ELSEVIER

Journal of Power Sources 69 (1997) 175–225

JOURNAL OF POWER SOURCES

PatentsALERT

This section contains abstracts of recently issued patents in the United States and published patent applications filed from over 30 countries under the Patent Cooperation Treaty and compiled in accordance with interest profiles developed by the Editors.

Further information about complete patents can be obtained from:

REEDFAX Document Delivery System
275 Gibraltar Road, Horsham, PA 19044, USA

Phone: +1 215 441-4768
Fax:+1 215 441-5463

who offer a 24-hour, 7-days a week service.

See overleaf for details of a special service for readers of

Journal of Power Sources

PII S0378-7753(97)02684-0

LEAD ACID

5547783

VALVE-REGULATED LEAD-ACID BATTERY

Funato Takayuki; Takahashi Katsuhiro Kyoto, JAPAN assigned to Japan Storage Battery Company Limited

The present invention provides a valve-regulated lead-acid battery in which the theoretical capacity (Ah) of the negative active material in the battery is less than that of the positive active material, the amount of a conductive additive, such as carbon, added into the negative active material is in the range of 0.5 weight % to 7.5 weight % of the negative active material, and the conductive additive is carbon, acetylene black, polyaniline, tin powder, tin compound powder, etc. having an average particle diameter of 100 mu or less.

5549990

BATTERY ELEMENT CONTAINING POROUS PARTICLES

Clough Thomas; Grosvenor Victor L; Pinsky Naum Grover Beach, CA, UNITED STATES assigned to Ensci Inc

A battery element comprising a porous substrate optionally having a coating of electrically conductive tin oxide on at least a portion of all three dimensions thereof. The porous substrate is useful in the positive active material of lead acid batteries.

5558960

SEASONAL USE LEAD ACID ELECTRICAL STORAGE BATTERY

Mitchell Howard Clarkston, MI, UNITED STATES assigned to Exide Corporation

A lead-acid battery formed of lead, acidic and basic materials, wherein these materials are in certain ratios by weight. The battery is intended for seasonal use applications, in which the battery may be idle for many months of each year. The battery includes positive and negative battery plates immersed in a sulfuric acid solution. The plates are formed of lead alloys and are coated with positive and negative, respectively, active materials. In addition, the acid solution includes small amounts of Sodium Sulfate that is set in certain proportions to the amount of positive lead oxide materials in the battery.

5561359

DISCHARGE PATH FOR A BATTERY COMPARTMENT OF AN ELECTRIC VEHICLE

Matsuura Masaak; Kuroki Masahiko Saitama, JAPAN assigned to Honda Giken Kogyo Kabushiki Kaisha

Concentration of hydrogen gas generated during a process of electrically recharging a battery of an electric vehicle is maintained by discharging the hydrogen gas during the process. An electric fan is installed inside a control unit box for accommodating a motor, an electric recharger and a control apparatus. The electric fan communicates ambient air to a motor through ducts. The air is further communicated to batteries through a duct and a nozzle member. Air directed by the electric fan during operation of the electric vehicle cools the motor driver and the motor. On the other hand, air communicated by the electric fan during a process of electrically recharging the batteries cools the electric recharger and then flows from the nozzle member to the batteries, blowing off hydrogen gas generated by the batteries during the electrical recharging process.

5563007

METHOD OF ENVELOPING AND ASSEMBLING BATTERY PLATES AND PRODUCT PRODUCED THEREBY

Young James; Keith Larry T; Weerts Daniel E Sunriver, OR, UNITED STATES assigned to Entek Manufacturing Inc

A method of enveloping and assembling positive and negative plates into a group suitable for use in an electrochemical cell by forming at least one row of

alternating positive and negative plates of a predetermined number with the top edges of said plates in longitudinal alignment, enveloping the plates with a separator material by bringing a continuous sheet of separator material into contact with both planar faces of the plates and sealing the separator material along the side and bottom edges of the plates to thereby form a row of enveloped plates interconnected to each other by the separator material, assembling the interconnected row of enveloped plates into a folded group by folding the row in an accordion-like manner, and compressing the folded group into a cube of predetermined size. The product of this method is a group of plates located in interconnected pockets of separator material that has been folded in an accordion-like manner and compressed into a cube of predetermined size.

5565282

BATTERY GANG VENT SYSTEM

Feres Fred F; Hudack Gerald Rochester Hills, MI, UNITED STATES assigned to Exide Corporation

A multiple vent plug assembly for vent ports of an electrical storage battery, the assembly includes a gang vent insert having a base wall and an upstanding peripheral rim defining a pair of side walls and a pair of end walls; an overcap including an inner rib for engagement with the upstanding peripheral rim of the gang vent insert; the insert including first and second parallel partitions extending between the pair of side walls to thereby divide the insert into three vent chambers including end chambers on either side of a center chamber, each chamber having a hollow vent barrel extending downwardly from the base wall and terminating at a drain hole. Third and fourth partitions extend partially between the pair of side walls and a fifth partition extends between and perpendicular to the third and fourth partitions to create, in cooperation with a portion of one of the side walls, a frit area for supporting a flame arrestor of glass frit material, the frit area having a slot therein which opens to atmosphere. The first, second, third and fourth partitions are formed with passageway openings arranged to permit air at atmospheric pressure to enter the center chamber from the end chambers and from the frit area, to thereby create an air lock preventing battery electrolyte from escaping through the drain holes and the frit area vent aperture in the event the battery is tilted to a position where battery electrolyte is at a level above the battery vent ports.

5569552

LEAD-ACID BATTERY HAVING A FLUID COMPARTMENT FOR REDUCING CONVECTION-INDUCED HEAT TRANSFER

Rao Purushothama; Uhlemann Thomas;Kump William H Eagan, MN, UNITED STATES assigned to GNB Technologies Inc

A lead-acid storage battery for starting, lighting and ignition applications is disclosed which minimizes convection-induced, heat transfer from the vehicle underhood environment surrounding the battery to the battery itself and comprises an injection-molded, integral plastic container, or a two-piece container, having a multi-wall configuration in which an inner container includes the cell elements of the battery and at least one outer container spaced from the inner container provides at least one fluid compartment for allowing fluid flow through the fluid compartment to achieve the desired thermal regulation, the fluid flow path being created by a series of spaced fluid baffles.

5582934

ADDITIVES FOR ELECTROLYTIC SOLUTIONS

Steinbrecher Leste North Wales, PA, UNITED STATES assigned to Henkel Corporation

The present invention relates to compositions and methods for improving the performance of lead-acid storage batteries, and reducing corrosion in lead-acid storage batteries, including the plates, terminals, posts, and cables. Compositions of the invention include cathodic inhibitors and solutions of cathodic inhibitors.

5582936

LEAD-ACID BATTERIES WITH OPTIMUM CURRENT COLLECTION AT GRID LUGS

Mrotek Edward N; Kao Wen-Hon Grafton, UNITED STATES assigned to Globe-Union Inc

A grid for a lead acid battery plate with a conductive frame having a top element and a bottom frame element, with conductive wires extending from the bottom element to the top element which includes an enlarged section beneath a current collection lug and being of a size and shape so as to optimize the current flow to the lug. Other features disclosed are the conductive wire shape and spacing so that the amount of conductive material such as lead is reduced where it has been predetermined that the current flow is minimal. In addition, the grid is designed to have equidistant potential points relative to the lug to optimize current flow. The advantage of such a grid is that it maximizes performance of the battery while keeping its weight at a minimum.

5592068

LEAD ACID BATTERY REJUVENATOR

Gregory William; Allen Chester C Irving, TX, UNITED STATES assigned to Gregory William E

A rejuvenator for lead acid batteries powered by a multi-solar cell unit and/or a rectified a.c. source, the output of which is applied to a capacitor. The output of the capacitor is in turn connected across the primary of a transformer. A switching circuit connects and disconnects the primary coil to and from the capacitor to produce in the secondary coil of the transformer a fast rise time current pulse for application to a battery. A positive temperature coefficient resistor is connected in series with an output terminal of the rejuvenator to protect the rejuvenator components in the event the output terminals, through accident or mistake, are connected to battery terminals of opposite polarity.

FUEL CELL

5551955

SOLID OXIDE FUEL CELL AND MANUFACTURING METHOD THEREOF

Taira Hiroaki; Iha Michiaki; Takagi Hiroshi Nagaokakyo, JAPAN assigned to Murata Manufacturing Co Ltd

A solid oxide fuel cell which has a fuel electrode and an air electrode respectively on a first surface and on a second surface of a solid electrolyte. The interface between the solid electrolyte and the fuel electrode, and the interface between the solid electrolyte and the air electrode are roughened. An exemplary way of toughening the interfaces is as follows: a green sheet of solid electrolyte, a green sheet of fuel electrode and a green sheet of air electrode are laminated with the green sheet of electrolyte in the middle; sandpaper is put on each of the green sheet of fuel electrode and the green sheet of air electrode with a plastic film in-between in such a manner that the rough surfaces of the sandpaper face the green sheets of electrode; the laminate of green sheets is press-fixed, whereby the rough surfaces of the sandpaper roughen the interfaces; and the sandpaper and the plastic films are removed.

5554453

CARBONATE FUEL CELL SYSTEM WITH THERMALLY INTEGRATED GASIFICATION

Steinfeld Georg; Meyers Steven; Lee Arthur Southbury, CT, UNITED STATES assigned to Energy Research Corporation

A fuel cell system employing a gasifier for generating fuel gas for the fuel cell of the fuel cell system and in which heat for the gasifier is derived from the anode exhaust gas of the fuel cell.

5554454

SOLID OXIDE FUEL CELL STACK

Gardner Frederick J; Day Michael J; Brandon Nigel; Brownell John Derby, UNITED KINGDOM assigned to Rolls-Royce plc

A solid oxide fuel cell stack includes a core region which comprises a plurality of first modules and a plurality of second modules stacked alternately. Each first module comprises a first distribution member formed from two corrugated ceramic plates which define internal passages for the supply of a first reactant to the fuel cells. The first distribution member is enclosed by a porous support structure which carries the fuel cells on its two parallel surfaces. A plurality of passages are defined between the porous support structure and the first distribution member which distribute and remove the first reactant from the anodes. Each second module comprises a second distribution member formed from two corrugated ceramic plates which define internal passages for the supply of a second reactant to the fuel cells. A plurality of passages are defined between the fuel cells and the second distribution member which distribute and remove the second reactant from the cathodes.

5558948

FUEL CELL ANODE AND FUEL CELL

Doyon Joel Bantam, CT, UNITED STATES assigned to Energy Research Corporation

A nickel anode electrode component comprised of a support member and a porous coherent member formed from a non-sintered nickel alloy constituent. The support member and porous coherent member are laminated together and the nickel anode electrode component is assembled within a fuel cell and formed into an anode electrode in situ within the cell.

5558955

CATHODE REACTANT FLOW FIELD COMPONENT FOR A FUEL CELL STACK

Breault Richard; Martin Ronald G; Roche Robert P; Kline Gregory R Coventry, CT, UNITED STATES assigned to International Fuel Cells Corporation

The reactant flow field on the cathode side of a fuel cell assembly is formed from a plate made from carbon particles that are bonded together by a fluorocarbon polymer binder. The cathode reactant flow field is non-porous, and is hydrophobic due to the presence of the poller binder. The carbon particles are preferably carbon flakes which pack together very tightly, and require only a minor amount of the polymer binder to form a solid plate. The plate will provide cathode reactant flow channels, will conduct electrons and heat and will minimize acid absorption in a fuel cell stack due to its hydrophobic nature.

5561000

GAS DIFFUSION ELECTRODE WITH CATALYST FOR AN ELECTROCHEMICAL CELL WITH SOLID ELECTROLYTE AND METHOD FOR MAKING SUCH AN ELECTRODE

Dirven Paul; Engelen Willy Westerlo, BELGIUM assigned to Vlaamse Instelling Voor Technologisch Onderzoek

Gas diffusion electrode with catalyst for an electrochemical cell with solid electrolyte, in particular for a fuel cell with solid electrolyte, which electrode contains a hydrophobic, porous back support, a non-catalytic intermediate layer which contains electron conductive material and an active catalytic layer which contains bound catalyst particles, characterized in that the intermediate layer contains a mixture of electron conductive material and a proton conductive ionomer, and in that the active layer.

5563003

FUEL CELL AND SUPPLEMENTARY ELECTROLYTE CONTAINER AND METHOD FOR SUPPLEMENTING FUEL CELL WITH ELECTROLYTE

Suzuki Hiroak; Ohtsuka Keizo; Kahara Toshik; Yoshida Tadashi Hitachi, JAPAN assigned to Hitachi Ltd

Molten carbonate type or phosphoric acid type fuel cells and a method for supplementing these fuel cells with an electrolyte are disclosed. A fuel cell having an extended life is provided by scattering a plurality of sealed supplementary electrolyte containers made of a material which is soluble in the electrolyte at elevated temperatures, and supplying the supplementary electrolyte from the dissolved containers to the fuel cell while the cell is working.

5565072

ELECTROCHEMICAL CELL PROVIDED WITH ION EXCHANGE MEMBRANES AND BIPOLAR METAL PLATES

Faita Giuseppe; Manteggaza Claudio Novara, ITALY assigned to De Nora Permelec S p A

A membrane electrochemical cell, in particular a fuel cell, of an improved type comprising a multiplicity of cell elements, each element made up of bipolar plates, current collectors, electrodes and membranes, wherein the function of electric current transmission through the cell elements, the release of heat towards the outside environment, the distribution of electric current to the electrodes and membranes, the removal of heat from the electrodes and membranes and the distribution of the reactants and products are performed by distinct components, in particular bipolar plates for the first two and porous electroconductive collectors for the others. The bipolar plates may have flat surfaces without grooves and are preferably manufactured with aluminum, titanium or alloys thereof, through cheap mass productions techniques; the bipolar plates are used together with collectors provided with deformability, residual resiliency and high porosity. Said collectors advantageously act also as distributors of the gaseous reactants and of the products.

5565279

SYSTEM AND METHOD FOR PROVIDING OPTIMUM CELL OPERATING TEMPERATURES AND STEAM PRODUCTION IN A FUEL CELL POWER PLANT

Fredley Robert R; Margiott Paul R; Parenti Karen L; Scheffler Glenn W Tolland, CT, UNITED STATES assigned to International Fuel Cells Corporation

The cell stack assembly of a fuel cell power plant is provided with a cooling system which provides optimum cell operating temperatures across each cell in the stack and also produces an optimum amount of steam. The cooling system includes at least one bypass through which a fraction of the coolant is fed from the coolant inlet side of the stack to the coolant outlet side of the stack. The bypass ensures that a fraction of the coolant is not heated to its target operating temperatures as it passes through the stack. This results in a more uniform cell operating temperature profile from the coolant inlet to the coolant outlet side of each cell; and also results in a lessening of excess steam production in the power plant.

5582624

PROCESS FOR PRODUCING MOLTEN-CARBONATE FUEL CELLS

Jantsch Uwe; Koch Hermann; Rohland Bernd; Weilberg Frank U; Wendt Hartmu Dornstadt, GERMANY assigned to MTU Motoren-und Turbine-Union Friedrichshafen GmbH

PCT No. PCT/EP94/00253 Sec. 371 Date Sep. 20, 1995 Sec. 102(e) Date Sep. 20, 1995 PCT Filed Jan. 29, 1994 PCT Pub. No. WO94/18713 PCT Pub. Date Aug. 18, 1994. The invention provides a process for producing the cathode layer of a molten-carbonate fuel cell in which the cathode layer is present in a layer arrangement with a matrix layer and an anode layer. A porous cobalt or iron layer is filled with lithium carbonate, the cobalt or iron layer is oxidized at a temperature below the melting point of the lithium carbonate in an oxidizing atmosphere to form a cobalt oxide or iron oxide layer, and subsequently, after the temperature is increased

above the melting point of the lithium carbonate, the cobalt oxide or iron oxide is reacted with the molten lithium carbonate to form lithium cobaltite or lithium ferrite.

5591537

SOLID OXIDE FUEL CELL

Bagger Carsten; Kindl Bruno; Mogensen Mogens Roskilde, DENMARK assigned to Forskningscenter

PCT No. PCT/DK94/00084 Sec. 371 Date Oct. 26, 1995 Sec. 102(e) Date Oct. 26, 1995 PCT Filed Mar. 1, 1994 PCT Pub. No. WO94/20998 PCT Pub. Date Sep. 15, 1994. A solid oxide fuel cell includes a cathode, a YSZ-electrolyte, and an anode, where the cathode is formed by a mixture of LSM and YSZ. According to the invention the content in the cathode of YSZ amounts to 20 to 75% by weight, whereby it is possible to reduce the polarisation resistance to 0,08 Omega cm2 at 40 mV. Furthermore, a mechanically stable structure is obtained.

5597494

METHOD OF MANUFACTURING MULTILAYER CERAMIC ELECTRONIC COMPONENT

Kohno Yoshiak; Suzuki Tatsuy Nagaokakyo, JAPAN assigned to Murata Manufacturing Co Ltd

Disclosed herein is a method of manufacturing a multilayer ceramic electronic component by forming external electrodes on a pair of opposite side surfaces of a sintered body obtained by sintering a laminate prepared by stacking a plurality of ceramic green sheets through internal electrodes to be electrically connected with prescribed ones of the internal electrodes. The method of manufacturing a multilayer ceramic electronic component comprises a step of forming the internal electrodes on single major surfaces of the ceramic green sheets by a thin film forming method, a step of electrochemically etching the opposite side surfaces of the sintered body for forming gap regions between the internal electrodes and those of the external electrodes which must not be electrically connected with the internal electrodes and a step of filling up clearance portions defined by dissolution/removing of the internal electrodes by the etching with an insulating material.

5599517

CATALYST FOR STEAM REFORMING OF HYDROCARBONS

Ul-Haque Israr; Trimm David L Baulkham Hills, AUSTRALIA assigned to Haldor Tops

A process for the production of hydrogen and/or carbon monoxide rich gases by steam reforming of a hydrocarbon feedstock, the process comprising the step of contacting the hydrocarbon feedstock and steam with a catalyst comprising nickel as a main catalytic component, a refractory carrier material for the nickel, and at least one catalytic element for the steam reforming of the hydrocarbon feedstock, the element being selected from the group consisting of germanium, tin, lead,arsenic, antimony and bismuth.

5599638

AQUEOUS LIQUID FEED ORGANIC FUEL CELL USING SOLID POLYMER ELECTROLYTE MEMBRANE

Surampudi Subbarao; Narayanan Sekharipuram R; Vamos Eugene; Frank Harvey A; Halpert Gerald; Olah George A; Prakash G K Surya Glendora, CA, UNITED STATES assigned to California Institute of Technology; University of Southern California

A liquid organic fuel cell is provided which employs a solid electrolyte membrane. An organic fuel, such as a methanol/water mixture, is circulated past an anode of a cell while oxygen or air is circulated past a cathode of the cell. The cell solid electrolyte membrane is preferably fabricated from Nafion trademark. Additionally, a method for improving the performance of carbon electrode structures for use in organic fuel cells is provided wherein a high surface-area carbon particle/Teflon trademark-binder structure is immersed within a Nafion trademark/methanol bath to impregnate the electrode with Nafion trademark. A method for fabricating an anode for use in a organic fuel cell is described wherein metal alloys are deposited onto the

electrode in an electro-deposition solution containing perfluorooctanesulfonic acid. A fuel additive containing perfluorooctanesulfonic acid for use with fuel cells employing a sulfuric acid electrolyte is also disclosed. New organic fuels, namely, trimethoxymethane, dimethoxymethane, and trioxane are also described for use with either conventional or improved fuel cells.

5599639

ACID-MODIFIED POLYBENZIMIDAZOLE FUEL CELL ELEMENTS

Sansone Michael J; Onorato Frank; Ogata Naoya Berkeley Heights, NJ, UNITED STATES assigned to Hoechst Celanese Corporation

An electrolytic membrane for use in fuel cell includes a fluid-imbibed acidified polybenzimidazole resin. The resin is alkyl or aryl sulfonated or alkyl or aryl phosphonated, preferably with a degree of substitution of from 15 to about 60 %.

5599640

ALKALINE FUEL CELL

Lee Jai Y; Lee Han H; Lee Jon H; Kim Dong M Taejeon, REPUBLIC OF KOREA assigned to Korea Advanced Institute of Science and Technology

The present invention relates to a fuel cell comprising an aqueous alkaline solution of electrolyte containing a hydrogen-releasing agent selected from the group consisting of NaBH4, KBH4, LiAlH4, KH and NaH, an oxygen electrode as a cathode and a hydrogen storage alloy electrode as an anode.

BATTERY MATERIALS

5552241

LOW TEMPERATURE MOLTEN SALT COMPOSITIONS CONTAINING FLUOROPYRAZOLIUM SALTS

Mamantov Gleb; Caja Josip; Dunstan Thanthrimudalige D J late of Knoxville, TN, UNITED STATES assigned to Electrochemical Systems Inc

Low temperature molten salt compositions comprised of a mixture of a metal halide, such as but not limited to aluminum trichloride, and a fluoropyrazolium salt, such as but not limited to 1,2-dimethyl-4-fluoropyrazolium chloride, which are resistant towards oxidation over a wide temperature gradient and are useful as electrolytes in electrochemical cells.

5558680

PREPARATION OF SILVER VANADIUM OXIDE CATHODES UTILIZING SOL-GEL TECHNOLOGY

Takeuchi Esther; Thiebolt William C East Amherst, NY, UNITED STATES assigned to Wilson Greatbatch Ltd

A method for preparing a cathode, having as active material silver vanadium oxide with vanadium of mixed valance properties prepared using a sol-gel process, which may generate a preparation of silver vanadium oxide and which may provide an alternate preparation technique for improving chemical control in the formation of a cathode for incorporation into an electrochemical cell.

5558954

PREPARATION OF CARBON ELECTRODES BY POLYMER-PRECIPITATION

Morrison Robert Modesto, CA, UNITED STATES assigned to PolyStor Corporation

The present invention provides a method of preparing carbon electrodes for use in electrochemical energy storage cells such as lithium ion batteries. The process involves a step of precipitating a polymer from a concentrated solution to yield a structure having at least a partially fractious morphology. The solvent from which the polymer has been precipitated (the primary solvent) is then exchanged with another solvent (the secondary solvent) in which the polymer is relatively insoluble. Thereafter, the secondary solvent is removed from the precipitated polymer and the dry polymer is contacted with a dopant such as phosphorous. Subsequently, the polymer with dopant is pyrolyzed to yield a carbon material which is assembled into an electrode.

5558959

POLYURETHANE BASED ELECTROLYTES FOR ELECTROCHEMICAL CELLS AND ELECTROCHEMICAL CELLS USING SAME

Venugopal Ganesh; Reichert Veronica R; Zhang Jinshan Duluth, GA, UNITED STATES assigned to Motorola Inc

An electrolyte system for use in connection with an electrochemical cell. The cell includes a positive and a negative electrode and the electrolyte system disposed there between. The electrolyte system includes a liquid electrolyte adapted to provide ion transport between the positive and negative electrodes and a segmented block copolymeric support structure for engaging the liquid electrolyte.

5558961

SECONDARY CELL WITH ORTHORHOMBIC ALKALI METAL/MANGANESE OXIDE PHASE ACTIVE CATHODE MATERIAL

Doeff Marca; Peng Marcus; Ma Yanpin; Visco Steven J; DeJonghe Lutgard C Hayward, CA, UNITED STATES assigned to Regents University of California

An alkali metal manganese oxide secondary cell is disclosed which can provide a high rate of discharge, good cycling capabilities, good stability of the cathode material, high specific energy (energy per unit of weight) and high energy density (energy per unit volume). The active material in the anode is an alkali metal and the active material in the cathode comprises an orthorhombic alkali metal manganese oxide which undergoes intercalation and deintercalation without a change in phase, resulting in a substantially linear change in voltage with change in the state of charge of the cell. The active material in the cathode is an orthorhombic structure having the formula MxZyMn(1-y)O2, where M is an alkali metal; Z is a metal capable of substituting for manganese in the orthorhombic structure such as iron, cobalt or titanium; x ranges from about 0.2 in the fully charged state to about 0.75 in the fully discharged state, and y ranges from 0 to 60 atomic %. Preferably, the cell is constructed with a solid electrolyte, but a liquid or gelatinous electrolyte may also be used in the cell.

5561202

POLYMER ELECTROLYTE MEMBRANE, AND PROCESS FOR THE PRODUCTION THEREOF

Helmer-Metzmann Freddy; Osan Frank; Schneller Arnold; Ritter Helmut; Ledjeff Konstantin; Nolte Roland; Thorwirth Ralf Mainz, GERMANY assigned to Hoechst Aktiengesellschaft

In order to produce a polymer electrolyte membrane from sulfonated, aromatic polyether ketone, an aromatic polyether ketone of the formula (I) (*See Patent for Chemical Structure*) (I) in which Ar is a phenylene ring having p- and/or m-bonds, Ar' is a phenylene, naphthylene, biphenylene, anthrylene or another divalent aromatic unit, X, N and M, independently of one another are 0 or 1, Y is 0, 1, 2 or 3, P is 1, 2, 3 or 4, is sulfonated and the sulfonic acid is isolated. At least 5% of the sulfonic groups in the sulfonic acid are converted into sulfonyl chloride groups, and these are reacted with an amine containing at least one crosslinkable substituent or a further functional group, and unreacted sulfonyl chloride groups are subsequently hydrolyzed. The resultant aromatic sulfonamide is isolated and dissolved in an organic solvent, the solution is converted into a film, and the crosslinkable substituents in the film are

then crosslinked. In specific cases, the crosslinkable substituents can be omitted. In this case, sulfonated polyether ketone is converted into a film from solution.

5565281

SHUTDOWN, BILAYER BATTERY SEPARATOR

Yu Wei-Ching; Geiger Margaret W Charlotte, NC, UNITED STATES assigned to Hoechst Celanese Corporation

The present invention is directed to a shutdown, bilayer battery separator and a process for making the same. A first microporous membrane with shutdown capability and a second microporous membrane with strength capability are joined together in face-to-face contact. The face of the first membrane being adhered by calendaring, adhesives, or welding, to the face of the second membrane, and the separator having a thickness of less than 3 mils, and a puncture strength, as measured from the second microporous membrane, of greater than 1900 g-mm, and a peel strength of greater than 1 grams/centimeter.

5567546

ION CONDUCTOR FOR ELECTROCHEMICAL CELLS

Maly-Schreiber Marth; Michel Josef Ulm, GERMANY assigned to Daimler-Benz AG

An ion conductor for electrochemical cells, comprising an alkali metal salt or a mixture of alkali metal salts, and mixed therewith on oligomer and/or polymer (hereinafter referred to simply as polymers), having at least one phosphazene base unit. The polymers are chemically stable with respect to the constituents of the ion conductor, and have an inorganic atom or an inorganic compound positioned at the phosphorous atom of at least one phosphazene base unit thereof. To form the ion conductor the alkali metal salts are heated to the melting temperature and the alkali metal salts, preferably fused to a low viscosity state, are admixed with the polymers which are dissolved in the alkali metal salt melt.

5567547

SOLID, GLYME-CONTAINING CATHODE MATERIALS

Golovin Milton N; Shackle Dale; Moulton Russel D San Jose, CA, UNITED STATES

This invention is directed to solid electrolytes containing a solvent and, in particular, a solvent comprising a mixture of an organic carbonate and glyme as well as electrolytic cells prepared from such solid electrolytes.

5569558

REDUCED VOLTAGE DELAY ADDITIVE FOR NONAQUEOUS ELECTROLYTE IN ALKALI METAL ELECTROCHEMICAL CELL

Takeuchi Esther S; Walsh Karen East Amherst, NY, UNITED STATES assigned to Wilson Greatbatch Ltd

An improved alkali metal/mixed metal oxide electrochemical cell capable of delivering high current pulses, rapidly recovering its open circuit voltage and having high current capacity, is described. The stated benefits are realized by dissolving a carbon oxide such as CO2 in the electrolyte.

5569559

ALKALINE SOLID POLYMER ELECTROLYTE, ELECTRODE AND ELECTROCHEMICAL GENERATOR CONTAINING SUCH AS ELECTROLYTE

Fauvarque Jean-Francois Paris, FRANCE assigned to Conservatoire National des Arts et Metiers and Electricite de France (Service National)

PCT No. PCT/FR93/00838 Sec. 371 Date Mar. 1, 1995 Sec. 102(e) Date Mar. 1, 1995 PCT Filed Sep. 2, 1993 PCT Pub. No. WO94/06166 PCT Pub. Date Mar. 17, 1994. Aqueous alkaline solid electrolyte comprising a polar polymer matrix which is solid at ambient temperature, and a compound or mixture of basic

compounds selected from alkaline metal, alkaline-earth or ammonium hydroxides. Preferably, the matrix is a polyether homopolymer or copolymer of different ethers or polyethers. The invention also concerns electrodes and/or electrochemical generators containing such an alkaline polymer solid electrolyte.

5569561

PRIMARY OR SECONDARY ELECTROCHEMICAL GENERATOR HAVING A NANOPARTICULATE ELECTRODE

Exnar Ivan; Graetzel Michael; Randin Jean-Paul Itingen, SWITZERLAND assigned to Renata A G

A high capacity primary or secondary electrochemical generator in which at least one electrode is composed of nanocrystalline particles of an electrically active material, said particles being electrically connected together, either by sintering a colloidal film of said electrically active material, or by compressing a mixture containing said nanocrystalline particles in pulverised form.

5569562

MANGANESE (III)-CONTAINING NICKEL (II) HYDROXIDE FOR THE PRODUCTION OF SECONDARY BATTERIES

Glemser Oskar; Axmann Peter Gottingen, GERMANY assigned to H C Starck GmbH & Co KG

Manganese(III)-containing nickel(II) hydroxide powders produced by coprecipitation carried out by dropping an acidified metal salt solution containing Ni+2 and Mn+3 ions into a feed of constant pH value, such that manganese(III) is incorporated into the nickel(II) hydroxide lattice, thereby preventing disproportionation into separate phases and improving performance characteristics of secondary battery electrodes manufactured therefrom.

5569564

ALKALINE CELL HAVING A CATHODE INCLUDING A TITANATE ADDITIVE

Swierbut Wendi M; Nardi John Westlake, OH, UNITED STATES assigned to Eveready Battery Company Inc

A cathode for use in an electrochemical cell having an anode and an electrolyte. The cathode includes a manganese dioxide active material and a titanate additive which includes at least one of BaTiO3 or K2TiO3. The cathode of the present invention is particularly adapted for use in an electrochemical cell having a zinc anode and an alkaline electrolyte.

5582623

METHODS OF FABRICATING RECHARGEABLE POSITIVE ELECTRODES

Chu May-Ying Oakland, CA, UNITED STATES assigned to PolyPlus Battery Company Inc

Disclosed are methods of making solid-phase active-sulfur-based composite electrodes. The method begins with a step of combining the electrode components (including an electrochemically active material, an electronic conductor, and an ionic conductor) in a slurry. Next, the slurry is homogenized such that the electrode components are well mixed and free of agglomerates. Very soon thereafter, before the electrode components have settled or separated to any significant degree, the slurry is coated on a substrate to form a thin film. Finally, the coated film is dried to form the electrode in such a manner that the electrode components do not significantly redistribute.

5582773

ELECTRICALLY-CONDUCTIVE TITANIUM SUBOXIDES

Cass Richard B Ringoes, NJ, UNITED STATES

A process for producing a ceramic material which is

electrically conductive by reacting titanium dioxide with intercalated graphite under conditions which effect the reduction of the titanium dioxide, said product comprising an electrically conductive, corrosion-resistant, substoichiometric titanium dioxide combined chemically with an intercalant or residue thereof, for example, a metal such as copper or nickel, and the use thereof in thermal, electrical and electro-chemical applications.

5582908

IGNITION RESISTANT CARBONACEOUS MATERIAL

McCullough Francis P Lake Jackson, TX, UNITED STATES assigned to The Dow Chemical Company

A process for preparing an ignition resistant carbonaceous material by exposing a meltblown or spunbonded acrylic precursor material in the form of at least one ply of a generally planar fibrous web, matt or batt to ionizing radiation to crosslink said acrylic material which is then heat treated in an inert atmosphere to increase the carbon content of said irradiated material to form said carbonaceous material. The invention also resides in a continuous self bonded fibrous carbonaceous material having a carbon content of from about 65% to less than about 92%, an oxygen content of less than about 2%, and a specific resistivity of from about 10-1 to about 1010 ohm-cm. Preferably said carbonaceous material has an oxygen content of less than about 1% and a nitrogen content of from about 5% to about 30%.

5582912

CRIMPED CARBONACEOUS FIBERS

McCullough Francis P; Hill Stephen E; Goswami Bhuvenesh Lake Jackson, TX, UNITED STATES assigned to The Dow Chemical Company

The present invention resides in ignition resistant non-linear carbonaceous fiber or fiber tow having a reversible deflection ratio of greater than 1:1 but equal to or less than 1.2:1. The fibers have a multiplicity of crimps along their length with a crimp frequency on the order of from 6 to 15 crimps per inch. Fibers of the invention have an elongatability of from about 2 to about 9%, a pseudo-elongatability of from about 0.2 to about 18%, and a tenacity without a loss of elongation on the order of at least 6 g/d. The carbonaceous fibers can be used, for example, as thermal insulation and/or fire resistant insulation in vehicles, building structures or clothing in furniture coverings, carpets, and the like, and can be used alone or blended with other fibers to form fine yarns.

5591318

METHOD OF FABRICATING A CONDUCTIVE POLYMER ENERGY STORAGE DEVICE

Li Changming; Lian Ke K; Wu Ha Vernon Hills, IL, UNITED STATES assigned to Motorola Energy Systems Inc

A method for making high power electrochemical charge storage devices, provides for depositing an electrically conducting polymer, onto a non-noble metal substrate, which has been prepared by treatment with a surfactant. Using this method, high power, high energy electrochemical charge storage devices may be fabricated with highly reproducible low cost.

5591394

ZIRCONIUM-BASED HYDROGEN STORAGE ALLOY USEABLE FOR NEGATIVE ELECTRODES FOR SECONDARY BATTERY

Lee Jai Y; Kim Soo R Yuseong ku, Taejeon, REPUBLIC OF KOREA

A zirconium-based hydrogen storage alloys having the composition formula: (*See Patent for Tabular Presentation*) PS wherein Q is Ti or Hf; 0<x< or =0.3; and 0<Y+Z+A+B<1, are disclosed. The Zr-based hydrogen storage alloy has a C-14 hexagonal structure and is mainly composed of single phase. The alloy is useable for a negative electrode material for secondary batteries. The Zr-based hydrogen storage alloy also has also a discharge capacity of 300-377 mAg/g and low reduction of discharge capacity at a low temperature and discharge rate.

5591539

ELECTROLYTICALLY CONDUCTIVE BATTERY SEPARATOR POLYMERIC FILM

Degen Peter J; Lee Joseph Y Huntington, NY, UNITED STATES assigned to Pall Corporation

A method for making an electrolytically conductive battery separator polyethylene film for alkaline battery applications is disclosed which comprises carrying out the grafting reaction in an environment free of air and comprising a pressurized inert gas blanket. The resulting lots of polyethylene film are capable of being made with the range of electrolytic resistance values required for a variety of alkaline battery applications, while exhibiting highly uniform electrolytic resistance characteristics.

5591540

PACKAGING FOR AN ELECTROCHEMICAL DEVICE AND DEVICE USING SAME

Louie Edmond; Reichert Veronica R; Anani Anaba A; Zhang Jinshan Lawrenceville, GA, UNITED STATES assigned to Motorola Inc

An electrochemical charge storage device includes first and second electrodes with first and second current collector respectively attached, an electrolyte disposed between the electrodes and first and second metal foils to separate the electrodes from a packaging material. The packaging material consists of multilayered first and second polymeric packaging films which enclose the other components of the device, and are sealed to each other.

5591541

HIGH STEEL CONTENT THIN WALLED ANODE CAN

Oltman John E Mount Horeb, WI, UNITED STATES assigned to Rayovac Corporation

This invention pertains to alkaline electrochemical cells, typically to metal-air cells of the button-type. Non-reactive elements of cells of the invention are thinner than corresponding non-reactive elements of prior art cells. Such elements can be made thinner because of improved structures of such elements. The anode can is made from a metal strip structure having a higher steel content. The cathode can has a modified temper, which improves relative stiffness and rigidity while retaining sufficient ductility. The seal disposed between the anode can and the cathode can is made thinner. Structure of the corner of the cathode can between the bottom and the side wall is improved. By so reducing the thicknesses of non-reactive elements of the cell, and thus the volume occupied by such non-reactive elements, the fraction of the cell devoted to holding electrochemically reactive anode material therein is increased, with corresponding increase in the milliampere hour capacity of the cell.

5591542

BATTERY DIAPHRAGM AND BATTERY WITH SUCH A DIAPHRAGM

Sakamoto Takesh; Hara Koji; Harada Akira Osaka, JAPAN assigned to Sumitomo Electric Industries Ltd

PCT No. PCT/JP94/00182 Sec. 371 Date Sep. 30, 1994 Sec. 102(e) Date Sep. 30, 1994 PCT Filed Feb. 8, 1994 PCT Pub. No. WO94/18711 PCT Pub. Date Aug. 18, 1994. A battery having a positive electrode, a negative electrode is equipped with a diaphragm between the electrodes. The diaphragm includes a hydrophilized polymer porous body with pores in which ethylene copolymer particles are held, having a melting point of 80° to 170°C, and side chains.

5591544

CURRENT COLLECTOR DEVICE

Fauteux Denis G; Massucco Arthur; Wilkins Ronnie; Shi Jie Acton, MA, UNITED STATES assigned to Arthur D Little Inc

A current collector device for a rechargeable electrolytic cell and method for manufacturing same. The device

includes an aluminum current collector having a substantially reduced oxidation layer relative to its native oxide layer, to, in turn, exhibit a relatively low interfacial impedance. A layer of electrode material is applied and adhered to the surface of the aluminum current collector to enable electrochemical activity with the particular ions in an electrolyte within the electrolytic cell. A primer may be applied between the electrode material and the aluminum current collector, wherein the primer serves to substantially preclude re-growth of the oxide layer which would otherwise occur absent such a primer.

5597661

SOLID POLYMER ELECTROLYTE, BATTERY AND SOLID-STATE ELECTRIC DOUBLE LAYER CAPACITOR USING THE SAME AS WELL AS PROCESSES FOR THE MANUFACTURE THEREOF

Takeuchi Masataka; Tokita Koji; Ueda Miyuki; Noguchi Jun; Yashima Hideo Chiba, JAPAN assigned to Showa Denko K K

PCT No. PCT/JP94/00903 Sec. 371 Date Jan. 30, 1995 Sec. 102(e) Date Jan. 30, 1995 PCT Filed Jun. 3, 1994 PCT Pub. No. WO94/29884 PCT Pub. Date Dec. 22, 1994. A solid polymer electrolyte comprising a composite of a polymer comprising 2-(meth)acryloyloxyethylcarbamic acid ester and an electrolyte salt, which has a high ionic conductivity and can be made into a thin film. The present invention is also directed to an electrode comprising the solid polymer electrolyte and an electroactive substance or polarizable material; as well as a process for manufacturing the same. In addition, the present invention is directed to primary and secondary batteries having the solid polymer electrolyte, as well as a process for manufacturing the same. The battery according to the present invention has a high capacity, high current density, and further in the case of a secondary battery, good cyclability. Finally, the present invention is directed to a solid-state electric double layer capacitor comprising the solid polymer electrolyte, as well as a process for manufacturing the same. The electric double layer capacitor has a high output voltage and a large take-out current.

5597662

CURABLE SOLID ELECTROLYTES CONTAINING A MODIFIED VISCOSITY AGENT AND ELECTROLYTIC CELLS PRODUCED THEREFROM

Isaacson Mark J; Golovin Milton N Santa Clara, CA, UNITED STATES assigned to Valence Technology Inc

This invention is directed to a solid electrolyte containing a polymeric matrix, a salt, a solvent and a viscosifying agent containing a reactive group as well as electrolytic cells prepared from such solid electrolytes.

5597665

POROUS METAL BODY, PROCESS FOR PRODUCING THE SAME AND BATTERY PLATE FORMED THEREFROM

Harada Keizo; Ishii Masayuk; Yamanaka Shosaku Itami JAPAN assigned to Sumitomo Electric Industries Ltd

A porous metal body is produced by forming a coating film of one or more metal capable of forming a eutectic alloy at temperatures not higher than the melting point of Al on a foamed resin skeleton having a three-dimensional network structure according to the plating, vapor deposition, sputtering, CVD or other vapor phase process, impregnating the foamed resin having the coating film formed thereon with a paste comprising powdery Al, a binder and an organic solvent as principal components to thereby obtain a paste-coated composite and heating the composite at a temperature ranging from 550°C to 750°C in a nonoxidizing atmosphere. The resultant porous metal body has a large effective surface area and a high space utilization factor and exhibits excellent performance in uses in filters and battery plates.

5599355

METHOD FOR FORMING THIN COMPOSITE SOLID ELECTROLYTE FILM FOR LITHIUM BATTERIES

Nagasubramanian Ganesan; Attia Alan I Albuquerque, NM, UNITED STATES

A composite solid electrolyte film is formed by dissolving a lithium salt such as lithium iodide in a mixture of a first solvent which is a cosolvent for the lithium salt and a binder polymer such as polyethylene oxide and a second solvent which is a solvent for the binder polymer and has poor solubility for the lithium salt. Reinforcing filler such as alumina particles are then added to form a suspension followed by the slow addition of binder polymer. The binder polymer does not agglomerate the alumina particles. The suspension is cast into a uniform film.

5599435

AQUEOUS ELECTROCHEMICAL PREPARATION OF INSERTION COMPOUNDS AND USE IN NON-AQUEOUS RECHARGEABLE BATTERIES

Li Wu; Dahn Jeffrey R Burnaby, CANADA assigned to Moli Energy (1990) Limited

Insertion compounds that are not stable in pure water can be prepared by an aqueous electrochemical method. The pH of the electrolyte and/or the concentration of ions of the inserted species must be sufficiently high to provide stability for the product compound. The method is useful for further lithiation of conventional lithium ion battery cathode materials.

5599644

CATHODES FOR ELECTROCHEMICAL CELLS HAVING ADDITIVES

Swierbut Wendi M; Nardi John Westlake, OH, UNITED STATES assigned to Eveready Battery Company Inc

A cathode for use in an electrochemical cell having an anode and an electrolyte. The cathode includes a manganese dioxide active material and an additive which includes at least one of SnO2, Fe2O3-TiO2, TiO2 (P-25), BaTiO3, K2TiO3, Nb2O5, or SnO. The cathode of the present invention is particularly adapted for use in an electrochemical cell having a zinc anode and an alkaline electrolyte.

LITHIUM BATTERIES

5558953

ELECTROCRYSTALLIZED LITHUIM METAL, METHOD FOR PRODUCING THE SAME, AND LITHIUM SECONDARY BATTERY

Matsui Tooru; Takeyama Kenichi Fujiidera, JAPAN assigned to Matsushita Electric Industrial Co Ltd

A non-aqueous electrolyte secondary battery having a long cycle life and a high reliability with substantially no internal short-circuit is provided by incorporating crystalline metal lithium as its negative electrode. The crystalline metal lithium is electrochemically deposited on a metal substrate in an electrolyte including a tetrahydrofran derivative or a 1,3-dioxolan derivative as a solvent.

5561004

PACKAGING MATERIAL FOR THIN FILM LITHIUM BATTERIES

Bates John B; Dudney Nancy J; Weatherspoon Kim A Oak Ridge, TN, UNITED STATES

A thin film battery including components which are capable of reacting upon exposure to air and water vapor incorporates a packaging system which provides a barrier against the penetration of air and water vapor. The packaging system includes a protective sheath

overlying and coating the battery components and can be comprised of an overlayer including metal, ceramic, a ceramic-metal combination, a parylene-metal combination, a parylene-ceramic combination or a parylene-metal-ceramic combination.

5561005

SECONDARY BATTERY HAVING NON-AQUEOUS ELECTROLYTE

Omaru Atsu Fujita Shigeru; Yokoyama Keiichi; Hihara Akio Kanagawa, JAPAN assigned to Sony Corporation; Mitsui Petrochemical Industries Ltd

A secondary battery having a non-aqueous electrolyte according to the present invention includes a negative electrode using a carbonaceous material capable of doping and undoping lithium ions as the anode material, a positive electrode using a composite oxide of lithium and-a transition metal as the cathode material, and a non-aqueous electrolyte formed by dissolving an electrolyte into a non-aqueous solvent, the non-aqueous solvent containing methylethyl carbonate and dimethyl carbonate. According to the present invention, a secondary battery having a non-aqueous electrolyte in which normal charge/discharge reactions can be maintained even in battery overcharge and after high-temperature storage of the charged battery, and which exhibits high energy density, long cycle life, high safety performance and excellent environment-resistance, can be produced.

5561006

CHARGEABLE LITHIUM ELECTROCHEMICAL CELL AND METHOD OF MANUFACTING IT

Lecerf Andracu e Biensan Philipp; Baudry Sylvie Rennes, FRANCE assigned to SAFT

The present invention consists in a rechargeable cell having an anode made from materials in which lithium can be inserted, a cathode and an electrolyte constituted by a solution of a lithium salt in a non-aqueous solvent. The material of said cathode includes at least one substance which is a yellow-green single-phase oxide of lithium and manganese with an orthorhombic crystal structure with the following lattice parameters: a=0.459+/-0.004 nm, b=0.577+/-0.004 nm and c=0.281+/-0.003 nm and containing lithium ions in a molar ratio Li/Mn such that 0.85< or =Li/Mn< or =1.10. After a first charge said substance is discharged in two stages of which the higher is at a mean voltage greater than 3.5 volts relative to the lithium.

5561007

CATHODE-ACTIVE MATERIAL BLENDS OF LIXMN2O4 AND LIY- ALPHA-MNO2

Saidi M Yazid Henderson, NV, UNITED STATES

A solid secondary, lithium electrochemical cell comprises a physical mixture of LixMn2O4(spinel) (O<x< or =2) and Liy- alpha-MnO2 (O< or =y<1). The cell is particularly suitable for use with anodes carbon materials.

5565284

LITHIUM SECONDARY CELL

Koga Keiji; Suzuki Hisash; Kaya Masanori; Arai Hitoshi; Kagotani Tsuneo; Miyaki Yousuke Nagano, JAPAN assigned to TDK Corporation

PCT No. PCT/JP93/01883 Sec. 371 Date Aug. 4, 1994 Sec. 102(e) Date Aug. 4, 1994 PCT Filed Dec. 24, 1993 PCT Pub. No. WO94/15374 PCT Pub. Date Jul. 7, 1994. A main object of the invention is to provide a lithium secondary cell which experiences minimal capacity deterioration upon repetitive charge-discharge cycles. The lithium secondary cell of the invention is characterized in that a negative and/or positive electrode material is bonded to a current collector surface by a binder containing a crosslinked polymer or formed by coating to a current collector a composition comprising an active material and a polymer binder containing a fluorinated polymer which is curable upon exposure to radiation, followed by radiation curing treatment.

5565688

METHOD FOR PREPARING AN ACTIVE SUBSTANCE OF LITHIUM SECONDARY CELLS

Hayashi Yasushi Oobu, JAPAN assigned to Nippondenso Co Ltd

A method for preparing an active substance for positive electrode in non-aqueous electrolytic secondary cells making use of a lithium or lithium alloy negative electrode is described. The method comprises providing an amorphous citrate complex of lithium and a transition metal and firing the complex at a predetermined temperature to obtain an active substance. The citrate complex is obtained by preparing an aqueous mixed solution of lithium hydroxide or carbonate, a water-soluble transition metal salt and citric acid and dehydrating the mixed solution to obtain an amorphous citrate complex. The complex is then fired at a temperature ranging from 300° to 900°C to obtain an active substance.

5567210

METHOD FOR MAKING AN ELECTROCHEMICAL CELL

Bates John B; Dudney Nancy J Oak Ridge, TN, UNITED STATES assigned to Martin Marietta Energy Systems Inc

Described is a thin-film battery, especially a thin-film microbattery, and a method for making same having application as a backup or primary integrated power source for electronic devices. The battery includes a novel electrolyte which is electrochemically stable and does not react with the lithium anode and a novel vanadium oxide cathode Configured as a microbattery, the battery can be fabricated directly onto a semiconductor chip, onto the semiconductor die or onto any portion of the chip carrier. The battery can be fabricated to any specified size or shape to meet the requirements of a particular application. The battery is fabricated of solid state materials and is capable of operation between -15°C and 150°C

5567548

LITHIUM ION BATTERY WITH LITHIUM VANADIUM PENTOXIDE POSITIVE ELECTRODE

Walk Charles; Margalit Nehemiah Herndon, VA, UNITED STATES assigned to Tracor Applied Sciences Inc

A battery having a positive electrode comprising delta LixV2O5, wherein x ranges from 0.9 to 1.0, wherein the LixV2O5 has admixed therewith a conductive material. The delta LixV2O5 may be formed chemically by reacting V2O5 with a lithium salt to transform all of the V2O5 into LixV2O5. Alternatively, and preferred is to form it by electrochemically reacting an admixture of V2O5 and a lithium metal containing electrode in an electrochemical reactor cell having a lithium containing electrolyte in a non-aqueous solvent to transform all of the V2O5 into LixV2O5, after which the LixV2O5 is removed from the cell and used as a predetermined electrode configuration for use in a lithium metal free secondary cell. The positive electrode is delta LiV2O5 with a conductive material therewith. The delta form of LiV2O5 of this invention has its three strongest X-ray diffraction peaks at 4.97, 3.25 and 3.39 in order of decreasing intensity.

5569520

RECHARGEABLE LITHIUM BATTERY FOR USE IN APPLICATIONS REQUIRING A LOW TO HIGH POWER OUTPUT

Bates John Oak Ridge, TN, UNITED STATES assigned to Martin Marietta Energy Systems Inc

Rechargeable lithium batteries which employ characteristics of thin-film batteries can be used to satisfy power requirements within a relatively broad range. Thin-film battery cells utilizing a film of anode material, a film of cathode material and an electrolyte of an amorphorus lithium phosphorus oxynitride can be connected in series or parallel relationship for the purpose of withdrawing electrical power simultaneously from the cells. In addition, such battery cells which employ a lithium intercalation compound as its cathode

material can be connected in a manner suitable for supplying power for the operation of an electric vehicle. Still further, by incorporating within the battery cell a relatively thick cathode of a lithium intercalation compound, a relatively thick anode of lithium and an electrolyte film of lithium phosphorus oxynitride, the battery cell is rendered capable of supplying power for any of a number of consumer products, such as a laptop computer or a cellular telephone.

5569560

COMPLEXING AGENT FOR IMPROVED PERFORMANCE IN A LITHIUM BASED HYBRID ELECTROLYTE

Olsen Ib I; Morris Jerry L Henderson, NV, UNITED STATES

A solid electrolyte that includes a complexing agent that is incorporated into the solid matrix provides for more effective transfer of current in an electrochemical cell or battery. The complexing agent immobilizes anions in the solid electrolyte so that at least a substantial majority of the charge transport is due to the cations, e.g.,lithium ions. Preferred complexing agents are derived from aza-ethers. With the inventive solid electrolyte, it is expected that the lithium transference number should approach unity.

5582935

COMPOSITE ELECTRODE FOR A LITHIUM BATTERY

Dasgupta Sankar; Jacobs James K Toronto, Ontario, CANADA

The composite positive electrode comprises a metallic current collector sheet the surface of which bears a double layer of a mixed oxide interface containing an oxide of the metal of the current collector and a transition metal oxide, and a layer of the same transition metal oxide over the mixed oxide interface. The double layer is in contact with a positive electrode containing an oxide of the same transition metal as the cathode active ingredient. The composite positive electrode is designed to be incorporated in a rechargeable lithium battery.

5591543

SECONDARY ELECTROCHEMICAL CELL

Peled Emanuel; Menachem Chen; Gorenshtein Aharo Even Yehuda, ISRAEL assigned to Ramot University Authority for Applied Research and Industrial Development Ltd

The invention relates to novel cathodes for secondarylithium cells and to lithium cells which contain such cathodes. The secondary cells can be charged and discharged substantially more times than corresponding cells which contain conventional LiCoO2 type cathodes. The cathodes are based on crystalline compounds of the Li1 xMx/2CoO2 type. One of the aspects of the invention is a process for the production of such crystalline cathodes, where M is selected from calcium, strontium, barium and magnesium and where the content of such bivalent cation M in the crystal is from about 0.1 weight-% to about 10 weight-%, preferably 0.2 to 5 weight-%. The novel crystalline cathode compound is synthesized by a solid/solid reaction at elevated temperature, generally in the 700°C to about 900°C range. The cathode may be prepared from small crystals of such a compound, in combination with a compatible binder or conductive material, such as graphite.

5591546

SECONDARY CELL

Nagaura Toru Fukuoka, JAPAN assigned to Hival Ltd

The present invention provides nonaqueous electrolyte secondary cells capable of withstanding severe overdischarge to obtain nonaqueous electrolyte secondary batteries having satisfactory cycle characteristics. A spinel-type lithium-containing metallic oxide represented by LiM2O4 (where M is a transitional metal element) is used as an active substance for each of the positive and negative electrodes of the cell embodying the invention. In an organic electrolyte containing lithium ion, the spinel-type lithium-containing metallic oxide represented by LiM2O4 is capable of reversibly undergoing an

electrochemical oxidation reaction involving removal of doping lithium ion and also an electrochemical reduction reaction involving lithium ion doping. Accordingly, when the cell of the invention is overdischarged (approx = reversibly charged), a reversible reaction involving lithium ion doping/undoping occurs at the positive electrode and negative electrode without entailing any damage due to overdischarge. As a result,when many cells are connected in series to obtain a battery, the cycle characteristics of the battery are not impaired even if the component cells are different in capacity.

5591547

METHOD OF MANUFACTURING A NEGATIVE ELECTRODE FOR LITHIUM SECONDARY BATTERY

Yoneda Tetsuya; Mitate Takehito; Nishimura Naoto; Yamada Kazuo Nabari, JAPAN assigned to Sharp Kabushiki Kaisha

A method of manufacturing a negative electrode for a lithium secondary battery includes the steps of mixing graphite particles as a main constituent that generates intercalation and de-intercalation of lithium ions with a compound including copper ions, obtaining graphite composite powder having copper oxide particles formed at least on a part of the surface of at least a part of the graphite particles by chemical reaction of the copper ions, and mixing the graphite composite powder with a binding material.

5591548

ELECTRODE MATERIALS FOR RECHARGEABLE ELECTROCHEMICAL CELLS AND METHOD OF MAKING SAME

Mao Zhenhua Coral Springs, FL, UNITED STATES assigned to Motorola Inc

A method for preparing a lithiated transition metal oxide electrochemical charge storage material for use in an electrochemical cell. The cell includes a cathode, an anode and an electrolyte disposed therebetween. The method involves the preparation of the lithiated, transition metal oxide material in an inert environment. The materials are characterized by improved electrochemical performance, and an identifiable x-ray diffraction matter.

5597526

LITHIUM CELL TREATING APPARATUS

Nishimura Katsunor; Honbo Hidetoshi; Gotoh Akihiro; Mizumoto Mamoru; Horiba Tatsuo Hitachi, JAPAN assigned to Hitachi Ltd

A treating fluid is in contact with a negative electrode containing lithium of a lithium cell under a first condition to react a surface portion of the negative electrode, and a treating fluid is in contact with lithium existing inside an article formed on the surface of the above-described negative electrode under a second condition. The cells can be effectively treated under safety condition to collect either the valuable substances, or the cell constructive components.

5597659

MANUFACTURING METHOD OF A SEPARATOR FOR A LITHIUM SECONDARY BATTERY AND AN ORGANIC ELECTROLYTE LITHIUM SECONDARY BATTERY USING THE SAME SEPARATOR

Morigaki Kenichi; Kabuto Noriko; Haraguchi Kazunori Nishinomiya, JAPAN assigned to Matsushita Electric Industrial Co Ltd

An organic electrolyte lithium secondary battery wherein lithium is an active material. The battery comprises a negative electrode made of metallic lithium or a lithium alloy and a separator made of a microporous polyolefin separator matrix whose pores are filled with an ionic conductive gel electrolyte. The separator is in the form of a sheet with at least one face contacting the negative electrode having a gel electrolyte layer. The gel electrolyte is formed by ultraviolet irradiation of a solution having a major component being a mixture of an oligomer and a monomer added to an organic electrolyte. Using the separator in an organic electrolyte

lithium secondary battery internal short circuiting of the battery due to dendridic lithium growing on a negative electrode during the charging cycle can be prevented and a longer cycle life achieved.

5597660

ELECTROLYTE FOR AN ELECTROCHEMICAL CELL

Bates John B; Dudney Nancy J Oak Ridge, TN, UNITED STATES assigned to Martin Marietta Energy Systems Inc

Described is a thin-film battery, especially a thin-film microbattery, and a method for making same having application as a backup or primary integrated power source for electronic devices. The battery includes a novel electrolyte amorphous lithium phosphorus oxynitride which is electrochemically stable and does not react with the lithium anode and a novel vanadium oxide cathode Configured as a microbattery, the battery can be fabricated directly onto a semiconductor chip, onto the semiconductor die or onto any portion of the chip carrier. The battery can be fabricated to any specified size or shape to meet the requirements of a particular application. The battery is fabricated of solid state materials and is capable of operation between -15°C and 150°C

5597663

LOW TEMPERATURE MOLTEN LITHIUM SALT ELECTROLYTES FOR ELECTROCHEMICAL CELLS

Pendalwar Shekhar L; Denton Frank R Sunrise, FL, UNITED STATES assigned to Motorola Inc

An electrochemical cell including a positive electrode, a negative electrode and a low temperature organic, liquid lithium salt electrolyte is provided. The low temperature lithium salt electrolyte includes a central atom selected from the group of aluminum, boron, gallium, indium, or thallium and at least four substituent groups which are organic, alkoxy groups. A unique characteristic of the electrolyte is that it remains liquid at ambient temperatures, as compared to most lithium salt electrolytes which are solid at room temperatures.

5597664

LITHIUM MANGANESE OXIDE COMPOUND AND METHOD OF PREPARATION

Ellgen Paul Oklahoma City, OK, UNITED STATES assigned to Kerr-McGee Corporation

A method for manufacturing Li2Mn2O4 which comprises the steps of providing LiMn2O4; providing a lithium salt; forming a solution or suspension of the LiMn2O4 and lithium salt in a liquid medium; and adding a reducing agent to the solution or suspension.

5599516

RECOVERY OF LITHIUM VALUES FROM BRINES

Bauman William; Burba John L Midland, MI, UNITED STATES assigned to FMC Corporation

Pellets of a polycrystalline hydrated alumina, especially Gibbsite, are infused with LiOH to obtain loadings up to 0.33 mol fraction of LiOH in the LiOH/Al(OH)3. The so-prepared material is useful for mixing with a LiX-containing brine solution, producing an interaction of the LiOH infused in the alumina pellets with the X ion (where X represents an acid salt moiety, especially halide) of the LiX-containing brine. The LiX interaction product is efficiently removed from the alumina pellets by water washing, leaving rejuvenated LiOH which can be used in yet another cycling of LiX formation/water removal. A plurality of loading and unloading cycles are achieved, yielding an appreciable amount of the lithium values derived from the brine.

5599642

LITHIUM SECONDARY BATTERY CONTAINING ORGANIC ELECTROLYTE, ACTIVE MATERIAL FOR CATHODE THEREOF, AND METHOD FOR MANUFACTURING THE ACTIVE MATERIAL

Toshiro Hiroyuki; Matsumoto Kazunobu; Kawakami Akira Ibaraki, JAPAN assigned to Hitachi Maxell Ltd

PCT No. PCT/JP94/00852 Sec. 371 Date Jun. 9, 1995 Sec. 102(e) Date Jun. 9, 1995 PCT Filed May 30, 1994 PCT Pub. No. WO94/28591 PCT Pub. Date Dec. 8, 1994. The lithium secondary battery uses lithium or a compound containing lithium as an anode active material, and lithium nickel oxide as a cathode active material. This battery is produced to enhance the charge and discharge capacity. The lithium nickel oxide is prepared as follows. Nickel oxide which contains nickel of more than trivalence or a nickel salt which produces nickel of more than trivalence when heated, and lithium salt are mixed at an Li/Ni (molar salt ratio) of 1.0 to 1.5. After preheating the mixture, it is baked at a temperature of 680°C to 780°C in an oxygen atmosphere, thus producing a lithium nickel oxide. The primary differential absorption spectrum of the electron spin resonance of the lithium nickel oxide is a singlet (single line) when measured by use of an X band at a temperature of 77 K., and the line distance (DeltaHpp) between the peaks is 140 mT or more. The intensity ratio of the main peak of the components other than the lithium nickel oxide and that of the lithium nickel oxide in a powder X-ray diffraction image is lower than 0.03. The Li/Ni ratio (atomic ratio) is above 0.9, and the grain size of the primary particles is below 1 mum.

5599643

LITHIUM ELECTROCHEMICAL CELL INCLUDING LITHIUM COPPER OXIDE IN THE CATHODE

Plichta Edward J; Behl Wishvender K Howell, NJ, UNITED STATES assigned to The United States of America as represented by the Secretary of the Army

A new cathode material, Li2CuO2, is used in lithium electrochemical cells.

NICKEL METAL HYDRIDE BATTERIES

5554456

ELECTROCHEMICAL HYDROGEN STORAGE ALLOYS AND BATTERIES CONTAINING HETEROGENEOUS POWDER PARTICLES

Ovshinsky Stanford R; Fetcenko Michael; Im Jun; Chao Benjamin; Reichman Benjamin; Young Kwo Bloomfield Hills, MI, UNITED STATES assigned to Ovonic Battery Company Inc

Non-uniform heterogeneous powder particles for electrochemical uses, and said powder particles comprising at least two separate and distinct hydrogen storage alloys selected from the group consisting of: Ovonic LaNi5 type alloys, Ovonic TiNi type alloys, and Ovonic MgNi based alloys.

5556719

METHOD FOR MAKING HIGH CAPACITY HYDROGEN STORAGE ELECTRODE AND HYDRIDE BATTERIES USING SAME

Hong Kuochih; Hong Kuoshiu; Hong Huiyim Troy, MI, UNITED STATES

This invention disclosures a method to make an improved hydrogen/hydride electrode for electro-chemical applications. The method comprises the steps of: (1) preparing the slurry of hydrogen storage material; (2) pasting the slurry onto and/or into a substrate current collector to make a wet pasted electrode; (3) drying the wet pasted electrode; and (4) sintering the pasted electrode. The aforementioned method is very useful for the hydrogen storage alloy comprising of Ti, 2-70 at. %; Zr, 2-70 at. % and Ni, 5-80 at. %. It is also useful for a pseudo AB5- or AB2-type alloy. In particular, a high capacity hydrogen storage electrode comprising a multicomponent hydrogen

storage alloy having composition represented by the formula: TiaZrbNicNbyRzMx, is made, wherein R is at least one element selected from the group consisting of C, Mg, Al, B, Si, V, Cr, Mn, Fe, Co, Cu, Zn, Hf, Bi, Sn, Ta, W, Pd, Ag, Mo, Sb, La, Ce, and Mm; M is at least one element selected from the group consisting of Ca, Li, Na, K, Rb, Cs, S and P; and the atomic mole ratios, a, b, c, x, y, and z are defined by: 0.22< or =a< or =0.70, 0.02< or =b< or =0.70, 0.05< or =c< or =0.80, 0.02< or =y< or =0.50, 0.005< or =z< or =0.30, 0< or =x< or =0.30, and a+b+c+x+y+z=1.00.

5558950

OPTIMIZED CELL PACK FOR LARGE SEALED NICKEL-METAL HYDRIDE BATTERIES

Ovshinsky Stanford R; Fetcenko Michael; Holland Arthur; Dean Kevin; Fillmore Donn Bloomfield Hills, MI, UNITED STATES assigned to Ovonic Battery Company Inc

A sealed prismatic metal hydride battery greater than 10 Ah in size comprising a battery case of high thermal conductivity; and at least one bundle of metal hydride electrodes of high thermal conductivity in thermal contact with said battery case. Batteries according to the invention prevent the accumulation of heat that can damage nickel metal hydride batteries particularly during overcharge.

5560752

PROCESS FOR ACTIVATION OF METAL HYDRIDES

Badding Michael E; McCormack Mark T; Murphy Donald W; Vyas Brijes Somerville, NJ, UNITED STATES assigned to Lucent Technologies Inc

Metals useful in the formation of hydrides for applications such as batteries are advantageously activated by hydriding/dehydriding process. This process involves repeatedly stepping the potential of metal/metal hydride electrodes in electrochemical cells. The process activates hydrogen-storing materials that are difficult to activate by conventional means.

5563008

FORMATION METHOD OF NICKEL ELECTRODE FOR SECONDARY ALKALINE BATTERIES

Pyun Young-bu; Jung Bok-hwan; Raikhelson Leonid Seoul, REPUBLIC OF KOREA assigned to Samsung Electronics Co Ltd

A formation method of nickel electrode for secondary alkaline batteries which comprises charging nickel electrodes, discharging the nickel electrodes to an amount equal to their full capacity, overdischarging the nickel electrodes under the same conditions with the previous discharging step, assembling a cell with the nickel electrodes and zinc anodes and alternating the cell between charging and discharging. Property deviations among the obtained battery articles are much reduced,so that batteries can be manufactured with uniform properties. The overdischarge of the nickel electrodes ahead of the cell assembling prevents the separator from being oxidized by gas generation. Further, the charging step subsequent to assembling the cell with the overdischarged nickel electrodes and the zinc electrodes forms metal zinc components, which act as an extra capacity for the zinc electrodes, so that each battery can always secure a constant extra capacity for the zinc electrode, contributing to uniformity of properties.

5563016

DIALLYLAMMONIUM COMPOUNDS, PROCESSES FOR THEIR PREPARATION AND THEIR USE

Baur Ruml udiger; Macholdt Hans-Tobias Eppstein/Taunus, GERMANY assigned to Hoechst AG

Ionic monomeric diallylammonium compounds having a targeted combination of diallylammonium cations with selected anions have particularly high and constant charge control properties and very good heat stabilities and dispersibilities. The compounds according to the invention are outstandingly suitable for use as colorless charge control agents in toners and developers for electrophotographic recording processes and for use as charge-improving agents in powders and paints for surface coating, in particular in triboelectrically or electrokinetically sprayed powder paints.

5567549

NICKEL METAL HYDRIDE BATTERY CONTAINING A MODIFIED DISORDERED MULTIPHASE NICKEL ALUMINUM BASED POSITIVE ELECTRODE

Ovshinsky Stanford; Young Rosa T Bloomfield Hills, MI, UNITED STATES assigned to Ovonic Battery Company Inc

A disordered positive electrode for use in an alkaline rechargeable electrochemical cell comprising: a solid solution nickel aluminum hydroxide material having a multiphase structure. This solid solution nickel hydroxide material is a multiphase structure that comprises at least one microcrystalline alpha-phase material. Phase stabilizers and conductivity enhancers can be included to further stabilize the material.

5569563

NICKEL METAL HYBRIDE BATTERY CONTAINING A MODIFIED DISORDERED MULTIPHASE NICKEL HYDROXIDE POSITIVE ELECTRODE

Ovshinsky Stanford R; Corrigon Dennis A; Benson Peter; Fierro Cristian A Bloomfield Hills, MI, UNITED STATES

A high capacity, long cycle life, positive electrode for use in an alkaline rechargeable electrochemical cell comprising: a solid solution nickel hydroxide material and carbon. The carbon acts to promote the multiphase structure and increase conductivity.

COMPONENTS AND/OR CHARGERS

5554918

MECHANICALLY-REHARGEABLE BATTERY

Haraus Yehuda; Goldstein Jonathan Jerusalem, ISRAEL assigned to Electric Fuel (E F L) Ltd

A mechanically-rechargeable single-cell consumer electric battery for generating up to two volts, the battery being capable of electrical recharge. The battery including a replaceable zinc anode, a housing containing the anode and provided with an aperture sealed by a removable closure, the aperture being sufficiently large to allow removal and replacement therethrough of at least the zinc anode, a cathode selected from the group including a manganese dioxide electrode, a nickel hydroxide electrode, a silver oxide electrode, and an air electrode also contained in the housing, a non-spillable electrolyte in contact with both cathode and anode, and a separator system physically separating the anode from the cathode.

5554920

RECHARGEABLE BATTERY CHARGING METHOD

Kokuga Toshiharu Sumoto, JAPAN assigned to Sanyo Electric Co Ltd

A rechargeable battery is supplementary charged after peak battery voltage is detected. The time interval for supplementary charging is variable and set as a function of the time to peak voltage or charging current. The longer the charging time or the higher the charging current,the longer the supplementary charging timer interval.

5554921

BATTERY CHARGER APPARATUS AND METHOD WITH MULTIPLE RANGE CURRENT CONTROL

Li Edward; Mitchell Ralph; Aseltine John Roselle, IL, UNITED STATES assigned to Motorola Inc

An improved battery charger apparatus and method with multiple range current control includes a programmable current source for providing a charge current to charge a battery. An amplitude of the charge current is dependent on a charge demand signal supplied to the programmable current source. A scaler provides a scaled charge current signal, dependent on the charge current and a current range signal. A charge current

control unit regulates the charge current by providing the charge demand signal to the programmable current source dependent on the scaled charge current signal. More than one amplitude of the charge current is provided to the battery, dependent on more than one current range signal provided by the charge current control unit to the scaler. Moreover, a constant amplitude of the scaled charge current signal is maintained responsive to the more than one current range signal.

5556722

TIGHTLY SEALED PRISMATIC BATTERY

Narukawa Satoshi; Amazutsumi Toru;Tamaki Hiyoshi; Yamauchi Yasuhiro Sumoto, JAPAN assigned to Sanyo Electric Co Ltd

Corner region vacancies resulting from insertion of a spiral electrode unit into a prismatic can are fully utilized to reinforce the can and produce superior battery characteristics. A non-circular spiral electrode unit is made by rolling a negative electrode-separator-positive electrode sandwich. A prismatic shaped can has corners which are thicker than the straight-line regions of the can. The can houses the the electrode unit In a tightly sealed fashion with the outer winding of the electrode unit mechanically held in electrical contact with the can.

5557188

SMART BATTERY SYSTEM AND INTERFACE

Piercey Lawrence E San Jose, CA, UNITED STATES assigned to Sun Microsystems Inc

A battery system includes intelligence to allow the battery system to control various aspects of the charging and discharging of the battery, as well as to constantly monitor the battery voltage, temperature, current charge/discharge rate, and remaining capacity of the battery. The intelligent battery system is capable of being charged from a simple voltage supply, with all aspects of charge/discharge rate control and monitoring being accomplished as a function of the intelligent battery system itself, rather than as part of an external charging circuit, or an external electronic device to be powered by the intelligent battery system. This alleviates the need for external systems to include such circuitry and control elements and allows, if desired, a variety of intelligent battery systems to be developed for use with a given electronic system or family of electronic systems, with each battery being able to control its own charge/discharge rates and monitoring functions. The intelligent battery system is capable of communicating with an external device such as a computer powered by the intelligent battery system, in order to provide an indication of the charge/discharge rate, the state of the battery charge, and the like.

5557189

METHOD AND APPARATUS INCLUDING A CURRENT DETECTOR AND A POWER SOURCE CONTROL CIRCUIT FOR CHARGING A NUMBER OF BATTERIES

Suzuki Mamoru; Iijima Minoru; Ishihama Yasuyuk; Fujiwara Nobuhir Saitama, JAPAN assigned to Sony Corporation

A battery charging apparatus for charging the electricity from a current source to a cell includes a variable resistor in parallel with the cell, a cell voltage detection unit for detecting the current voltage value of the cell and a comparator for comparing the current voltage value to a pre-set voltage value. The resistance value of the variable resistor is controlled responsive to the results of comparison so that the current from the current source is caused to flow through both the cell and the variable resistor with progress in the charging of the cell. The current is prevented from flowing through the cell when the cell is fully charged, so that overcharging is eliminated. If plural cells are charged in series, the control operation of not causing the current to flow through the fully charged cell can be carried out for each of the cells, so that integrated charging may be continued until all of the cells are fully charged thus shortening the cell charging time.

5557190

BATTERY RECHARGING SYSTEM WITH SIGNAL-TO-NOISE RESPONSIVE FALLING VOLTAGE SLOPE CHARGE TERMINATION

Brotto Daniele Baltimore, MD, UNITED STATES assigned to Black & Decker Inc

The falling voltage slope charge termination routine is performed during intervals of the charging cycle in which signal-to-noise ratio is comparatively high. The falling voltage slope charge termination technique is automatically disabled or rendered less sensitive to noise during times when the signal-to-noise ratio is comparatively low. In this way, accurate charge termination is accomplished without error otherwise induced by voltage noise during charging. The charge termination technique responds quickly to a charged battery indication, since signal averaging to negate the effects of noise can be minimized or eliminated.

5557192

CHARGING APPARATUS WITH A COMPENSATION CIRCUIT

Tamai Mikitaka Sumoto, JAPAN assigned to Sanyo Electric Co Ltd

The charging time for rechargeable batteries which require constant voltage charging is reduced by compensating for IR losses in the battery pack circuitry. A voltage detection circuit measures battery pack terminal voltage and a charging control circuit insures that battery voltage does not exceed a reference voltage. The system is improved by a compensation circuit which at least compensates for resistance in circuitry other than the rechargeable battery.

5558679

METHOD FOR MOUNTING A BATTERY ON A SUBSTRATE

Tuttle Mark E Boise, ID, UNITED STATES assigned to Micron Communications Inc

An improved battery, an improved battery contact assembly and an improved method for attaching a battery to a substrate are provided. The battery includes a housing and a cover for attachment to the housing by crimping. During the crimping process a portion of the housing is bent over a portion of the cover such that a portion of the housing is substantially co-planar with a portion of the cover. Thus the two co-planar surfaces provide the positive and negative contact surfaces of the battery on a single side of the battery. The receiving portion of the contact assembly includes a substrate having a pair of contacts formed thereon. The contacts are shaped and sized to match the contact surfaces of the battery. The battery is attached to the substrate and traces using an electrically conducting adhesive.

5558681

METHOD OF BONDING A METAL CONNECTION TO AN ELECTRODE INCLUDING A CORE HAVING A FIBER OR FOAM-TYPE STRUCTURE FOR AN ELECTROCHEMICAL CELL, AND A RESULTING ELECTRODE

Loustau Marie-Thacu ergra ese; Verhoog Roelof; Precigout Claude Bordeaux, FRANCE assigned to SAFT

A method of bonding a metal connection to an electrode including a core having a fiber or foam-type structure for an electrochemical cell, in which method at least one metal strip is pressed against one edge of the core and is welded thereto under compression, wherein, at least in line with the region in which said strip is welded to the core, which is referred to as the main core , a retaining core of a type analogous to that of the main core is disposed prior to the welding.

5558949

BATTERY BOX

Iwatsuki Syuichiro; Fukagawa Masami; Oshida Kei; Mochizuki Kazuyuki; Fujimoto Hiroyuki; Okamoto Masayoshi Wako, JAPAN assigned to Honda Giken Kogyo Kabushiki Kaisha

A battery box has a center frame extending between two rows of batteries housed in the battery box. The center frame has an array of upwardly projecting locking pins. A central holder bar is installed on the locking pins of the center frame. The battery box also has an inner frame including a left straight frame with locking pins and a right straight frame with locking pins. A left holder bar and a right holder bar are installed respectively on the locking pins of the left straight frame and the right straight frame. The central, left, and right holder bars are fastened in position by nuts that are tightened over the locking pins, thereby holding the batteries firmly in the battery box.

5558952

POCKET SEPARATOR FOR ELECTRIC STORAGE BATTERY PLATES

Knauer Davis Kutztown, PA, UNITED STATES assigned to East Penn Mfg Co

A pocket separator which contains positive or negative plates in an electric storage battery, which has a closed bottom, left and right sides, and an open top. The pocket is formed of a porous separator sheet,with the facing inner surfaces of the pocket having a plurality of continuous vertical ribs, and a plurality of short, inclined ribs at the side edges, with a plurality of broken vertical ribs in the center, which engage a positive or negative plate in the pocket.

5558956

SYSTEM FOR ISOLATING BATTERIES DURING TESTING

Gujer Rudol; Simpson Clifford Saratoga, CA, UNITED STATES

An apparatus for shielding adjacent batteries during testing includes a shell with partitions to form an array of pockets, and a cover with shields. When a cover is placed in a closed position on top of the shell,each shield would contact a corresponding partition to completely isolate two batteries placed in two pockets adjacent to the shield and partition. In this manner, even if a battery catches fire or leaks, the partition and the shield minimizes the effect on an adjacent battery.

5558958

FLEXIBLE CORE SPACER FOR STORAGE BATERIES

Mrotek Edward N; Schilling Norber Grafton, WI, UNITED STATES assigned to Globe-Union Inc

A flexible spacer for positioning a cell element in a cell compartment of a container of a storage battery includes a sheet member folded over on itself to a U-shaped configuration with the space between opposing surfaces of the sheet member defining a compartment for receiving the cell element, enabling the cell element and the spacer to be inserted as a unit into the cell compartment, the opposing surfaces of the sheet member each including a ribbed section that flexes upon insertion of the spacer and element into the cell, automatically adjusting for differences in cell element thickness.

5558962

ALUMINUM CURRENT COLLECTOR FOR AN ELECTROCHEMICAL CELL HAVING A SOLID CATHODE

Marincic Nikol; Rabadjija Luka Winchester, MA, UNITED STATES assigned to Pacesetter Inc

The electrochemical cell includes an electrode structure having an aluminum current collector in combination with an active cathode material containing polycarbon monofluoride. The electrode structure also includes a polymeric separator and a lithium anode. The electrode structure is spiral wound and mounted within a cylindrical housing formed of conventional stainless steel. Care is taken to ensure that the aluminum foil isolates the polycarbon monoflouride of the cathode material from the stainless steel of the housing. The cylindrical housing is flooded with a non-aqueous electrolyte solution. The resulting cell is employed within an implantable medical device. In an alternative embodiment, electrode structures employing the aluminum current collector and the polycarbon monoflouride active cathode material are formed as rectangular plates and are mounted in parallel within a rectangular housing. In another alternative embodiment, the aluminum current collector is employed within a button cell.

5561360

BATTERY CYCLE LIFE IMPROVEMENTS THROUGH BIFURCATED RECHARGE METHOD

Ayres John L; Bendert Richard M; Crouch Dell A Cicero, IN, UNITED STATES assigned to General Motors Corporation

A two part battery recharge method first introduces stepped charge current to the battery to restore a majority of energy to a deeply discharged battery. Thereafter, relatively low frequency periodic charge currents and discharge currents interspersed with relaxation periods are introduced to the battery to effectuate efficient energy restoral and increased cycle life of the battery.

5561361

COMPUTER POWER SUPPLY AND BATTERY RECHARGING SYSTEM

Sengupta Upa; Turnbull Robert; Shah Rajesh; Fritz Brian St Joseph, MI, UNITED STATES assigned to Zenith Data Systems Corporation

A power supply system, for example, for use with a portable personal computer, includes a smart battery pack and a charging system. The smart battery pack is provided with a dedicated microcontroller for controlling the charging level of the battery charger system. In particular, the status of the battery including the voltage and temperature of the battery is applied to the microcontroller along with a signal representative of the current load demand of the computer system. The micro controller, in turn, provides a control signal in the form of fixed frequency, variable duty cycle pulse width modulated (PWM) signal for controlling the charging level of the battery charger system. The duty cycle of the PWM signal is used to regulate the charging current supplied by the battery charger. In particular, the DC value of the PWM signal is used as a reference to control the charging current of the regulator to provide a variable output charging current with a relatively wide current range. As such, the battery charger is adapted to efficiently utilize the residual capacity of the battery charger system for optimizing charging of the battery packs during all operating conditions of the computer system. Moreover, the use of a PWM signal from the battery pack to control the battery charger enables a single type of battery charger to be utilized for various battery technologies.

5561362

REMAINING CAPACITY METER AND DETECTION METHOD FOR ELECTRIC VEHICLE BATTERY

Kawamura Nobuyuk; Kumagai Naotake; Owada Tomiji; Koga Hisamitsu; Kato Masaaki; Furukawa Nobuya Okazaki, JAPAN assigned to Mitsubishi Jidosha Kogyo Kabushiki Kaisha

A remaining capacity meter is provided for an electric vehicle battery. This meter is suited for use in the detection of a remaining capacity of the electric vehicle battery. The meter includes a full charge detection device for detecting whether the battery has been brought into a fully-charged state, a remaining capacity setting device for setting, as a full-charge-time capacity, the remaining capacity of the battery at the time of detection of the fully-charged state by the full charge detection device, a discharge/charge-based correction device for correcting the remaining capacity, which has been set by the remaining capacity setting device, while integrating, with respect to time, a current discharged from or charged into the battery, and a deterioration-based correction device for correcting the fully-charged capacity, which has been set by the remaining capacity setting device, by a deterioration-based correction quantity corresponding to the number of chargings and battery temperatures at the time of the respective chargings. A method for the detection of the remaining capacity of such an electric vehicle battery is also described.

5563479

POWER SUPPLY APPARATUS FOR ELECTRIC VEHICLE

Suzuki Shigemits Aichi pref, JAPAA assigned to Aisin Seiki Kabushiki Kaisha

A power supply apparatus for an electric vehicle, which is adapted to restrain battery discharge due to current pulsations of a load. The apparatus has a battery, a coil and a capacitor connected to the battery via the coil to supply power. The apparatus controls the burden ratio of discharge current between the battery and the capacitor in accordance with various operation modes of the electric vehicle to extend a travelable distance thereof.

5563491

COMBINED PARKING METER AND ELECTRIC-VEHICLE BATTERY CHARGER WITH REMOTE STATUS RECEIVER

Tseng Ling-yuan Saratoga, CA, UNITED STATES

A combined parking meter/battery charger station includes a detachable remote receiver to inform the vehicle operator of charge-level status and other information. Upon sufficient payment or credit, the remote receiver is released so that it may be carried away from the charging station. The receiver includes a visual or audible indicator which may keep the operator apprised of charge status, time remaining on the meter or account information. The audible alert may be used to indicate a full charge or to warn that little time is remaining, or other conditions. Communication from the station to the receiver may either be directly from the station or, alternatively, a station may communicate with a central office associated with a plurality of the stations and broadcast may be made therefrom.

5563494

METHOD OF MONITORING THE CHARGING OF SEALED NICKEL STORAGE CELLS, AND A CHARGER USING THE METHOD

Cuesta Rosendo; Rouverand Christophe Saint Loubes, FRANCE assigned to Saft

A method of monitoring rapid charging of sealed nickel storage cells of the nickel-hydride type and of the nickel-cadmium type, said cells optionally being associated in a battery, wherein once said cells have been identified and a relationship for the heating of said cells as a function of charging time for a given charging mode has been determined and stored, the charging of said cells is stopped when the difference between the temperature of said cells and a reference temperature exceeds a predetermined value, the reference temperature being calculated on the basis of said heating relationship and as a function of the charging time that has already elapsed.

5563495

CHARGING CIRCUIT WITH BATTERY CHARGE MONITOR CIRCUIT

Tomiyori Yutaka; Murata Yukio Tokyo, JAPAN assigned to NEC Corporation

A charging circuit charges a nickel-cadmium battery by means of a constant current source. A resistor, diodes and a tantalum capacitor are connected between an output terminal of the charging circuit and a ground potential. A junction between the capacitor and the diode is connected to one input terminal and an output terminal of a comparator and to the output terminal of the charging circuit. The other input terminal of the comparator is supplied with a reference potential. An output signal having a period which depends on a voltage of the battery is generated at the output terminal. The diodes compensate for a variation of the period of the output signal caused by temperature dependent capacitance change of the capacitor.

5563496

BATTERY MONITORING AND CHARGING CONTROL UNIT

McClure Malcolm S Indianapolis, IN, UNITED STATES assigned to Span Inc

A unit that can be a tiny module within a battery pack includes a microprocessor operating through onboard sensors and read circuitry to monitor battery current, voltage and temperature and to develop fast charge termination control data. Various termination schemes are available including negative delta V, dT/dt, dV/dt, absolute temperature,absolute voltage, and override timer. The microprocessor also operates to develop state of charge, percentage of capacity charge and other status

data, to store such data along with setup and calibration data, in an EEPROM, to report data to a host periodically or when polled to and to operate automatically or at a user's request to initially perform and update a calibration as to actual battery capacity. During times when the pack is idle, the unit automatically reverts to a low-power mode in which measuring circuitry is deenergized but during such times, it operates periodically to compensate for self-discharge as a function of temperature. In the read circuitry, a ramp generator generates a linear ramp voltage that is compared with voltages proportional to battery voltage, supply voltage, battery current and temperature, using comparators connected to pins of a common port of the microprocessor and using a mask to obtain all readings from a single generation of the ramp. Voltage dividers of the read circuitry are so arranged as to permit accurate readings of current in either direction and to operate in a bridge configuration to obtain normalized measurements independent of ramp slope. Dynamic correction of readings and other features are also provided.

5565755

CHARGING BATTERIES OF ELECTRIC VEHICLES

Keith Arlie L Laurel Springs, NC, UNITED STATES

An electric vehicle having a computer for controlling the charging of its battery includes a probe adapted to connect with a receptacle on a charging station which has a computer for controlling the charging voltage provided over the connection to the vehicle. In response to the vehicle announcing its presence with a broadcast signal, the charge station receptacle may be raised until it senses a laser signal presented by the vehicle to indicate alignment of the receptacle with the vehicle probe. The vehicle and station communicate over a current loop to establish battery type and voltage, method of payment and credit card number, as well as the cost basis for the power. When communications are complete, the system switches over to utilize the same connections for the charging current. The computers include stop modes which they rest in, and to which they return if performance of vehicle and station diagnostics (respectively) indicate inoperability or if other faults occur. The vehicle charges the battery in a short program triggered by a AC voltage zero crossing interrupt, the background program of which determines when charging should cease because the battery is full, a switch has been operated, or because excessive voltage or current has been sensed. The charged voltage is adjusted by motor driven autotransfer in response to a computer servoprogram. Many probe, receptacle and operational details assure safe,easy, automated operation.

5565756

MICROPROCESSOR CONTROLLED PORTABLE BATTERY CHARGER AND METHOD OF CHARGING USING SAME

Urbish Glenn F; Blanton Gerald W; McGinnis Robert W; Dorinski Dale Coral Springs, FL, UNITED STATES assigned to Motorola Inc

A portable battery charger for use with a variety of battery packs is capable of determining and applying the appropriate charge voltage and current. Electronic circuitry within the portable battery charger identifies the type of battery pack to be charged and selects the appropriate set of battery banks in the charger. Sensors determine the state of charge of the battery pack and a controller controls the functions of the charger. A multiplicity of connectors on the portable battery charger are provided to allow connection to a variety of battery packs. The charger first identifies the type of battery pack and determines the charging profile to be used to charge the battery pack. The charging profile is set in the portable charger by selecting the appropriate sources of electrical power, and the battery pack is then appropriately charged.

5565759

SMART BATTERY PROVIDING BATTERY LIFE AND RECHARGE TIME PREDICTION

Dunstan Robert A Beaverton, OR, UNITED STATES assigned to Intel Corporation

A smart battery that can predict the remaining life and recharge time of the battery based on battery-specific characteristics. A memory stores battery-specific characteristics, such as charge characteristics, discharge characteristics, capacity characteristics, and

self-discharge characteristics. The environmental conditions of the battery, such as temperature, and battery current (charge or discharge) are measured. A microcontroller periodically determines an incremental self-discharge of the battery based on the measured environmental conditions and the self-discharge characteristic of the battery. The microcontroller predicts the remaining battery life of the battery based on the remaining capacity of the battery, the environmental conditions of the battery, and a selected discharge rate of the battery. The discharge rate can be selected by a user, a power management system or by other means. A charge rate of the battery can also be selected. The microcontroller predicts the recharge time of the battery based on the selected charge rate, the present battery capacity, one or more charging characteristics of the battery, and the environmental conditions of the battery (such as battery temperature).

5567209

METHOD OF MANUFACTURING SOLID ELECTROLYTIC CAPACITOR

Kobayashi Atsush; Arai Satoshi Tokyo, JAPAN assigned to NEC Corporation

The invention provides a method for manufacturing a solid electrolytic capacitor having oxide film of valve action metal as a dielectric substance and conducting polymer as solid electrolyte. The method includes the steps of forming solid monomer compound on a surface of the oxide film by applying monomer compound solution to the surface and then drying the monomer compound solution, and forming a conducting polymer layer by polymerizing the solid monomer compound with an oxidizer. The method provides a capacitor having a quite small impedance in a resonant frequency and also having a superior high frequency characteristic.

5567541

METHOD AND APPARATUS FOR MEASURING THE STATE OF CHARGE IN A BATTERY BASED ON VOLUME OF BATTERY COMPONENTS

Rouhani S Zi Idaho Falls, ID, UNITED STATES assigned to Lockheed Idaho Technologies Company

The state of charge of electrochemical batteries of different kinds is determined by measuring the incremental change in the total volume of the reactive masses in the battery. The invention is based on the principle that all electrochemical batteries, either primary or secondary (rechargeable), produce electricity through a chemical reaction with at least one electrode, and the chemical reactions produce certain changes in the composition and density of the electrode. The reactive masses of the electrodes, the electrolyte, and any separator or spacers are usually contained inside a battery casing of a certain volume. As the battery is used, or recharged, the specific volume of at least one of the electrode masses will change and, since the masses of the materials do not change considerably, the total volume occupied by at least one of the electrodes will change. These volume changes may be measured in many different ways and related to the state of charge in the battery. In one embodiment, the volume change can be measured by monitoring the small changes in one of the principal dimensions of the battery casing as it expands or shrinks to accommodate the combined volumes of its components.

5568024

DRIVE CONTROL SYSTEM AND METHOD FOR BATTERY CAR

Suzuki Akira Nogi Machi, JAPAN assigned to Fuji Jukogyo Kabushiki Kaisha

Two motor sensors are disposed at two different angular positions of the motor to generate two pulse signals of different phases. The motor rotational speed and direction can be detected on the basis of these two pulse signals. The detected motor rotational direction is checked as to whether it is the same or opposite to that determined by the shift lever. If opposite, the battery car is determined to be being caused to move down on a

sloping road, and the motor torque is corrected so that the battery car can be once stopped on condition that the accelerator pedal is slightly depressed. After that, when the accelerator pedal is further depressed and the accelerator pedal stroke reaches a stroke enough to generate a motor torque for starting the battery car on a sloping road, the ordinary drive control is executed. Therefore, the start and slow speed drive on a sloping road can be facilitated, without any skill, thus lightening the burden on the driver that the driver must depress both the accelerator and brake pedals frequently.

5568036

CONTACTLESS BATTERY CHARGING SYSTEM WITH HIGH VOLTAGE CABLE

Hulsey Stephen J; Woody George; Radys Ray G Los Angeles, CA, UNITED STATES assigned to Delco Electronics Corporation

A high voltage cable system for use with a contactless battery charging system that charge propulsion batteries of an electric vehicle, and the like. The contactless battery charging system includes a primary power converter coupled to a power source and a secondary power converter located on the electric vehicle that is coupled propulsion batteries of the electric vehicle. The primary and secondary power converters are connected by way of a coaxial power cable. An isolation transformer is coupled between the output of the primary power converter and the coaxial power cable. This transformer allows one of the two outputs of the primary power converter to be connected to ground potential. The isolation transformer improves the safety and reduces electromagnetic interference (EMI) when coupling power to the secondary power converter. The isolation transformer 30 allows for the use of a stepped-up voltage level to be used in the primary power converter, which reduces the amount of current in the coaxial power cable required to deliver power to the secondary converter. This allows a much higher charge power to be delivered to the electric vehicle using a reasonably sized coaxial power cable.

5568037

BATTERY CHARGING SYSTEM HAVING REMOTELY LOCATED CHARGING UNITS

Massaroni Kenneth; Meadows Vernon Plantation, FL, UNITED STATES assigned to Motorola Inc

A system for charging batteries having a system controller and battery charging units powered by a common power line. The system controller contains charge instructions corresponding to various types of batteries and the battery packs have an identifier to identify which set of instructions are used to charge the battery pack. Further, the battery charging units and the system controller communicate over the common power line by power line carrier communications. When a battery pack is inserted into one of the battery charging units, it obtains the battery identification and sends it to the system controller. The system controller alternatively sends the corresponding charge instructions to the charger,or begins to run the charge instructions and controls the charger remotely. In either case, the battery pack is charged according to the charge instructions.

5568039

APPARATUS AND METHOD OF PROVIDING AN INITIATION VOLTAGE TO A RECHARGEABLE BATTERY SYSTEM

Fernandez Jose M Lawrenceville, GA, UNITED STATES assigned to Motorola Inc

An undervoltage recovery pulse network and method used with a lithium ion battery system for providing a initiation voltage to a battery controller which has been operationally disabled due to an event associated with the lithium ion battery system. The undervoltage recovery pulse network includes a switch for detecting a first voltage applied to a data terminal by a charging system. A coupler is used for supplying a second voltage from a charging terminal to the battery controller to enable the battery controller from its disabled state. The battery controller then connects the voltage potential of a cell to the charging terminal for

detection by a charging system. This allows the charging system to detect an attached battery so it may apply a charging voltage to charging terminal.

5568040

CHARGING ARRANGEMENT FOR THE TIME-CONTROLLED CHARGING OF AT LEAST ONE RECHARGEABLE CELL

Krainer Eric; Sonnek Marti St Veit an der Glan, AUSTRIA assigned to U S Philips Corporation

Apparatus for the time controlled charge of a battery includes a switching device to control the supply of charge current to the battery. The switching device is in turn controlled by a control device including a time signal generation stage having a temperature sensitive device responsive to the ambient temperature of the apparatus so as to adjust the time signal generation stage to alter the battery charge time in a sense to prevent overcharging of the battery.

5568052

PERFORMANCE MONITOR FOR ELECTRIC VEHICLE

Sway-Tin Min; Roterman Thaddeus; Impullitti Joseph F; Meir David S; Zawacki Ronald A Troy, MI, UNITED STATES assigned to Chrysler Corporation

A system and method for monitoring usage of current immediately available from the traction batteries of an electric vehicle includes a means for generating a signal representative of the current being drawn from the batteries; a means for generating a signal representative of the maximum current available from the batteries for immediate use; and a means responsive to the drawn-current signal and the maximum-available-current signal for generating a usage signal representing the ratio of drawn current to maximum-available current. A display, such as an analog meter responsive to the usage signal and calibrated from zero-percent to one-hundred-percent available current usage, displays the transitory current usage as a percentage of maximum-available current. Where the batteries supply current to both the vehicle's traction motors and noncritical electrical components , a relay responsive to the usage signal sheds the noncritical component's load from the batteries when current usage rises above a given level. A current limiter responsive to the usage signal is preferably also provided to limit the supply of current to the traction motors when current usage rises above a still higher level.

5569553

BATTERY DESIGN FOR ACHIEVING END-OF-LIFE INDICATION DURING ELECTRICAL DISCHARGE

Smesko Sally A; Takeuchi Esther; Ebel Steven North Tonawanda, NY, UNITED STATES assigned to Wilson Greatbatch Ltd

A cell construction that makes use of unbalanced electrode components or portions comprising one of the electrodes of an electrochemical cell to provide an end-of-life indication, is described. The unbalanced electrode components can have dissimilar physical dimensions or dissimilar percent loading of electrode active material. This renders the one dissimilar electrode component having the lesser physical dimension, i.e., lesser surface area or thickness, or lesser quantity of electrode active material electrochemically unreactive prior to the other electrode component during the course of cell discharge. Upon the early exhaustion or unreactiveness of the one dissimilar electrode component, the total cell interelectrode working capacity is reduced by a predetermined factor. The remaining functional electrode component provides the cell with sufficient capacity for electrical discharge at a predetermined lower energy level.

5569556

BATTERY CHARGE INDICATOR

Bohmer William Succasunna, NJ, UNITED STATES assigned to Display Matrix Corporation

A battery charge indicator is disclosed which accurately displays the true state of charge or energy remaining in an alkaline battery in which the indicator is installed. An alkaline battery cell utilizes a steel can which contains the active chemical ingredients within and provides the conductive surface for the cathode. When the battery is

sealed at the open end with a combination plug and anode, the closed end of the steel can becomes distorted or bulged due to internal pressures which are caused by both the expansion of the cathode material due to electrical discharge of the battery and hydrogen gas which accumulates during shelf life in storage. An increase the amount of hydrogen gas occurring during storage creates a distortion or bulge in the center of the closed end of the can. When the battery has been electrically discharged, the cathode material physically expands inside the can causing distortion to extend to the outer periphery of the closed end of the can. The angle between the surface of the closed end of the can at the periphery and the long end or wall of the battery becomes more than ninety degrees. The disclosed battery charge indicator utilizes the distortion or deflection of the periphery of the end portion of the can to move an indicating element to show the degree of discharge of the battery.

5569993

CHARGING BATTERIES OF ELECTRIC VEHICLES

Keith Arlie L Laurel Springs, NC, UNITED STATES

An electric vehicle having a computer for controlling the charging of its battery includes a probe adapted to connect with a receptacle on a charging station which has a computer for controlling the charging voltage provided over the connection to the vehicle. In response to the vehicle announcing its presence with a broadcast signal, the charge station receptacle may be raised until it senses a laser signal presented by the vehicle to indicate alignment of the receptacle with the vehicle probe. The vehicle and station communicate over a current loop to establish battery type and voltage, method of payment and credit card number, as well as the cost basis for the power. When communications are complete, the system switches over to utilize the same connections for the charging current. The computers include stop modes which they rest in, and to which they return if performance of vehicle and station diagnostics (respectively) indicate inoperability or if other faults occur. The vehicle charges the battery in a short program triggered by a AC voltage zero crossing interrupt, the background program of which determines when charging should cease because the battery is full, a switch has been operated, or because excessive voltage or current has been sensed. The charged voltage is adjusted by motor driven autotransfer in response to a computer servoprogram. Many probe, receptacle and operational details assure safe, easy, automated operation.

5569999

SYSTEM FOR MONITORING THE CURRENT DRAWN FROM TRACTION BATTERIES IN ELECTRIC VEHICLES AND HYBRID VEHICLES

Boll Wolf; Knuml orzer Guml unther; Heidenfelder Hans-Dieter Weinstadt, GERMANY assigned to Mercedes-Benz AG

The invention relates to a battery current monitoring system for traction batteries in electric vehicles and hybrid vehicles, in which battery current monitoring system the maximum battery current is monitored in order to avoid damage to the battery as a result of overheating due to excessively high battery currents and, if appropriate,the said maximum battery current is reduced to a normal value which is permitted for continuous operation. Monitoring is activated if the battery current exceeds a prescribed limit value. The battery current is however not reduced until the battery temperature exceeds a prescribed limit value. It is also proposed not to use the measured average battery temperature as the control variable, but rather to use a reference temperature calculated on the basis of heat balances for individual reaction zones of the battery. The monitoring is terminated as soon as both the average and the calculated battery temperatures drop below a prescribed uncritical value.

5583406

CONTROL METHOD AND SYSTEM FOR REGENERATION BRAKING OF AN ELECTRIC VEHICLE

Mutoh Nobuyoshi; Kaneko Satoru; Masaki Ryoso; Ohmae Tsutomu Katsuta, JAPAN assigned to Hitachi Ltd

When a voltage level determinator judges from the

terminal voltage of a smoothing capacitance that a battery is in an over-charged state and cannot receive regeneration energy, a regeneration/free-wheel mode selector switches to a free-wheel mode for consuming the energy of the battery. For this purpose, a torque reducing signal generator executes a control in which only a magnetizing component current flows through the primary winding and no dr. force is generated in the motor, with the result that the energy of the battery is consumed as heat loss inside the motor. Then, when the over-charged state is eliminated and the energy receiving capability of the battery is recovered, the regeneration/free-wheel mode selector switches the mode to the regeneration mode to obtain regeneration braking.

5583415

APPARATUS FOR SIMULATING HIGH BATTERY TEMPERATURE FOR RECHARGEBLE BATTERY SYSTEMS

Fernandez Jose; Meadows Vernon; Garrett Scott; Lam Dao N; Kamke James F Lawrenceville, GA, UNITED STATES assigned to Motorola Inc

A battery system for use with portable electronic products which includes protection circuitry for allowing the battery system to be safely recharged in a recharging system. The battery system includes cells and a plurality of controls including and overcharge protection circuit for limiting the amount of current to the cells by a charging network and a thermistor and thermistor control for controlling the state of the thermistor to simulate a high temperature condition allowing the charging network to switch modes and accommodate battery system which does not following the charging regimen provided by charging system.

5583416

APPARATUS AND METHOD FOR STEP-CHARGING BATTERIES TO OPTIMIZE CHARGE ACCEPTANCE

Klang James K Rosemount, MN, UNITED STATES assigned to GNB Battery Technologies Inc

Apparatus and method for charging a battery, wherein a target voltage is applied to a battery. During charging, the applied voltage is periodically increased and decreased a predetermined amount to modify the applied voltage by a small step in either direction. The charging input is measured as the current flow to the battery at each of the applied levels, and the target charging voltage is adjusted in the direction of the improved charge acceptance as indicated by the differentials of the input current flow at the increased and decreased levels. By repeating the process, the charging voltage is continually moved in the direction of an optimized charge acceptance level. Alternatively, a target current is applied and increased and decreased by a small step and adjusted in the direction of the improved charge acceptance, which corresponds to the differentials of the resulting voltages at the increased and decreased levels.

5583871

METHOD FOR HIGH-SPEED CHARGING OF SECONDARY BATTERIES AND APPARATUS THEREFOR

Simmonds Stewart N; Miyamoto Isamu Port Coquitlam, CANADA assigned to Datalink Corporation

PCT No. PCT/JP94/00651 Sec. 371 Date May 24, 1995 Sec. 102(e) Date May 24, 1995 PCT Filed Apr. 20, 1994 PCT Pub. No. WO95/09471 PCT Pub. Date Apr. 6, 1995. To provide a single universal charging apparatus, capable of charging at high speed and efficiency any type of secondary battery, and capable of charging secondary batteries any arbitrary charging rate. In selecting the arbitrary amount of current from low current to high current while charging a variety of secondary batteries, the voltage and temperature of the battery are monitored, so that either at the point at which the rate of rise of the temperature of the battery exhibits an increase over the immediately previous rate of rise that exceeds a given reference value, or at the point at which the difference in change of battery voltage is decreased continuously for a preestablished amount of time, the charging of the battery is stopped.

5592064

BATTERY CHARGING APPARATUS, POWER SUPPLY, AND ATTACHMENT FOR CONNECTING DIFFERENT TYPES OF BATTERY PACKS TO A BATTERY CHARGER

Morita Hideyo Sumoto, JAPAN assigned to Sanyo Electric Co Ltd

A charging attachment connects battery packs having different cell types with a battery charger, and a power source attachment connects these battery packs to electrical equipment such as a video camera. The charging attachment has a mount for a constant voltage chargeable battery pack and electrically connects it with constant voltage adapter terminals on a battery charger. The power source attachment has easy on-off coupling with electrical equipment and mounts a reduced size battery pack on equipment designed for full size battery packs. The charging and power source attachments can be single unit.

5592065

BATTERY CHARGER HAVING BATTERY TEMPERATURE MEASUREMENT PROBE

Oglesbee John W; Bohne William C; McGinnis Robert Athens, GA, UNITED STATES assigned to Motorola Inc

A battery charger is used for recharging a battery pack when the battery pack is placed in a charging pocket The battery pack generates heat upon being recharged, which is collected by a probe. The probe senses the temperature and changes in temperature of the battery pack by means of a temperature sensing element disposed therein. The temperature sensing element provides an electrical signal indicative of the temperature of the battery pack to a charging circuit. The charging circuit, upon sensing sufficient temperature conditions, modifies the operation of the charger such that only low rate currents are thereafter applied to the battery pack.

5592067

DISTRIBUTED MULTI-MODULE BATTERY EQUALIZATION

Peter David; Ayres John Anderson, IN, UNITED STATES assigned to General Motors Corporation

An apparatus and method are disclosed for equalizing individual module voltages in a multiple module battery pack during recharging. Two individual module voltages are compared, and charge redistribution is caused to occur by way of switched mode converters when the voltages are not equivalent. Switched mode converters may be of unidirectional or bidirectional topologies.

5592069

BATTERY CHARGER

Dias Donald; Lee Robert Carrollton, TX, UNITED STATES assigned to Dallas Semiconductor Corporation

A battery charger with charging parameter values derived from communication with a battery pack to be charged. Communication is over a one-wire bus with battery pack transmissions in response to charger inquiries. The battery charger may be in the form an integrated circuit driving a power transistor or other controllable DC supply. A battery pack may contain a program with multiple charging currents and charging interval termination methods such as time, temperature rise, and incremental voltage polarity. A lack of communication may be invoke a default charging program or denial of access to the charger. The charger also communicates over a high-speed three-wire bus with an external computer for analysis of identification information acquired from the battery and for control of the charger.

5592070

BATTERY CHARGER HAVING A TEMPERATURE SENSOR AND A RECHARGEABLE BATTERY CHARGING METHOD

Mino Takayuk Mihara gun, JAPAN assigned to Sanyo Electric Co Ltd

A temperature sensor avoids battery charger over-heating when rechargeable batteries arc charged In succession. The battery charger is provided with a control means having a voltage detection section and a control circuit. The control circuit stops charging when a rechargeable battery reaches full charge. The control means also has a temperature sensor to determine the temperature of heat producing elements in the power supply circuit. Charging current is reduced when the temperature of heat generating elements exceeds a specified temperature. Full charge detection is suspended when charging current is reduced to avoid false detection.

5592093

ELECTRONIC BATTERY TESTING DEVICE LOOSE TERMINAL CONNECTION DETECTION VIA A COMPARISON CIRCUIT

Klingbiel August Willowbrook, IL, UNITED STATES assigned to Midtronics Inc

An electronic battery testing device includes first and second electrical probes for coupling to first and second battery terminals, respectively, and electrical circuitry coupled to the electrical probes for providing an output related to battery condition. The probes each have a pair of electrical connections. A bridge circuit connected between the first and second electrical probes provides a bridge output. An amplifier connected to the bridge output provides an amplified output. The amplified output is indicative of a loose connection between an electrical probe and a battery terminal. The amplified output may be used to indicate an alarm condition.

5592094

BATTEREY DISCHARGE CHARACTERISTICS CALCULATION METHOD AND REMAINING BATTERY CAPACITY MEASURING DEVICE

Ichikawa Hiroshi Shizuoka ken, JAPAN assigned to Yazaki Corporation

A method and a device for determining the battery discharge characteristics and estimating the remaining battery capacity easily by a simple mechanism even if time elapses. A discharge characteristics calculation section reads voltage, current, and temperature from a voltage sensor, a current sensor, and a temperature sensor, respectively,and determines the approximated discharge characteristics at a given time based on a position relationship of the discharge characteristics curved surface function V=a*log(H0-H)+b*H+c to voltage-temperature-duration of discharge axes. A duration of discharge characteristics calculation section determines the duration of discharge from a fully charged state to the present based on the approximated discharge characteristics. A remaining capacity calculation section determines the remaining capacity based on the approximated discharge characteristics.

5592095

CHARGE MEASUREMENT CIRCUIT FOR A BATTERY IN WHICH OSCILLATORS ARE USED TO INDICATE MODE OF OPERATION

Meadows Vernon Lilburn, GA, UNITED STATES assigned to Motorola Inc

A battery pack has a charge measurement circuit for estimating the state of charge during use. The charge measurement circuit includes a sense resistor, amplifier, at least one oscillator, counter, and a communications circuit. The battery pack powers a host device, which has a limited number of modes of operation, each mode requiring a different current level. The number of oscillators equals the number of modes of operation of the host device. As current is drawn from the battery cells, the sense resistor and amplifier act to convert the current to a voltage level. The voltage level is fed to each oscillator present. Each oscillator provides a clock signal at a frequency corresponding to one mode of operation of the host device, and is activated when the voltage level is within a preselected range. The clock signal is fed to a counter, which counts at a rate determined by the frequency of the active oscillator. The host device can request the current count value from communications circuit to estimate the state of charge of the battery cells.

5598083

BATTERY CHANGING SYSTEM FOR ELECTRICALLY POWERED VEHICLE

Gaskins Paul M Bristol, TN, UNITED STATES assigned to Stamler Corporation

A battery changing system is provided for an electrically powered vehicle. The battery changing system includes a housing for the battery. The housing includes first and second spaced crossbars. A battery manipulating mechanism is mounted to the vehicle. This battery manipulating mechanism includes at least one outwardly projecting arm that is pivotally connected to the vehicle and driven by an actuator so as to raise and lower the battery. More specifically, the arm includes an upwardly directed recess for engaging the first crossbar on the battery housing and a downwardly directed saddle for receiving the second crossbar of the battery housing. A locking plate may be selectively extended to secure the second crossbar in the saddle.

5598084

CHARGING BATTERIES OF ELECTRIC VEHICLES

Keith Arlie L Laurel Springs, NC, UNITED STATES

An electric vehicle having a computer for controlling the charging of its battery includes a probe adapted to connect with a receptacle on a charging station which has a computer for controlling the charging voltage provided over the connection to the vehicle. In response to the vehicle announcing its presence with a broadcast signal, the charge station receptacle may be raised until it senses a laser signal presented by the vehicle to indicate alignment of the receptacle with the vehicle probe. The vehicle and station communicate over a current loop to establish battery type and voltage, method of payment and credit card number, as well as the cost basis for the power. When communications are complete, the system switches over to utilize the same connections for the charging current. The computers include stop modes which they rest in, and to which they return if performance of vehicle and station diagnostics (respectively) indicate inoperability or if other faults occur. The vehicle charges the battery in a short program triggered by a AC voltage zero crossing interrupt, the background program of which determines when charging should cease because the battery is full, a switch has been operated, or because excessive voltage or current has been sensed. The charged voltage is adjusted by motor driven autotransfer in response to a computer servoprogram. Many probe, receptacle and operational details assure safe,easy, automated operation.

5598085

CIRCUIT ARRANGEMENT FOR CHARGING RECHARGEABLE BATTERIES

Hasler Rudolf Vienna, AUSTRIA assigned to US Philips Corporation

A circuit arrangement for charging batteries comprises a charging current source for supplying charging current pulse trains. The circuit arrangement comprises a first detection device for determining an actual voltage dependent upon a variable reference voltage, which actual voltage is proportional to the average sum voltage of a battery. The first detection device supplies a detection signal corresponding to the detection result and which controls the duty cycle of the pulse-shaped control signal which can be generated by a control pulse generator. The control pulse generator varies the duty cycle dependent on the detection signal when the actual voltage increases or the reference voltage decreases, in a manner such that the ratio between the charging period and the charging pause in a charging pulse train is reduced. A device is provided which enable the reference voltage to be varied in the same sense as the duty cycle depending on this duty cycle.

5598086

PEAK VOLTAGE AND PEAK SLOPE DETECTOR FOR A BATTERY CHARGER CIRCUIT

Somerville Thomas A Chandler, AZ, UNITED STATES assigned to Motorola Inc

A peak voltage and peak slope detector circuit of high resolution is disclosed for sensing a battery voltage during a battery charging sequence. Battery charging circuitry is disabled when a battery voltage is being

sampled to eliminate error due to noise. The battery voltage is sampled at predetermined intervals for a predetermined time period which is determined by a sample timer. A Voltage To Frequency Converter converts the battery voltage to a signal. The signal frequency corresponds to the magnitude of the battery voltage. The number of pulses output by the VFC are counted during the predetermined time period. The number of puises are counted and compared against a previous sample by a counter comparator to determine peak voltage. The peak voltage occurs when the sampled count is less than the previous sample count. The rate of change of the battery voltage is monitored by a second counter comparator for determining peak slope during the battery charging sequence.

5598087

SYSTEM FOR MONITORING RESIDUAL CAPACITY OF BATTERY

Hara Kazuhiro Wako, JAPAN assigned to Honda Giken Kogyo Kabushiki Kaisha

A battery monitor system for monitoring the residual capacity of a battery has a controller for determining the residual capacity of a battery, detecting the output electric power of the battery when the battery is being discharged, and correcting the residual capacity depending on the output electric power such that as the output electric power of the battery increases, a new residual capacity produced when the residual capacity is corrected decreases. The residual capacity may be corrected by subtracting a residual capacity corrective value, which increases as the output electric power of the battery increases, from the residual capacity. The residual capacity of the battery can accurately be determined and monitored depending on the output electric power from the battery. In the case where the battery monitor system has a residual capacity display unit and is combined with an electric vehicle, the driver of the electric vehicle can visually recognize the residual capacity of the battery depending on the running condition of the electric vehicle.

5598088

METHOD FOR DETERMINING THE CHARGE STATE OF A BATTERY, IN PARTICULAR A VEHICLE STARTER BATTERY

Richter Gerolf Hildesheim, GERMANY assigned to Robert Bosch GmbH

PCT No. PCT/DE94/01349 Sec. 371 Date Jun. 23, 1995 Sec. 102(e) Date Jun. 23, 1995 PCT Filed Nov. 17, 1994 PCT Pub. No. WO95/14239 PCT Pub. Date May 26, 1995. A method is specified for determining the charge state of a battery, for example a vehicle starter battery, in which a charge balance is carried out by evaluating the charging current and the discharging current. This charge balance is checked with the aid of the measured battery open-circuit voltage and corrected. Depending on further variables, for example, the battery temperature, a time interval is determined which can be used to detect how long the battery can still supply an acceptable discharging current under the given conditions. This time interval is optimized with the aid of suitable correction functions, and serves as a measure of the present charge state of the battery.

5598089

SECONDARY BATTERY CHARGING APPARATUS

Shintomi Yuichi Kyoto, JAPAN assigned to Rohm Co Ltd

A charging apparatus has a controller which controls the charging and discharging of a secondary battery. The controller has a power changeover circuit which makes a changeover so that when a charging DC power source from an AC adapter is present, the charging DC power source is used as the power source of the controller and that when the charging DC power source from the AC adapter is absent with the secondary battery being set, the secondary battery is used as the power source of the controller.

5598098

ELECTRONIC BATTERY TESTER WITH VERY HIGH NOISE IMMUNITY

Champlin Keith S Minneapolis, MN, UNITED STATES

A cell/battery is excited by a time-varying signal that is characterized by periodically making step transitions between discrete levels. The immediate change in a responsive signal is determined by a circuit that is only enabled during a brief window of time encompassing a step transition, and which employs a holding capacitor to store dynamic conditions existing at the instant of enablement. Action of this holding capacitor causes the circuit to only respond to changes in noise signals occurring during the enablement window and not to the actual level of the noise itself. By making the window sufficiently narrow, noise signals can change by only an acceptably small amount and can be removed by synchronously detecting the response to the step excitation and averaging the result over time. Two embodiments are disclosed. A first embodiment utilizes a step current-signal excitation and a voltage-signal response to directly determine a particular component of incremental resistance. A second, preferred, embodiment utilizes a step voltage-signal excitation and a current-signal response to directly determine a particular component of incremental conductance.

5598964

APPARATUS FOR ULTRASONIC WELDING OF BATTERY ASSEMBLIES

Gore Kiron; Oh Sang Libertyville, IL, UNITED STATES assigned to Motorola Inc

An unwelded battery assembly is fed to a shuttle which moves the unwelded battery assembly to a moveable platform in a raised position. The platform lowers the battery assembly into a nest which rigidly supports the battery assembly. An ultrasonic horn is lowered into contact with the battery assembly and welds the battery cover to the battery housing. The welded battery assembly is then raised out of the nest by the moveable platform, and is moved to a second stage while another unwelded battery assembly is shuttled to the platform. A central control circuit operates and synchronizes the apparatus.

5600222

THERMAL MANAGEMENT USING A HYBRID SPIRAL/HELICAL WINDING GEOMETRY

Hall John T; Radys Ray G; Woody George R Woodland Hills, CA, UNITED STATES assigned to Delco Electronics Corporation

An inductive battery charging system comprising a charge probe and a charge port that employs multi-turn spiral and helical windings in the charge probe to provide improved thermal management of the power produced by the charging system. The thermal management provided by the multi-turn windings of the present invention improves the power handling capacity of the system and reduces AC proximity losses. Numerous flat helical coil and spiral transformer windings are disclosed that provide for differing thermal management schemes. The present invention may be used to increase the inductive charging capacity of electric vehicle propulsion batteries to on the order of 120 KW. The present invention may be used with almost any transformer or inductor that uses foil windings.

5600224

APPARATUS AND METHOD FOR CHARGING ONLY RECHARGEABLE BATTERIES

Mody Deepak R; Krishnamurthy Arun K; Liew Kin S; Nguyen Anh X Parkland, FL, UNITED STATES assigned to Motorola Inc

A battery charger which electronically discriminates between rechargeable and non-rechargeable batteries, and which charges only rechargeable NiCd batteries. This feature is made possible due to the variation in the internal resistances between various types of battery cells.

5600225

NONCONTACTING CHARGING DEVICE

Goto Masataka Minato ku, Tokyo, JAPAN

A non-contacting charging device is disclosed which performs charging in which electric power of a charger 1 is supplied without direct contact to a storage battery 210, and which includes in the charger 1 a primary coil 103 and circuits 104, 105 for supplying AC power to the primary coil, and also includes in the radio communication device having a storage battery 210, a secondary coil 212 that couples electromagnetically with the primary coil 103 and a circuit 211 for supplying the induced current power generated in the secondary coil to the storage battery as charging power. This device is provided with halt signal generating circuits 203, 209, and 214 for generating a halt signal that commands a halt of supply of AC power to the primary coil, and a halting circuit for halting supply of AC power to the primary coil in response to a halt signal, the halt signal generating circuit being provided in the radio communication device. If it is necessary to make or receive a call during charging of the radio communication device, a halt signal is generated on the radio communication device side to halt charging, thereby eliminating the attractive force caused by the electromagnetic induction in effect between the radio communication device and the charger, and allowing removal of the radio communication device from the charger with a minimum of effort.

5600226

METHODS OF CONTROLLING THE APPLICATION AND TERMINATION OF CHARGE TO A RECHARGEABLE BATTERY

Falcon Carl B Royersford, PA, UNITED STATES assigned to Galaxy Power Inc A Pennsylvania Corporation

As a substantially constant charge current is applied to a battery, the voltage is periodically measured and the slope of the voltage characteristic is calculated. The minimum slope of the bottom peak of the slope profile is dynamically identified and, as appropriate, updated and stored. With each identification and update of the minimum slope, a trigger threshold between the minimum slope and top peak is defined, and then stored, by adding a trigger value to the minimum slope. A termination threshold or value between the minimum slope and the trigger threshold may also be calculated and stored with each such identification and update of the minimum slope. When the calculated slope, increasing from the bottom peak, reaches the trigger threshold, the method is armed-as by setting a trigger threshold flag-so that when the calculated slope thereafter once again passes through the trigger threshold and then reaches the termination threshold, full-current charging of the battery is terminated. The termination threshold-which identifies the substantially fully-charged state of the battery-may, in some forms of the invention, be preset to equal the minimum slope value. Premature termination resulting from a high impedance spike or inflection point occurring in the voltage profile when charging current is initially applied to the battery may be avoided by gradually increasing the applied charging current at the beginning of the charging process.

5600227

ELECTRICAL STORAGE BATTERY CHARGER AND CONDITIONER

Smalley Gustav Manville, NJ, UNITED STATES

The present invention provides a charging, discharging and conditioning method and apparatus that provides an improved method of breaking in new rechargeable batteries and reconditioning old batteries. Batteries are charged according to the method of the present invention by applying a high frequency charging current to the batteries. The charging current is then removed once the batteries are substantially charged. The resulting charged batteries are thereafter rapidly discharged, using a high discharge current switched on and off at a high frequency. The resulting discharged batteries may then be charged by conventional techniques. A novel battery charger for use in the above described method includes a high frequency switch operably connected in the circuit path of a battery charging socket and a dc power supply. The high frequency switch is preferably driven by a high frequency, substantially rectangular wave signal.

5600566

APPARATUS AND METHOD FOR MONITORING STATE OF BATTERY

Park Yong-Sik Seongnam, REPUBLIC OF KOREA assigned to Samsung Heavy Industries Co Ltd

An apparatus and a method for monitoring the state of a battery are disclosed in which a micro-processor is used to accurately measure the current state of a battery used for supplying electric power in electric automobiles and the like. The present invention includes: a plurality of passive modules with a micro-processor installed thereon for measuring the charge state of respective batteries; an active module for measuring the overall state of the batteries and for supervising the respective passive modules; and serial lines for connecting the passive modules and the active module. The passive modules compute the charge/discharge states of the respective batteries within certain time intervals to record the data into an internal RAM. The active module measures the overall charge/discharge state of the total batteries within certain time intervals, and receives the data on the charge/discharge states of the individual batteries through the serial communications. Then the active module compares these data to compute the overall battery residual capacity. With the present invention, the maintenance and wiring are easy to implement, and the exact time for charging the batteries can be known, thereby extending the life expectancy of the batteries.

OTHER BATTERIES

5552245

MODIFIED ELECTROLYTE FOR ELECTROCHEMICAL CELLS AND CELLS USING SAME

Li Changming; Lian Keryn; Bai Lijun; Kincs Joseph G Vernon Hills, IL, UNITED STATES assigned to Motorola Inc

An electrolyte system for use in an electrochemical cell such as a battery or capacitor, and which includes an aqueous electrolyte and a modifier species. The modifier should be adapted to act as a surfactant, as well as reduce oxidation of the electrode materials in the electrochemical cell. The aqueous electrolyte may be, for example, KOH, and the modifier species may be a porphine or porphine derivatives.

5554411

TREATMENT OF SOLID ELECTROLYTES TO PROMOTE WETTABILITY

Higley Lin R; Dalke Janet Troy, MI, UNITED STATES assigned to Hughes Aircraft Company

A beta-double prime aluminum oxide solid electrolyte is prepared for wetting by a liquid electrode material. The method includes mechanically rubbing an asperity-filling metal against the surface of the solid electrolyte until the solid electrolyte turns gray in color, which fills in asperities in the surface of the electrolyte. The electrolyte and deposited asperity-filling metal are heated to a temperature above the melting point of sodium,and sodium is de posited onto the electrolyte surface and permitted to wick along the surface.

5554452

METAL-AIR BATTERIES HAVING IMPROVED AIR ACCESS VALVES

Delmolino William P; Putt Ronald A Cumming, GA, UNITED STATES assigned to Matsi Inc

A prismatic metal-air battery is provided for having at least one prismatic metal-air cell received in a cell cavity of a prismatic casing. The casing comprises a wall portion which defines a surface. The wall portion has at least one opening in communication with the cell cavity which is adapted to allow the passage of air into the cell cavity. The casing also includes a valve member having a surface bearing on the wall portion surface. The valve member also has at least one opening therein. The wall portion surface and the valve member surface are adapted to allow movement of the valve member across the wall portion surface between a closed position, in which the valve member opening does not overlap with

the wall portion opening, and an open position, in which the valve member opening and wall portion opening at least partially overlap. Importantly, the casing also includes means for providing an attractive force between the wall portion and the valve member.

5554457

FOIL POSITIVE ELECTRODES IN SODIUM-NICKEL CHLORIDE BATTERIES

Bugga Ratnakumar; Attia Alan I; Halpert Gerald Arcadia, CA, UNITED STATES

Power density of a sodium/transition metal halide cell, particularly a Na/NiCl2 cell is enhanced by forming a high area foil nickel chloride electrode such as a film of sintered nickel chloride deposited on an expanded metal screen and folded or coiled into a compact form and immersed in the aluminate salt catholyte disposed within a beta alumina solid electrolyte tube.

5554458

ALUMINUM NON-AQUEOUS ELECTROLYTE SECONDARY CELL

Noda Kazuhiro; Endo Eishi; Takahashi Kenichi Kanagawa, JAPAN assigned to Sony Corporation

An aluminum non-aqueous electrolyte secondary cell having excellent rechargeable characteristics and comprising an aluminum or an aluminum alloy negative electrode, characterized in that it comprises a negative electrode made from aluminum or an aluminum alloy, a non-aqueous electrolyte containing a non-aqueous solvent with an aluminum halide and an organic halide dissolved therein, and a positive electrode containing FeS2 as the active material.

5556720

SEALED ZINC SECONDARY BATTERY AND ZINC ELECTRODE THEREFOR

Charkey Allen Brookfield, CT, UNITED STATES assigned to Energy Research Corporation

A zinc negative electrode comprising a zinc active material, Ba(OH)2 or Sr(OH)2 and a conductive matrix including a metallic oxide which is more electropositive than zinc. The zinc negative electrode is incorporated into a zinc secondary battery having an electrolyte whose electrolyte constituent is a low percentage of the electrolyte. The zinc negative electrode is split into electrode assemblies separated by a porous hydrophobic element.

5558682

PROCESS FOR PRODUCING A WIND-TYPE ALKALINE SECONDARY BATTERY

Urairi Masakatsu; Tachibana Toshimitsu; Matsumoto Kenji; Shinomura Toshihiko; Iida Hiroyuki; Kawamura Kazunori; Yano Shuuji; Ishida Osamu Osaka, JAPAN assigned to Nitto Denko Corporation; Hitachi Maxell Ltd

An alkaline secondary battery comprising a negative comprising cadmium, zinc or iron or an oxide or thereof or a hydrogen absorbing alloy, a positive electrode comprising a metal oxide or a metal hydroxide, and a separator, which are all impregnated with an electrolyte comprising an alkaline aqueous solution is disclosed, wherein the separator is made of a polyolefin fiber sheet which has a wicking rate of pure water of at least 10 mm per 2 minutes when one end of the sheet is dipped in pure water at 20°C and 60% RH. Since the separator is chemically stable and exhibits sufficient hydrophilic properties, the battery retains a high electrode utilization even at a high rate discharging and has a practically sufficient cycle life.

5558947

RECHARGEABLE BATTERY SYSTEM AND METHOD AND METAL-AIR ELECTROCHEMICAL CELL FOR USE THEREIN

Robison George Atlanta, GA, UNITED STATES

Rechargeable metal-air battery systems comprise a plurality of plate groups disposed within a battery cell and have input and output conduits. A fluid electrolyte is circulated through the battery cell by a pump and regenerated by a divester for recirculation through the battery cell. The divester divests the particles of active material suspended within the electrolyte of their oxide layer resulting from passivation caused by the electrolyte solution being saturated with oxide. The divester performs its function by bringing the particles of active material into frictional contact with one another. The battery system constructed in accordance with the present invention may be chemically recharged by removing the spent active material suspended within the electrolyte and replacing it with new active material.

5558957

METHOD FOR MAKING A THIN FLEXIBLE PRIMARY BATTERY FOR MICROELECTRONICS APPLICATIONS

Datta Madhav; Shenoy Ravindra Yorktown Heights, NY, UNITED STATES assigned to International Business Machines Corporation

A method is provided for making a flexible primary battery suitable for microelectronics applications, and more particularly, for use with self-contained self-powered portable devices (SSPD) such as RF-ID tags. The method generally employs photolithography and etching techniques to minimize the thicknesses of metal foils required in the structure of the battery, as well as packaging methods which yield a flexible and durable battery having a thickness of not more than about 0.5 millimeter, and preferably about 0.3 millimeter or less, and a relatively small size on the order of a few square centimeters in surface area.

5560999

AIR MANAGER SYSTEM FOR RECIRCULATING REACTANT AIR IN A METAL-AIR BATTERY

Pedicini Chris; Sieminski Dennis P; Skeggs Leonard; Young Jeffrey; Cherry Ernest Marietta, GA, UNITED STATES assigned to AER Energy Resources Inc

An air manager is disclosed which recirculates reactant air in a battery and exchanges only a minimal amount of recirculated air for ambient air that is necessary to maintain a sufficient oxygen concentration in the battery. In the air manager, the reactant air is recirculated in a defined air pathway that provides reactant air to the entire area of all the air cathodes. A catalyst element is also provided in the air manager to convert the hydrogen gas that is generated during the recharge of a metal-air battery to water vapor. The air manager is nevertheless compact and lightweight so that the resulting battery is portable.

5561002

ELECTRODE FOR ALKALINE STORAGE BATTERY AND METHOD OF MANUFACTURING

Sakamoto Takeshi; Uemiya Takafumi; Nishi Tetsuya; Kariya Ayao; Terao Tovs oru Osaka, JAPAN assigned to Sumitomo Electric Industries Ltd

An improved electrode for an alkaline storage battery can suppress the reduction of the battery capacity when the battery is used in a high-temperature environment. The electrode is formed by charging or filling a collector, which consists of a porous body of a nickel-boron alloy containing 0.001 to 3 percent by weight of boron, with an active material. The porous body of the nickel-boron alloy can be formed by depositing nickel on a surface of a substrate consisting of a porous polymer by electroless plating with a boron compound serving as a reductant.

5562741

METHOD OF MAKING A BIPOLAR BATTERY HOUSING

Meadows Clarence A; Adams Robert Muncie, IN, UNITED STATES assigned to General Motors Corporation

A method of making a bipolar battery comprising a plurality of framed, bipolar electrodes stacked together and embedded in a housing molded in situ thereabout. The housing will preferably comprise a polymeric foam.

5563002

PROGRAMMABLE BATTERY

Harshe Girish R Wheeling, IL, UNITED STATES assigned to Motorola Inc

A programmable battery capable of providing a variable voltage and/or current depending upon the needs of a particular host device. The battery is formed on a separator substrate and includes a plurality of discrete battery cells which may be resettably interconnected in various configurations in order to provide varying voltage and/or current. The discrete cells are electrically interconnected via a resettable micropositioner switch . The micropositioner switch determines the voltage and/or current needs of a particular device and electrically interconnects a sufficient number of discrete cells in series and/or parallel, in order to satisfy the requirements of the device.

5563004

RECHARGEABLE METAL-AIR ELECTROCHEMICAL CELL WITH HYDROGEN RECOMBINATION AND END-OF-CHARGE INDICATOR

Buzzelli Edward; Thibault William Kennesaw, GA, UNITED STATES assigned to AER Energy Resources Inc

A rechargeable metal-air electrochemical cell comprising a hydrogen-oxygen recombination electrode recombines hydrogen produced at the anode with oxygen to replenish the supply of water in the cell. The cell comprises an oxygen gas-permeable, liquid water-impermeable air cathode disposed in the cell case such that the cell is substantially impermeable to liquid water and the cell can receive and discharge oxygen gas through an opening in the cell case. During the discharge mode of the cell, the recombination electrode is inactive, and during the recharge mode, the recombination electrode catalyzes the electrochemical recombination of hydrogen and oxygen in the cell to form water. According to another aspect, the cell can comprise a device for indicating the end of the charge mode by sensing the level of current between the cathode and the recombination electrode and comparing that current level to a predetermined current level. When the current level between the cathode and the recombination electrode exceeds the predetermined current level, the device indicates that the end of charge has been reached or can activate a recharge disconnect switch.

5563006

ELECTROCHEMICAL CELL

Von Benda Klaus; Berger Gerhard Nurtingen, GERMANY

An electrochemical cell comprises a cell casing defining a negative electrode compartment for containing an alkaii metal negative electrode; and a plurality of flat plate solid electrolyte electrode holders in the casing and extending parallel to opposed walls of the casing. Each electrode holder comprises a pair of spaced plates and provides a positive electrode compartment containing a liquid electrolyte, and a positive electrode. The positive electrodes are electrically connected in parallel and define, together with envelopes, a positive plate stack. When the cell is fully charged, the major portion of the liquid alkali metal is contained in the negative electrode compartment outside the positive plate stack. Wicking means for the liquid alkali metal are provided adjacent at least the plates of the holders. The level of the liquid alkali metal remains substantially constant in the wicking means.

5567401

METHOD OF PRODUCING STABLE METAL OXIDES AND CHALCOGENIDES AND POWER SOURCE

Doddapaneni Narayan; Ingersoll David Albuquerque, NM, UNITED STATES

A method of making chemically and electrochemically stable oxides or other chalcogenides for use as cathodes for power source applications, and of making batteries comprising such materials.

5567538

METAL-AIR CELL HAVING THIN-WALLED ANODE AND CATHODE CANS

Oltman John E; Dopp Robert B; Burns John D Mount Horeb, WI, UNITED STATES assigned to Rayovac Corporation

This invention pertains to alkaline electrochemical cells, typically to metal-air cells of the button-type. Non-reactive elements of cells of the invention are thinner than corresponding non-reactive elements of prior art cells. Such elements can be made thinner because of improved structures of such elements. The anode can is made from a metal strip structure having a higher steel content. The cathode can has a modified temper, which improves relative stiffness and rigidity while retaining sufficient ductility. The seal disposed between the anode can and the cathode can is made thinner. Structure of the corner of the cathode can between the bottom and the side wall is improved. By so reducing the thicknesses of non-non-reactive elements of the cell, and thus the volume occupied by such non-reactive elements, the fraction of the cell devoted to holding electrochemically reactive anode material therein is increased, with corresponding increase in the milliampere hour capacity of the cell.

5567539

NON-AQUEOUS SECONDARY CELL

Takahashi Osamu; Tanaka Mitsutoshi Minami Ashigara, JAPAN assigned to Fuji Photo Film Co Ltd

An enclosed non-aqueous secondary cell is herein disclosed, in which a group of electrodes comprising positive and negative electrodes allowing absorption and release of a light metal and separators are accommodated in a closed-end cell-armoring can together with a non-aqueous electrolyte and an opening of the armoring can is closed by an insulating gasket positioned around the inner periphery of the opening of the can and a closing lid fitted in and supported by the gasket and simultaneously serving as a positive or negative terminal, wherein the closing lid comprises an explosion-proof valve capable of deforming towards the direction opposite to the group of electrodes in response to an increase in the internal pressure of the cell, a terminal cap provided with vent holes and arranged at the side of the explosion-proof valve opposed to the group of electrodes and a non-reverse type switch which is positioned between the explosion-proof valve and the terminal cap and serves to shut-off the electrical connection between the terminal cap and the positive or negative electrode when the temperature of the cell is raised or the pressure in the cell is increased. The foregoing cell construction permits shutting off of the electrical connections within the cell when the temperature and/or internal pressure thereof increase.

5567540

ELECTROCHEMICAL POWER GENERATING SYSTEM

Stone Gordon R; McGee Richard L; Amick Douglas J O'Fallon, IL, UNITED STATES assigned to Voltek Inc

A method of controlling a power generating system comprising a plurality of metal-air cells and a pump for circulating an electrolyte solution through the cells. The method comprises sensing an operating condition of the generating system, and selectively energizing the pump as a function of the sensed operating condition whereby energizing the pump causes the electrolyte solution to be circulated through the cells.

5567544

BATTERY

Lyman Philip C Boulder, CO, UNITED STATES assigned to Boundless Corporation

A battery assembled in the form of a lightweight structural panel and including isolated battery cells. Each of the cells includes a honeycomb structure wherein each film-like layer in the honeycomb structure is an electrode stack. Each of the electrode stacks includes an elongated cathode, an elongated separator, and an elongated anode. The separator is wetted with an electrolyte solution to facilitate the electrochemical reaction. The electrochemical reaction may be that of an NiMH2 battery, an NiH battery, an Li+ battery, an NiCd battery, a Lead-acid battery, or any other suitable electrochemical reaction. Alternatively, the battery cell

could be composed of a foam-like cathode, foam-like separator, and a foam-like anode. With either embodiment, the invention achieves the storage of electrochemical energy in a structure with a multitude of voids defined therein so that the structure is relatively stiff, yet light weight.

5568353

ELECTROCHEMICAL CAPACITOR AND METHOD OF MAKING SAME

Bai Lijun; Kincs Joseph G; Chason Mar Vernon Hills, IL, UNITED STATES assigned to Motorola Inc

An electrochemical charge storage device having two asymmetric inorganic electrodes is provided. The device may be fabricated using a bipolar plate which acts as both the conductor, and as the substrate upon which the active electrodes are formed. The bipolar plate may further be adapted to act as one of the active electrodes by activating a portion of the bipolar plate material.

5569551

DUAL AIR ELECRTRODE CELL

Pedicini Christopher S; Thibault William; Turner Chris; Tinker Lawrence Marietta, GA, UNITED STATES assigned to AER Energy Resources Inc

A dual air electrode metal-air cell having a casing including an upper cathode mask wall, a lower cathode mask wall, and a plurality of side walls; a metal anode with at least upper and lower sides covered with separator materials; an upper air cathode positioned between the upper cathode mask wall and the separator materials on the upper side of the anode; a lower air cathode positioned between the lower cathode mask wall and the separator materials on the lower side of the anode; a gas vent positioned on one or more of the side walls of the casing; and a liquid electrolyte substantially trapped by the separator materials. The separator materials comprise one ore more layers of an absorbent fibrous web and one or more layers of a microporous membrane that, when wet, is gas-impermeable and liquid-permeable.

5569554

SEALED RECHARGEABLE BATTERY WITH STABILIZER

Tsenter Bori Jerusalem, ISRAEL assigned to Acme Electric Corporation

A voltage regulator for a sealed rechargeable storage battery containing one or more rechargeable working cells and at least one regulator cell. The regulator cells are capable of consuming gas in a gas space within the sealed battery during charging of the working cells. The regulator cell is in gaseous communication with the gas space, and having a voltage stabilizer maintaining a preselected voltage range to the regulator cell and maintain a current to the regulator cell depending on the gas to be consumed.

5569555

RECHARGING OF ZINC BATTERIES

Goldstein Jonathan; Gektin Inna; Givon Menachem; Yarchi Yachin Jerusalem, ISRAEL assigned to Electric Fuel (E F L) Ltd

The invention provides a process for removing discharged active zinc-containing material from a mechanically rechargeable zinc battery anode, containing the same, the anode being of the type comprising a skeletal frame, including conductive metal and having a portion of a surface area thereof formed as open spaces, and an active zinc anode component compacted into a rigid static bed of active anode material encompassing the skeletal frame, and having two opposite major surfaces, the process comprising introducing the anode between a pair of spaced-apart first and second crusher plates, each of the crusher plates being provided with a plurality of pointed projections of varying heights and a plurality of recesses of varying depths, the crusher plates being aligned with each other to the effect that tips of projections of the first crusher plate substantially mutually occlude with recesses provided on the second crusher plate and tips of projections of the second crusher plate substantially mutually occlude with recesses provided on the first surface; abruptly reducing the space between adjacent crusher plates said anode bed; moving said crusher plates away from said deformed anode bed and then

displacing said deformed bed, along at least a first axis, by at least half the distance between adjacent projection tips of at least one of said crusher plates; again abruptly reducing the space between adjacent crusher plates; and repeating the last two steps until the fragmentation of the bed and the dislodgement of the resulting fragmented particles from the skeletal frame are achieved.

5582622

METHODS OF MAKING BIPOLAR BATTERY PLATES COMPRISING CARBON AND A FLUOROELASTOMER

Lafollette Rodney M Provo, UT, UNITED STATES assigned to Bipolar Technologies Inc

Bipolar battery cells, bipolar batteries, and related methods are disclosed. The disclosed bipolar plate comprises a composite of long carbon fibers and a filler of carbon particles and a fluoroelastomer. A fluoroelastomeric sealant for placement between adjacent cells is also disclosed.

5582929

ELECTROLYTE COOLING DEVICE FOR USE WITH A METAL-AIR BATTERY

Dechovich Bori Jerusalem, ISRAEL assigned to Electric Fuel (E F L) Ltd

The invention provides an electrolyte cooling device for use in combination with a multi-cell metal-air battery, the device comprising an electrolyte reservoir divided into a smaller compartment and a larger compartment, the compartments being connected by a valve arranged to periodically allow flow of electrolyte from the smaller compartment to the larger compartment; a warm electrolyte liquid flow path leading from an electrolyte-holding volume of each cell of the battery to an inlet port of the smaller compartment; a cooled electrolyte liquid flow path leading from an outlet port of the larger compartment to the electrolyte-holding volume of each said cell of the battery; at least one cooling fluid conduit passing through the smaller compartment; and pumping means for circulating a cooling fluid through the conduit and through radiator means arranged for the disposal therefrom of heat.

5582930

HIGH ENERGY DENSITY METAL-AIR CELL

Oltman John E; Dopp Robert B; Burns John D Mount Horeb, WI, UNITED STATES assigned to Rayovac Corporation

This invention pertains to alkaline electrochemical cells, typically to metal-air cells of the button-type. Non-reactive elements of cells of the invention are thinner than corresponding non-reactive elements of prior art cells. Such elements can be made thinner because of improved structures of such elements. The anode can is made from a metal strip structure having a higher steel content. The cathode can has a modified temper, which improves relative stiffness and rigidity while retaining sufficient ductility. The seal disposed between the anode can and the cathode can is made thinner. Structure of the corner of the cathode can between the bottom and the side wall is improved. By so reducing the thicknesses of non-reactive elements of the cell, and thus the volume occupied by such non-reactive elements, the fraction of the cell devoted to holding electrochemically reactive anode material therein is increased, with corresponding increase in the milliampere hour capacity of the cell.

5582931

RECTANGULAR CELL

Kawakami Soichiro Nara, JAPAN assigned to Canon Kabushiki Kaisha

An object of the present invention is to provide a rectangular or sheet-like cell being capable of supplying the flow of a large current, and having a large energy density per volume, at least comprising a negative electrode active material, a separator, a positive electrode active material, an electrolyte, and a collector, characterized in that positive electrodes made of positive electrode active material and negative electrodes made of negative electrode active material are formed in a plurality of regions separated from each other at least on a foldable insulating member, and the cell is housed by being folded up in a resin having no active material. According to the present invention, a rectangular cell can be fabricated which can attain an energy density

equivalent to that of spirally wound cylindrical cell, and supply the flow of a large current, with the dead space of cell storage space reduced to the utmost. Further, since the integration can be effected even with a single cell, a sheet-type or rectangular cell having a higher cell voltage can be :nade. Also, the manufacturing process of cells can be simplified.

5582932

TEMPERED THIN-WALLED CATHODE CAN

Oltman John E; Burns John D Mount Horeb, WI, UNITED STATES assigned to Rayovac Corporation

This invention pertains to alkaline electrochemical cells, typically to metal-air cells of the button-type. Non-reactive elements of cells of the invention are thinner than corresponding non-reactive elements of prior art cells. Such elements can be made thinner because of improved structures of such elements. The anode can is made from a metal strip structure having a higher steel content. The cathode can has a modified temper, which improves relative stiffness and rigidity while retaining sufficient ductility. The seal disposed between the anode can and the cathode can is made thinner. Structure of the corner of the cathode can between the bottom and the side wall is improved. By so reducing the thicknesses of non-reactive elements of the cell, and thus the volume occupied by such non-reactive elements, the fraction of the cell devoted to holding electrochemically reactive anode material therein is increased, with corresponding increase in the milliampere hour capacity of the cell.

5582937

BIPOLAR BATTERY CELLS, BATTERIES AND METHODS

LaFollette Rodney M Provo, UT, UNITED STATES assigned to Bipolar Technologies Inc

Bipolar battery cells, bipolar batteries, and related methods are disclosed. The disclosed bipolar plate comprises a composite of long carbon fibers and a filler of carbon particles and a fluoroelastomer. A fluoroelastomeric sealant for placement between adjacent cells is also disclosed.

5591538

ZINC-BROMINE BATTERY WITH NON-FLOWING ELECTROLYTE

Eidler Phillip A; Lex Peter J Muskego, WI, UNITED STATES assigned to ZBB Technologies Inc

A battery including a plurality of bipolar electrodes and non-conductive separators, each having first and second surfaces. A carbon coating is applied on the first surface of each of the plurality of carbon plastic electrodes, and each separator is disposed in spaced, sandwich relation with respect to two of the plurality of electrodes. The electrodes and separators define a plurality of electrochemical cells, including a plurality of anodic half-cells, and a plurality of cathodic half-cells. A high surface area carbon material is disposed in, and completely fills,each cathodic half-cell, and an electrolyte is disposed in each half-cell. A spacer is disposed in each anodic half-cell. The spacer may be a mesh or screen made from polymeric material. The spacer may also be an aggregated glass mat.

5597658

ROLLED SINGLE CELL AND BI-CELL ELECTROCHEMICAL DEVICES AND METHOD OF MANUFACTURING THE SAME

Kejha Joseph B Willow Grove, PA, UNITED STATES

Rolled single cell and bi-cell electrochemical devices and method of manufacturing, wherein the anode, cathode and composite electrolyte layers are separately fed and simultaneously rolled while the composite polymer electrolyte layer is wet or semi-solid, and may be possibly solidified later.

5599637

PERFORMANCE ZINC ANODE FOR BATTERIES

Pecherer Eugeny; Biran Joseph;Korall Menachem; Goldstein Jonathan Netanya, ISRAEL assigned to Electric Fuel Limited (E F L)

The invention provides a zinc battery anode, comprising a substantially planar skeletal frame including conductive metal and having a portion of its surface area formed as open spaces, and further comprising an active zinc anode component encompassing the skeletal frame, the active anode component being formed of a slurry of porous granules comprising zinc, impregnated with and suspended in an electrolyte, and compacted under pressure to the skeletal frame.