

substantially completed between charge pulses during the regulation mode. Automatic protection of the controller and the load is achieved by rapidly disconnecting the battery and/or load in response to specified conditions. The photovoltaic array is disconnected from the battery at night to prevent battery discharge into the array. Equalization of the battery is performed automatically, at a voltage level slightly higher than the regulated voltage, after a predetermined number of days or if the battery voltage falls below a predetermined level.

5635817

VEHICLE BATTERY CHARGING SYSTEM

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An emergency vehicle battery charging device is utilized to charge a depleted battery of a first vehicle from the engine system of a running second vehicle at a predetermined maximum charging current above that used for a trickle charge and below the typical starting current of either vehicle. The battery charging device includes a control housing having a first pair of cables extending therefrom which is rigidly connected to the battery terminals of one of the vehicles and a second pair of cables extending therefrom for being selectively connected to the battery terminals of the other of the vehicles. The cables include a current limiting device to prevent any exceeding of the predetermined maximum charging current which is preferably with in a range of about 40 to 60 amps. The control housing includes a polarity detecting device to verify the correct polarity of the connection of the terminals of the two batteries and to electrically disconnect the two batteries of there was an incorrect polarity. When using the emergency vehicle battery charging device, the dead battery of a first vehicle, which is not started or running, should be charged through the engine system of the second vehicle, which is running, in about three to five minutes.

5635819

METHOD OF CHARGING A BATTERY

Ryberg Bertil Torslanda, SWEDEN assigned to AB Volvo Penta

PCT No. PCT/SE93/00411 Sec. 371 Date Dec. 14, 1994 Sec. 102(e) Date Dec. 14, 1994 PCT Filed May 11, 1993 PCT Pub. No. WO93/23906 PCT Pub. Date Nov. 25, 1993. A method and a device for charging a rechargeable battery by means of a generator which delivers regulating voltage from a voltage regulator receiving a value indicative of the battery voltage in order to regulate the generator in response to the voltage in relation to predetermined nominal charging voltage. A voltage drop may be introduced between the battery and the regulator in dependence of the operational condition of the battery, the voltage drop reducing the battery the voltage value received by the regulator. In accordance with the invention, the voltage drop is introduced between the positive terminal of the battery and the regulator by connection of a diode which is forward biased. The voltage drop is introduced in dependence of the battery voltage.

5635820

BATTERY CHARGING CONTROL DEVICE AND METHOD FOR ACCURATELY DETECTING A CHARGING END STATE

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The present invention discloses a controlling device and a method for charging a battery for an electric vehicle which improves the battery consumption ratio and its stability. The charge controlling device includes a battery temperature sensing member, a battery voltage sensing member, a current sensing member, a charging mode switch, a charge control device. When the predetermined charging mode is a constant current/constant voltage method, if the battery temperature is above the maximum predetermined temperature, a charging end signal is produced. If the battery temperature is below the minimum predetermined temperature, the full-charging state is determined in accordance with the measured current value and the charging end signal is produced. On the other hand, when the predetermined charging mode is a constant current charging mode, if the battery temperature is below the minimum predetermined temperature, the battery voltage drop state is determined. If the battery voltage drop occurs below the predetermined voltage, the charging end signal is

produced in accordance with the charging limit time, and a battery charging member.

5635842

METHOD OF ESTIMATING RESIDUAL CAPACITY OF BATTERY

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In estimating the residual capacity of a battery according to the maximum output estimating process, a reference point is established in advance at the intersection of a plurality of current/voltage characteristic linear curves corresponding to various residual capacities of the battery or in an area in the vicinity of the intersections of the curves. A current/voltage characteristic linear curve is determined so as to pass through the reference point and a measured operating point of the battery which corresponds to the present discharging current and output voltage values measured when the battery is discharged. Then, a maximum transfer power value of the battery is determined from the current/voltage characteristic linear curve thus determined, and the present residual capacity of the battery is estimated from the maximum transfer power value.

5637979

RECHARGEABLE BATTERY CHARGING METHOD AND APPARATUS

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A plurality of series connected rechargeable batteries are charged by detecting battery voltages and controlling charging current. Normal charging is performed until any one battery voltage reaches a prescribed voltage. After any one battery voltage reaches the prescribed voltage, all batteries are charged such that a charging current is controlled to keep each battery voltage from exceeding the prescribed voltage.

5637980

BATTERY CHARGING/DISCHARGING SWITCHING CONTROL PROTECTIVE CIRCUIT

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A battery charging/discharging switching control protective circuit including a charging discharging loop, a constant current control circuit connected to the input terminal of the charging discharging loop, a microprocessor control circuit, a time series control circuit with its input terminal connected to the microprocessor control circuit and its output terminal connected to the switch of the charging discharging loop and the switches of the constant current control circuit, the time series control circuit being controlled by the microprocessor control circuit to control the transistor of the charging discharging loop in charging or discharging the battery at a constant current value, and to control the switches of the charging discharging loop in turning off the transistor at the beginning or the end of the charging or discharging operation, so as to prevent the occurrence of electric arc, sparks, transient electric current and voltage during the switching of the switches of the charging discharging loop.

5637981

METHOD FOR CHARGING A SECONDARY BATTERY AND CHARGER USED THEREFOR USING CONSTANT CURRENT AND CONSTANT VOLTAGE

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A secondary battery charging method and a charger used therefor, in which the method uses a constant current and a constant voltage such that the secondary battery is first charged with the constant current until the terminal voltage of the battery becomes a reference voltage higher than the full charging voltage for the battery and then further charged with the constant voltage which is equal to the full charging voltage. These two charging operations are switched by using various kinds of detection and control circuits, so that the secondary battery is properly charged in a short time. Further, the