Apparatus and methods for quickly and safely recharging and magnetically balancing a series of batteries or battery groups to their full charge capacity. The battery charging system includes a multi-output transformer having an impedance in the primary, a secondary with multiple outputs, and circuitry for charging each of the batteries or battery groups whereby the portion of charging current flowing from each of the multiple outputs to each of the batteries or battery groups relates inversely to the voltage of each of the batteries or battery groups.

5646505

METHOD OF CHARGING A BATTERY USING ASYMMETRICAL CURRENT

Melnikov Izot F; Nikolayev Anatoliy G St Petersburg, assigned to Vista International Inc

A method of charging a discharged battery by creating a level direct current carrier and a riding alternating current charging vector which rides on the level direct current, the alternating current having a repeating waveform comprising two phase displacements per wavelength. The phase displacements comprise a first amplitudinal increase and a second amplitudinal increase, a first amplitudinal decrease and a second amplitudinal decrease, the second amplitudinal increase beginning substantially at the same time that the phase angle of the alternating current charging vector returns to a zero angle, the second amplitudinal decrease ending substantially at the same time that the phase angle of the alternating current charging vector returns to a forty five degree angle; cyclically repeating the waveform at a constant angular frequency,phase period and amplitude; and applying such alternating current through battery terminals for a sufficient period of time for the level direct current carrier to rise substantially to the original direct current voltage of the battery in accordance with the affectivity of the alternating current charging vector and to charge the battery.

5646506

METHOD OF CHARGING A SECONDARY BATTERY AND AN APPARATUS THEREFOR

Suzuki Takeshi Koganei shi, Tokyo, JAPAN

A method of charging a secondary battery by applying the voltage pulses higher than a rated terminal voltage of the secondary battery at predetermined intervals so that a charging current intermittently flows through the secondary battery while the peak value or pulse width of the charging current is controlled as the voltage measured across the terminals of the secondary battery at the intervals when the the voltage pulses are not applied steppedly is made higher.

5646507

BATTERY CHARGER SYSTEM

Timmons John B; Boden David P; Stahl Larry D Winston Salem, NC, UNITED STATES assigned to Douglas Battery Manufacturing Company

A direct current power source for powering an electric vehicle. The power source has a rechargeable battery and a battery charger control unit for providing a charge to the battery with an amount of electrical energy which corresponds to the amount of electrical energy discharged since the previous charge plus a selected additional amount of charge to slightly overcharge the battery during a fullrestoration. The battery charger control unit includes a charge monitor for determining the flow of electrical energy into and out of the battery and a charge controller for controlling a battery charger. In one embodiment, the battery and the battery charger control unit are integrated. In the preferred embodiment, the charge controller includes means for controlling the battery charger in accordance with the amount of electrical energy charged to and discharged from the battery as measured by the charge monitor. In addition, the charge controller may include means for controlling a function of the vehicle in accordance with the amount of electrical energy charged to and discharged from the battery as measured by the charge monitor.