recharging system receiving current from a power supply and delivering current through a rectifier to a battery and a load, the system having a low voltage disconnect switch capable of interrupting current to the battery. A current shunt is provided for generating a first signal having a first value representative of the current flowing through the rectifier. A current shunt is provided for generating a second signal having a second value representative of the current flowing through the load. A microprocessor is provided for calculating a third value, the third value being equal to the second value subtracted from the first value. A microprocessor is also provided for generating a third signal indicative of thermal runaway when the third value exceeds a predetermined value. A switch for interrupting current to the battery when the third signal exceeds the predetermined value may also be provided.

5642270

BATTERY POWERED ELECTRIC VEHICLE AND ELECTRICAL SUPPLY SYSTEM

Green Ross Marti; Kellaway Michael John Cambridge, UNITED KINGDOM assigned to Wavedriver Limited

PCT No. PCT/GB92/01435 Sec. 371 Date Jan. 28, 1994 Sec. 102(e) Date Jan. 28, 1994 PCT Filed Aug. 3, 1992 PCT Pub. No. WO93/02887 PCT Pub. Date Feb. 18, 1993. A charging system for a battery powered electric vehicle operates bidirectionally for charging the battery or for supplying power back to the utility grid at any selected power factor so that load leveling may be effected. A communications link between the utility and the charging system carries control signals and a control system associated with the charging system is responsive to the signals for controlling the charging rate and direction.

5645952

METHOD AND APPARATUS FOR CHARGING AND DISCHARGING ELECTRIC ENERGY

Lampinen Markku; Viitanen Minna; Lamminen Jaakko; Fomino Marina FIN Espoo, FINLAND assigned to Lampinen Markku

PCT No. PCT/FI93/00154 Sec. 371 Date Oct. 13, 1994 Sec. 102(e) Date Oct. 13, 1994 PCT Filed Apr. 13, 1993 PCT Pub. No. WO93/21664 PCT Pub. Date Oct. 28, 1993. A method and apparatus for storing and producing electrical energy in an electrochemical cell, where the cathode is a porous air electrode and the anode is a hydrogen-containing metal hydride. According to the invention, an overpressure is allowed to form inside the porous air electrode during charging, the said pressure preventing the formation of hydrogen bubbles on the metal hydride electrode. The overpressure remains at the desired level because the pores of the air electrode are made so small that the surface tension of the electrolytic solution penetrating into the pores seals the porous air electrode.

5646503

METHOD FOR BALANCING POWER SOURCES AND STRUCTURE THEREFOR

Stockstad Troy L Phoenix, AZ, UNITED STATES assigned to Motorola Inc

A power source balancing circuit balances two power sources such as two battery cells. When the power source balancing circuit is enabled, it compares a current flowing through the first battery cell and a first resistor with a current flowing through the second battery cell and a second resistor. Because the resistance of the first resistor is equal to that of the second resistor, a difference between the two currents indicates a difference between the voltages of the two battery cells. If a current difference larger than a predetermined limit is detected, the battery cell with a higher voltage is discharged through a corresponding discharge resistor by switching on a corresponding switch. The corresponding switch is controlled by a corresponding flip-flop.

5646504

MAGNETICALLY BALANCED MULTI-OUTPUT BATTERY CHARGING SYSTEM

Feldstein Robert S Dobbs Ferry, NY, UNITED STATES

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.