、

図5に明示するごとく、左右フロントサイドメンバ7, 8の車両前後方向後端にそれぞれ前後サイドメンバ結合部7a, 8aを介し結合されて、ここから車両前後方向後方へ延在する左右リヤサイドメンバ11, 12と、

トンネル部材6および左右フロントサイドメンバ7, 8間を結合するよう車幅方向に延在する橋絡部材15, 16とを、主たる車体フロア骨格部材として具える。

【0023】

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車体フロア5の組み立てに際しては、先ず車体組み立て治具（図示せず）により車体骨格部材6～12, 15, 16間の相互位置決めを行うが、その際、これら車体骨格部材6～12, 15, 16に設けた基準位置としてのロケットホール（図5に、左右フロントサイドメンバ7, 8のロケットホール7b, 8bで示す）に車体組み立て治具の対応する位置決めピンを挿入して車体骨格部材6～12, 15, 16の相互位置決めを行う。

【0024】

次に、この相互位置決め状態を保って車体骨格部材6～12, 15, 16間を溶接などにより相互に結合する。

そして、車体フロア骨格部材6～12, 15, 16間の隙間を塞ぐよう図4のごとく、フロントフロアパネル13およびリヤフロアパネル14を取り付けることにより、車体フロア5を高精度に組み立てる。

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なお、かかる高精度な組み立てを実現するために、組み立て時の基準位置となるロケットホール（図5に、左右フロントサイドメンバ7, 8のロケットホール7b, 8bで示す）は、対を成すもの同士が車幅方向両側に位置するように配置する。

【0025】

図1～3につき前述したごとくバッテリー2を車体フロア5の下側に配して、またバッテリー2の車幅方向中央がほぼ車体の車幅方向中程に位置するように配して取り付けに際しては、バッテリー2を車体フロア5に対し図5に示すごとく前後方向相対位置に位置させ、これによりバッテリー5の大部分を後で詳述するごとく、車体後側部分よりも強度的に優れており、且つバッテリー取り付け精度の維持に有利な、車体前側部分を構成するトンネル部材6、

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左右フロントサイドメンバ7,8および橋絡部材15,16によって支持し得るようになる。

【0026】

なおバッテリー2は図5に示すごとく、バッテリーフレーム2a内に多数のバッテリーセル（図示せず）を収納し、これら多数のバッテリーセル相互に電気接続して1ユニットに構成し、電動モータ用として十分な大容量化を実現したものとする。

かかるバッテリー2を上記の通り車体フロア5の下側に配して取り付けに当たり、本実施例においては当該バッテリー2を、図5に示したガイド手段21による車両上下方向案内下に上昇させて、最終的に図1～3および図5に示すごとく車体フロア5の下側における取り付け位置となし、この位置においてバッテリー2をねじ式ロック機構22により車体フロア5の下側にロックして取り付けるものとする。

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【0027】

一方でバッテリー2は上記の車体取り付け時に、電動モータなど車体側電装系に対し電気接続する必要があり、この電気接続を司るコネクタ構造が不可欠である。

そこで本実施例においては図5に示すごとく、上記の車体側電装系に接続された車体側のコネクタ部材、およびバッテリー2に接続されたバッテリー側のコネクタ部材より成るコネクタユニット23を設ける。

【0028】

なお上記のようにバッテリー2を、ガイド手段21による車両上下方向案内下に上昇させた後、このバッテリー2をねじ式ロック機構22で車体フロア5の下側に取り付ける場合、

車体側のコネクタ部材およびバッテリー側のコネクタ部材より成るコネクタユニット23は、バッテリー2の上昇ストローク中にバッテリー側のコネクタ部材が車体側のコネクタ部材に電気接続状態に嵌合されるよう構成、配置するのが、バッテリー2の取り付けを自動化する上で大いに有利である。

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【0029】

<ガイド手段>

バッテリー2を車体取り付けに際し上昇させる間、車両上下方向に案内するためのガイド手段21を詳述する。

このガイド手段21は、上昇中のバッテリー2を、車体フロア5の下面における下向きバッテリー収納空所に対し整列した車両前後方向位置および車幅方向位置に位置決めしておくもので、図6～8につき後述するロケットピンなどにより構成する。

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【0030】

かかるロケットピンなどで構成されるガイド手段21は、上記したその設置目的に照らして当然ながら、2個一組として設ける必要がある。

そしてガイド手段21は、バッテリー2を車体フロア5の下面における下向きバッテリー収納空所に対し高精度に整列させるものでないと、バッテリー2が上昇ストローク中にバッテリー収納空所の開口縁と干渉し、最悪の場合バッテリー2が取り付け不能になる。

【0031】

バッテリー2を車体フロア5の下面における下向きバッテリー収納空所に対し高精度に整列させるためには、その用をなすべく設ける2個一組のバッテリーガイド手段21を、前記車体フロア組み立て時の高精度な基準位置であった車体前側部分の車幅方向両側における2個一組のロケットホール（例えば図5に示すフロントサイドメンバ7,8のロケットホールを7b,8b）の近くに配置する必要がある。

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【0032】

その理由は、以下のためである。

バッテリーガイド手段21と車体フロア5のロケットホール（例えば図5に示すフロントサイドメンバ7,8のロケットホールを7b,8b）との距離が遠いほど、バッテリーガイド手段21の設置箇所における車体フロア組み立て誤差の累積値が大きくなって、バッテリーガイド手段21が車体フロア5に対し大きな相対位置ずれを持つようになり、その分だけバッテリー収納空所に対するバッテリー2の整列精度が低下する。

しかし、バッテリーガイド手段21を車体フロアロケットホールの近くに配置すれば、上記

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車体組み立て誤差の累積値が小さく、車体フロア5に対するバッテリーガイド手段21の相対位置ずれも小さくて、バッテリー収納空所に対するバッテリーの整列精度が高くなる。

【0033】

かかる理由から、2個一組のバッテリーガイド手段21は、車体フロア組み立て時の高精度基準位置であった車体前側部分の車幅方向両側における2個一組の車体フロアロケットホール7b, 8bの近くに配置すれば、

2個一組のバッテリーガイド手段21がバッテリー2を車体フロア5の下面における下向きバッテリー収納空所に対し高精度に整列させ得て、

バッテリー2が上昇ストローク中にバッテリー収納空所の開口縁と干渉する不都合を回避することができる。

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【0034】

かように2個一組のバッテリーガイド手段21を、同じく2個一組の車体フロア5のロケットホール7b, 8bの近くに配置させるに際し本実施例においては、

これらロケットホール7b, 8bが車体フロア5の前側部分において車幅方向両側に位置することから、バッテリーガイド手段21を図5に示すごとく、バッテリー2の前端に近い箇所でその車幅方向両側に設置する。

【0035】

かように配置するバッテリーガイド手段21はそれぞれ、図6～8に明示する構成のロケットピンにより構成する。

つまり、バッテリー2のバッテリーフレーム2aにブラケット24を介してロケットピン本体25を設け、このロケットピン本体25をブラケット24から上方へ突出させる。

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バッテリー2の上昇中、ロケットピン本体25が貫入するロケットスリーブ26をフロントサイドメンバ7(8)に設ける。

【0036】

かかるバッテリーガイド手段21によれば、バッテリー2の上昇中、これに設けたロケットピン本体25が図6, 7に示すごとく、フロントサイドメンバ7(8)に設けたロケットスリーブ26内に貫入し、上昇中のバッテリー2を車両前後方向および車幅方向に拘束する。

よってガイド手段21は、バッテリー2を車体フロア5の下面における下向きバッテリー収納空所に対し高精度に整列させた状態で車両上下方向に案内し、バッテリー2が上昇ストローク中にバッテリー収納空所の開口縁と干渉する不都合を回避することができる。

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【0037】

また本実施例においては、バッテリーガイド手段21を図5に示すごとく、バッテリー2の前端に近い箇所でその車幅方向両側に設けることにより、車体フロア5の組み立て時高精度基準位置であった車体フロア前側部分のロケットホール7b, 8bに近接配置したため、

バッテリー2を車体フロア5の下面における下向きバッテリー収納空所に対し一層高精度に整列させておくことができ、上記の作用効果を更に顕著なものにすることができる。

【0038】

＜ねじ式ロック機構の構成＞

上記したロケットピン式バッテリーガイド手段21による案内下で図1～3および図5に示すごとく車体フロア5の下側における取り付け位置まで上昇させたバッテリー2を車体フロア5の下側にロックして取り付けるためのねじ式ロック機構22を以下に詳述する。

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【0039】

このねじ式ロック機構22を本実施例においては、図5に示すように左側フロントサイドメンバ7と左側リヤサイドメンバ11との左側前後サイドメンバ結合部7a、および右側フロントサイドメンバ8と右側リヤサイドメンバ12との右側前後サイドメンバ結合部8aよりも車両前後方向前方には6個、これら左右のサイドメンバ結合部7a, 8aよりも車両前後方向後方には2個、それぞれ設ける。

【0040】

前側における6個のねじ式ロック機構22は、そのうちの4個を、バッテリー2（バッテリーフレーム2a）の前側における車幅方向両側にそれぞれ2個ずつ配置して、バッテリー2の前側に

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における車幅方向両側をフロントサイドメンバ7,8に取り付けるようになし、

残りの2個を、バッテリー2（バッテリーフレーム2a）の車両前後方向前端に車幅方向へ相互離間させて配置し、バッテリー2の前端をフロントサイドメンバ7,8およびトンネル部材6間の橋絡部材15,16に取り付けるようになる。

後側における2個のねじ式ロック機構22は、バッテリー2（バッテリーフレーム2a）の車両前後方向後側における車幅方向両側にそれぞれ配置して、バッテリー2の後側における車幅方向両側をリヤサイドメンバ11,12に取り付けるようになる。

【0041】

ここで、ねじ式ロック機構22を左右の前後サイドメンバ結合部7a,8aより前方に多く（6個）配置し、左右の前後サイドメンバ結合部7a,8aより後方に少なく（2個）配置した理由を説明する。

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【0042】

本実施例のようにバッテリー2を車体フロア5の下側に取り付ける場合、バッテリー2の厚さ（車両上下方向寸法）を、同方向における確保スペースの関係で、あまり大きくすることができないことから、また、バッテリー2の車幅方向における寸法（バッテリー2の幅）も、バッテリー2が車幅を越えてはみ出すのを許容し得ないことから、

電動車両の要求が満足されるようバッテリー2の大容量化を実現しようとする、バッテリー2の車両前後方向における寸法（バッテリー2の長さ）が必然的に大きくなる。

【0043】

かように大容量化のため長大となったバッテリー2を車体フロア5の下側に配して取り付けると、図5に示すようにバッテリー2が、左フロントサイドメンバ7と左リヤサイドメンバ11との間における左側の前後サイドメンバ結合部7a、および、右フロントサイドメンバ8と右リヤサイドメンバ12との間における右側の前後サイドメンバ結合部8a分の双方に跨って車両前後方向に延在することになる。

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【0044】

ところで、左右の前後サイドメンバ結合部7a,8aを挟んで、これよりも前方における車体フロア5の前側部分には、乗員保護の目的などに叶うよう十分な強度を持たせてあるが、左右の前後サイドメンバ結合部7a,8aよりも後方における車体フロア5の後側部分は、車体フロア前側部分ほどの強度が要求されないことから、車体軽量化のために車体フロア前側部分よりも低強度に構成されている。

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【0045】

従来のように、かかる車体フロア前側部分および車体フロア後側部分間における強度差を考慮することなく、バッテリー2の車体フロア5に対する取り付け点を、バッテリー2の車幅方向両側においてそれぞれ等分配置するのでは、

低強度な車体フロア後側部分に対するバッテリー2の取り付け強度分担割合が、高強度な車体フロア前側部分に対するバッテリー2の取り付け強度分担割合と同じになったり、これよりも大きくなることもある。

【0046】

このように低強度な車体フロア後側部分に対するバッテリー2の取り付け強度分担割合が、高強度な車体フロア前側部分に対するバッテリー2の取り付け強度分担割合以上になると

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、低強度な車体フロア後側部分が、車両上下方向における変形に弱いことから、車体フロア5に対するバッテリー2の取り付け面精度を確保し難くなって、バッテリー2の取り付けを自動化するときの妨げになるだけでなく、バッテリー2に変形荷重が加わったり、バッテリー2の支持姿勢が不安定になるなどの弊害も及ぶ。

【0047】

そこで本実施例においてはバッテリー2の取り付け強度を、低強度な車体フロア後側部分よりも、高強度な車体フロア5の前側部分で多く分担させるようにし、これにより、車体フロア5に対するバッテリー2の取り付け面精度を確保し易くなって、バッテリー2の取り付けを容易に自動化し得るようになすと共に、バッテリー2に変形荷重が加わったり、バッテリー2

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の支持姿勢が不安定になるなどの問題を生ずることのないようにする。

【0048】

そのため本実施例においては、車体フロア5に対するバッテリー2の取り付けを司るねじ式ロック機構22を図5につき上述した通り、左右の前後サイドメンバ結合部7a, 8aより前方に多く（6個）配置し、左右の前後サイドメンバ結合部7a, 8aより後方に少なく（2個）配置する。

これによりバッテリー2は、左右の前後サイドメンバ結合部7a, 8aより前方における6個のねじ式ロック機構22で高強度な車体フロア5の前側部分に取り付け、左右の前後サイドメンバ結合部7a, 8aより後方における2個のねじ式ロック機構22で低強度な車体フロア5の後側部分に取り付けることとなる。

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【0049】

8個のねじ式ロック機構22は全て同様な構成とするため、バッテリー2（バッテリーフレーム2a）の前端部において車幅方向両側に配置したねじ式ロック機構22につき、その詳細構造を以下に説明する。

図9, 10はそれぞれ、ねじ式ロック機構22の全体構造を示し、図9は、このねじ式ロック機構22をアンロック状態で、また図10は、このねじ式ロック機構22をロック状態でそれぞれ示す。

そして図11, 12はそれぞれ、図9, 10に示すねじ式ロック機構22の要部を分解して示す斜視図である。

【0050】

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図9, 10に全体を示すねじ式ロック機構22は、車体フロア5（フロントサイドメンバ7, 8）に固着したロックプレート27との共働によりバッテリー2を車体フロア5の下側取り付け位置に着脱自在にロックするもので、

そのためロックプレート27には、矩形開口27aを穿設すると共に、その中央に配して円形開口27bを穿設する。

ロックプレート27を車体フロア5に固着するに際しては、ロックプレート27の四隅における隅角孔27cに挿通したボルトなどの緊締手段により、ロックプレート27を対応する側のフロントサイドメンバ7（8）に取着する。

【0051】

ねじ式ロック機構22は、バッテリー2（バッテリーフレーム2a）に取着したロックベース31と、これに取り付けたボルト32と、これに螺合したロックナット33とを主たる構成要素とする。

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ボルト32は、ロックベース31に回転自在に挿通すると共に、図9～11におけるボルト32の下端に一体成形したボルトヘッド（図示せず）で、図9～11の上方へ抜け止めする。

【0052】

上記のごとくロックベース31に抜け止めして回転自在に設けたボルト32は、上記抜け止め端部と反対側の端部にロックナット33を螺合して具える。

このロックナット33は、そのねじ込み方向に見て矩形など四角形断面のナットとし、その中央に、ボルト32へねじ込むための雌ねじを有する構成とする。

【0053】

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そして図9～11に示すように、ロックベース31の中心円形ボス部31aには、ロックナット33の回転を図9に示す弛緩方向制限位置であるアンロック位置、および、図10, 11に示す緊締方向制限位置であるロック位置間に制限する2個のストッパ31b, 31cを設ける。

【0054】

ロックプレート27に設けた矩形孔27aおよび円形孔27bのうち、前者の矩形孔27aは、図9に示すアンロック位置にあるロックナット33の通過を、その通過方向と直交する全方向に正確に位置決めした状態で許容するものとし、後者の円形孔27bは、ロックベース31に設けた中心円形ボス部31aの嵌合を許容するものとする。

ただし円形孔27bの直径は、図10, 11に示すロック位置にあるロックナット33の通過を許容しない大きさとする。

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【0055】

なおロックナット33には、その挿入通過方向先端の長辺側隅角をそれぞれ面取りしてテーパ面33aを、また短辺側隅角をそれぞれ面取りしてテーパ面33bを形成する。

これらテーパ面33a, 33bはそれぞれ以下のように機能する。

【0056】

つまり、バッテリーガイド手段21は前記したごとく、バッテリー2をその上昇ストローク中、横方向に位置決めして、バッテリー収納空所に対し整列させるが、この整列だけでは、コネクタユニット23を構成する車体側コネクタ部材およびバッテリー側コネクタ部材の嵌合部を相互に正しく芯だしすることができない。

かかる芯だし不良があると、両コネクタ部材の相互嵌合部に、嵌合方向を横切る方向の横負荷を掛けてコネクタユニット23の耐久性を低下させるだけでなく、コネクタ部材の相互嵌合部に部分的に隙間を生じさせてスパークが発生する原因となる。

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【0057】

ところで本実施例においては、ロックナット33をロックプレート27の矩形孔27aに挿入方向へ通過させようとするとき、ロックナット33のテーパ面33a, 33bが矩形孔27aの開口縁に衝接して当該矩形孔27aの開口縁との共働により、ロックナット33をロックプレート27の矩形孔27a内に導きつつこの矩形孔27a内に嵌合させる。

【0058】

このとき、ロックナット33がロックプレート27の矩形孔27a内に隙間無く密に嵌合されることから、バッテリー2を、コネクタユニット23のバッテリー側コネクタ部材が車体側コネクタ部材に対し正確に芯だしされるよう位置決めすることができ、

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両コネクタ部材の相互嵌合部に、嵌合方向を横切る方向の横負荷が作用することがなく、コネクタユニット23の耐久性が低下したり、コネクタ部材の相互嵌合部に部分的に隙間が生じてスパークが発生するという問題を回避することができる。

【0059】

従って、ロックナット33のテーパ面33a, 33b、および、これらと共働するロックプレート27の矩形孔27a（その開口縁）は、コネクタユニット23のバッテリー側コネクタ部材と車体側コネクタ部材とが相互に芯だしされるようバッテリー2を車体フロア5に対し水平方向に位置決めする位置決め部の用をなし、

結果として、コネクタユニット23のバッテリー側コネクタ部材および車体側コネクタ部材間を芯だしするためのコネクタ部材芯だし手段を構成する。

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【0060】

次に図11, 12をも参照しつつ、ボルト32の緊締方向（本実施例では右ねじとする）回転時および弛緩方向回転時に、ロックナット33を同方向へ強制的に連れ回して、図10, 11に示す緊締方向制限位置（ロック位置）および図9に示す弛緩方向制限位置（アンロック位置）に回転させるためのロックナット連れ回し機構を詳述する。

【0061】

図11, 12に明示するごとく、ロックナット33をねじ込むボルト32の先端部外周に複数個の軸線方向溝32aを円周方向等間隔に形成することにより、当該ボルト32の先端部を非円形断面形状となす。

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かかるボルト32の先端部に図9, 10のごとくに嵌着してロックナット強制連れ回し部材34を設ける。

【0062】

このロックナット強制連れ回し部材34は、板状部材34aと、これに一体成形した2個の脚部34bとで構成する。

板状部材34aの中心に、ボルト32の上記先端部非円形断面形状に対応する非円形孔34dを穿ち、この非円形孔34dをボルト32の先端部に摺動自在に嵌合することにより、ロックナット強制連れ回し部材34をボルト32の先端部に回転係合させて軸線方向スライド可能に設ける。

【0063】

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ロックナット強制連れ回し部材34は、ボルト32の先端部に遊嵌したバネ35などの弾性手段でロックナット33に向け附勢し、このため、ロックナット強制連れ回し部材34から遠いバネ35の端部が着座するバネ座36をボルト32の先端部に係着して設ける。

バネ35などの弾性手段でロックナット33に向け附勢されるロックナット強制連れ回し部材34の脚部34bにそれぞれ、ロックナット33の前記した長辺側テーパ面33aとの共働により以下のカム作用を生起する平坦カム面34cを設定する。

【0064】

ロックナット強制連れ回し部材側平坦カム面34cは、ボルト32の回転時にこれと一体回転するロックナット強制連れ回し部材34が平坦カム面34cをバネ35の弾力でロックナット長辺側テーパ面33aに押圧されることにより、ロックナット33を連れ回し得るよう傾斜させるが、以下の作用も可能になるような傾斜角とする。

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つまり、ロックナット33がストッパ31bまたは31cにより対応方向制限位置に抑止された後は、ロックナット強制連れ回し部材34が平坦カム面34cにおいてロックナット長辺側テーパ面33aを乗り越えつつ、また、この乗り越えに伴ってバネ35を圧縮しつつロックナット33から遠ざかる方向へストロークしながら、ロックナット33に対し相対回転してロックナット連れ回し力を解放し得るよう、ロックナット強制連れ回し部材側平坦カム面34cの傾斜角を決定する。

【0065】

バネ35などの弾性手段でロックナット33に向け附勢されるロックナット強制連れ回し部材34のストローク限界位置は、ボルト32の先端部外周に設けた軸線方向溝32aの長さにより規定する。

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軸線方向溝32aの長さを決定するに際しては、ボルト32の緊締方向回転によりロックナット33が図10,11のロック位置にされて緊締方向ストロークを開始した後ただちに、ロックナット強制連れ回し部材34が上記のストローク限界位置となつてここに止まり、ロックナット33が更に緊締方向ストロークを行うとき、ロックナット33がロックナット強制連れ回し部材34の脚部34bから離れるよう、軸線方向溝32aの長さを決定する。

【0066】

<ねじ式ロック機構の作用>

上記の構成になるねじ式ロック機構22は、ロックベース31を前記した通りバッテリー2（バッテリーフレーム2a）に取着してバッテリー2の側に設け、ロックプレート27を車体フロア5に取着して車体側に設けることにより実用し、

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バッテリー2を車体フロア5の下側における下向き開口付きバッテリー収納空所内に着脱自在に収納してロックするに際し、ねじ式ロック機構22はロックプレート27との共働により以下のように当該ロック機能を果たす。

【0067】

先ず、バッテリー取り付け時のロック作用を図13～15に基づき説明する。

バッテリー2の取り付けに際しては、ボルト32の図13(a)に矢印で示す弛緩方向への回転によりロックナット33が、後で詳述するようにロックナット連れ回し部材34により連れ回されて、ストッパ31bにより図9および図13(a)に示す弛緩方向制限位置（アンロック位置）されている。

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【0068】

ここでバッテリー2を車体フロア5の下面における下向き開口付きバッテリー収納空所内に上昇させると、ロックナット33がテーパ面33a, 33bとロックプレート矩形孔27aとの前記した共働により、ロックプレート矩形孔27aに対し芯だしされつつ、図9および図13(a)に示すごとくロックプレート矩形孔27aに通過すると共に、ロックベース31の中心円形ボス部31aがロックプレート円形孔27bに陥入して、ロックナット33がバッテリー収納空所内に位置し、ロックベース31がロックプレート27の外部露出下面に着座する。

【0069】

この状態でボルト32をナットランナなどにより図13(b)に矢印で示す緊締方向に回転させると、ボルト32と共に回転するロックナット強制連れ回し部材34が平坦カム面34cおよ

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びテーパ面33aを介してロックナット33を連れ回し、このロックナット33をストッパ31cとの衝接により、図10、図13(b)および図14(a)に示す緊締方向制限位置（ロック位置）となす。

しかし、ロックナット33はこの緊締方向制限位置（ロック位置）を越えてロックナット強制連れ回し部材34により連れ回されることがなく、図10、図13(b)および図14(a)に示すごとく当該回転位置に止まる。

【0070】

ところでロックナット強制連れ回し部材34は、図15(a)の状態から同図(b)に示すように、平坦カム面34cにおいてバネ35に抗しロックナット長辺側テーパ面33aを乗り越えつつ、また、この乗り越えに伴ってバネ35を圧縮しつつロックナット33から遠ざかる方向にストロークしながら、ロックナット33に対し相対回転し得てロックナット連れ回し力を解放することができる。

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【0071】

このため、ロックナット強制連れ回し部材34の存在によってもボルト32は緊締方向への更なる回転を妨げられない。

ボルト32を更に緊締方向へ回転をさせると、ロックナット33は図14(b)に示すごとく、緊締方向制限位置（ロック位置）を保って同図の矢印方向へねじ込まれ、同図に示す下限位置のロックナット強制連れ回し部材34（脚部34b）から離れつつ、ロックベース31に接近する方向へストロークする。

これによりロックナット33およびロックベース31は、両者間にロックプレート27を挟圧し、バッテリー2をバッテリー収納空所内に収納した位置にロックして保持することができる。

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【0072】

次に、バッテリー取り外し時のアンロック作用を図16～18に基づき説明する。

バッテリー2をバッテリー収納空所から取り出すためロック解除するに際しては、上記したロック状態においてボルト32をナットランナなどで図16(a)に矢印で示す弛緩方向へ回転させる。

【0073】

当初はロックナット33が図16(a)に示すように、図14(b)と同じロック用ねじ込みストローク位置にあって、下限位置のロックナット強制連れ回し部材34（脚部34b）から離れているため、ボルト32と共に弛緩方向に回転されるロックナット強制連れ回し部材34は、ロックナット33に対し同方向へ相対回転可能であり、ボルト32の上記弛緩方向回転を何ら妨げない。

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【0074】

かかるボルト32の弛緩方向回転は、ロックナット33をして図16(b) および図17(b)に矢印で示す緩み方向へストロークさせ、直ちに図18(a)に示すごとく下限位置のロックナット強制連れ回し部材34（脚部34b）に接触させる。

しかし図18(a)に示す接触状態では未だ、ロックナット強制連れ回し部材34（脚部34b）がロックナット33のねじ込み方向後端面上に乗っていて、ロックナット連れ回し力を発生し得ないため、ロックナット強制連れ回し部材34（脚部34b）はボルト32と共にロックナット33に対し弛緩方向へ相対回転する。

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【0075】

かかる相対回転によりロックナット強制連れ回し部材34は図18(b)に示すごとく、脚部34bの平坦カム面34cがロックナット長辺側テーパ面33aと対向する回転位置となる。

この時バネ35がロックナット強制連れ回し部材34を図18(b)の矢印方向に附勢して、ロックナット強制連れ回し部材34を、その平坦カム面34cがロックナット長辺側テーパ面33aに対向したストローク位置となす。

以上により図16(b) および図17(a)に示すごとく、ロック時と同じ緊締方向制限位置のままのロックナット33と、ロックナット強制連れ回し部材34とは、テーパ面33aおよび平坦カム面34cの共働により回転係合された状態となる。

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【0076】

この状態でボルト32を更に弛緩方向に回転させると、ボルト32と共に回転するロックナット強制連れ回し部材34が平坦カム面34cおよびテーパ面33aを介してロックナット33を連れ回し、このロックナット33を図17(b)に示すごとくストッパ31bと衝接する弛緩方向制限位置（アンロック位置）まで強制回転させる。

しかし、ロックナット33はこの弛緩方向制限位置（アンロック位置）を越えてロックナット強制連れ回し部材34により連れ回されることがなく、図17(b)に示すごとく当該回転位置に止まる。

【0077】

ところでロックナット強制連れ回し部材34は、図18(b)の状態から同図(a)に示すように、平坦カム面34cにおいてバネ35に抗しロックナット長辺側テーパ面33aを乗り越えつつ、また、この乗り越えに伴ってバネ35を圧縮しつつロックナット33から遠ざかる方向へストロークしながら、ロックナット33に対し相対回転し得てロックナット連れ回し力を解放することができる。

【0078】

このため、ロックナット強制連れ回し部材34の存在によってもボルト32は弛緩方向への更なる回転を妨げられない。

ボルト32を弛緩方向へ更に回転をさせると、ロックナット33は図17(b)の弛緩方向制限位置（アンロック位置）を保って同図の矢印方向へ緩みストロークを行い、バネ35を圧縮しつつロックナット強制連れ回し部材34（脚部34b）を同方向へ変位させながら、ロックベース31から遠ざかる方向へストロークする。

【0079】

これにより、ロックナット33およびロックベース31によるロックプレート27の挟圧力（ロック）が解除され、ロックナット33をロックプレート27の矩形孔27aに通過させつつ、またロックベース31の中心円形ボス部31aをロックプレート27の円形孔27bから抜きながら、バッテリー2をバッテリー収納空所内から取り外すことができる。

【0080】

<コネクタユニット>

なお、バッテリー2は車体側電装系との間の電気接続を司るコネクタ構造が不可欠であり、そのため本実施例においては図5につき前述したごとくコネクタユニット23を設ける。

このコネクタユニット23は、図19, 20に示すように、車体側電装系に接続された車体側のコネクタ部材41と、バッテリー2に接続されたバッテリー側のコネクタ部材42とで構成する。

【0081】

ところで本実施例のように、バッテリー2を、前記したロケットピン式バッテリーガイド手段21による案内下で図1～3および図5に示すとき車体フロア5の下側における取り付け位置まで上昇させ、この位置でバッテリー2を上記したねじ式ロック機構22により車体フロア5の下側におけるバッテリー収納空所内にロックして取り付ける場合、

車体側のコネクタ部材41およびバッテリー側のコネクタ部材42より成るコネクタユニット23は、バッテリー2の上昇ストローク中にバッテリー側コネクタ部材42が車体側コネクタ部材41に電気接続状態に嵌合されるよう構成、配置するのが、バッテリー2の取り付けを自動化する上で大いに有利であり、本実施例においてもコネクタユニット23を、図19, 20につき後述するごとく、そのように構成する。

【0082】

しかして、コネクタユニット23が、2個一組のバッテリーガイド手段21（図5参照）の双方から遠く離れているときは勿論のこと、これらバッテリーガイド手段23のうちの一方のみから遠く離れているときも、

前記した車体組み立て誤差の累積により、コネクタユニット23を成すバッテリー側コネクタ部材42と、車体側コネクタ部材41との相対位置ずれが発生して、バッテリー側コネクタ部材42と車体側コネクタ部材41との相互嵌合部に芯ずれを生ずる。

【0083】

かかるバッテリー側コネクタ部材42および車体側コネクタ部材41間の芯ずれは、両コネクタ部材41,42の相互嵌合部に、嵌合方向を横切る方向の横負荷を掛けてコネクタユニット23の耐久性を低下させるだけでなく、コネクタ部材41,42の相互嵌合部に部分的に隙間を生じさせてスパークの発生原因となる。

【0084】

そこで本実施例においては、バッテリー側コネクタ部材42および車体側コネクタ部材41により構成されるコネクタユニット23を図5に示すように、バッテリー2の車幅方向両側に設けたバッテリーガイド手段21の双方に対し近い位置、つまり、これらバッテリーガイド手段21から等距離の中間位置に配置する。

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【0085】

かかる配置のコネクタユニット23は、バッテリーガイド手段21の双方に対し近く、車体側コネクタ部材41およびバッテリー側コネクタ部材42の位置が車体組み立て誤差の累積による影響を最小限にされて高精度である。

従ってこれらコネクタ部材41,42の相互嵌合部における芯ずれを殆どなくすることができ、両コネクタ部材41,42の相互嵌合部に、嵌合方向を横切る方向の横負荷が作用することが無く、コネクタユニット23の耐久性が低下したり、コネクタ部材41,42の相互嵌合部に部分的に隙間が生じてスパークが発生するという問題を解消することができる。

【0086】

なお上記の趣旨に照らせば、コネクタユニット23は車体フロア5の車幅方向中程に配置することになる。

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ところで車体フロア5の車幅方向中程には、車体フロア5の強度確保と、車体側電装系のワイヤハーネス配線用などのため、トンネル部材6が設けられ、車両前後方向に延在する中高形状のトンネル部が設定されている。

そのため本実施例においてはコネクタユニット23を、図5,19,20に示すように車体フロア5の車幅方向中程で車両前後方向に延在する中高形状のトンネル部材6（トンネル部）内に配置する。

【0087】

この配置に当たっては、図5に明示するごとく車体フロア5のトンネル部材6（トンネル部）と、バッテリー2（バッテリーフレーム2a）の前端面とが交差する箇所のトンネル部材6（トンネル部）内にコネクタユニット23を配置するのが良い。

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【0088】

そして図19,20に示すごとく、コネクタユニット23を構成する車体側コネクタ部材41およびバッテリー側コネクタ部材42のうち、車体側コネクタ部材41は上記の箇所において車体フロア5のトンネル部材6（トンネル部）内にブラケット43を介し取り付け、バッテリー側コネクタ部材42は上記の箇所においてバッテリー2（バッテリーフレーム2a）の前端面にブラケット44を介し取り付ける。

【0089】

なお、車体側コネクタ部材41およびバッテリー側コネクタ部材42は、バッテリー2の上昇ストローク中に（好ましくは上昇ストローク端で）電気接続状態に相互嵌合されるような取り付け位置とするのは勿論であるが、

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ねじ式ロック機構22によるバッテリー2の取り付け後、下側におけるバッテリー側コネクタ部材42がトンネル部材6（トンネル部）から下方へ張り出すことのないよう車体側コネクタ部材41およびバッテリー側コネクタ部材42の取り付けレベルを決定するのが良い。

【0090】

<実施例の効果>

上記した本実施例のバッテリー取り付け構造によれば、バッテリー2を車体フロア5の下側にロックして取り付けるためのねじ式ロック機構22を、図5に示すように左側前後サイドメンバ結合部7aおよび右側前後サイドメンバ結合部8aよりも車両前後方向前方には6個、これら左右の前後サイドメンバ結合部7a,8aよりも車両前後方向後方には2個、それぞれ設け

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