

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**

Shiska Theodor Clinton, PA, UNITED STATES

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**

Park Hae-Woo Ulsan shi, KOREA assigned to Hyundai Motor Company

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