CLASS 320, ELECTRICITY: BATTERY OR CAPACITOR CHARGING OR DISCHARGING

SECTION I - CLASS DEFINITION

Where a term, phrase, or derivation thereof appears in italics in this class definition, that term or phrase is defined in the Glossary, below. Use of such italics may be limited to once per sentence or paragraph for better readability.

GENERAL STATEMENT OF CLASS SUBJECT MATTER

This class provides for a method or apparatus for controlled or regulated charging, discharging, or combined charging and discharging of one or more *voltaic cells*, *batteries*, or *capacitors*.

SCOPE OF CLASS

This is the residual class for subject matter relating to:

1. a method or apparatus for *charging* or electrically rejuvenating (e.g., depolarizing, etc.) a *voltaic cell*, *battery*, or electrical *capacitor*, wherein said charging or rejuvenating is accomplished by controlled addition of electrical energy into the cell, battery, or capacitor;

2. a method or apparatus for *discharging* a voltaic cell, battery, or electrical capacitor, wherein discharging is accomplished by controlled release of electrical energy from the cell, battery, or capacitor into a nominal electrical load, and further wherein the voltaic cell, battery, capacitor, or combination thereof comprises the only source of supply for the load;

3. a method or apparatus for combined charging and discharging, whether or not the charging and discharging occur simultaneously;

4. a method or apparatus for charging, discharging, or combined charging and discharging, in combination with subject matter auxiliary or appurtenant thereto for measuring, testing, signalling or indicating a charge or related condition of a cell, battery, capacitor, or operation of a related charge or discharge circuit with respect to a charging or discharging function or condition; or

5. a cell, battery, or capacitor structurally combined with a generator or electrical converter, whether or not electrical interconnection therebetween is recited.

(1) Note. The term "capacitor" has replaced the archaic term "condenser" used in previous definition(s) of this class. However, these terms are to be interpreted herein as being interchangeable and therefor synonymous in scope and breadth, irrespective of the modern accepted interpretation of the term "condenser." See Glossary, below.

(2) Note. This class provides for charging or discharging of a plural battery or capacitor arrangement (e.g., battery pack, etc.), with or without a controlled generator. However, charging or discharging of a single battery or capacitor with a controlled generator is classified elsewhere. See References to Other Classes, below.

(3) Note. This class provides for a charging circuit where a cell, battery, or capacitor forms the only intended useful load for the circuit. Where a load diverse from a cell, battery, or capacitor to be charged is recited, or where there is recited an additional circuit having utility outside of this class, original classification is outside of this class unless specifically provided for herein.

(4) Note. A nominal electrical load for receiving discharge energy may be either a single load or a plural load that functions or appears as a single load to a discharge circuit. The load must be recited only by its electrical characteristics (e.g., a D.C. load, a capacitive load, etc.), and may also be recited as a nominal variable load. Unless specifically provided for herein, original classification is outside of this class where: (a) the recited load is identified by its non-electrical characteristics or its particular-art purpose (e.g., electric motor, welding, electrolysis, etc.); (b) plural loads function or appear to a discharge circuit as other than a single or merely variable electrical load; or (c) a source, other than a voltaic cell, battery, capacitor, or combination thereof, is recited for supplying the load, unless specifically provided for herein (See (8) Note, below).

(5) Note. If an electrical load is disclosed as a battery or a capacitor, then claimed recitation of the load as a "battery," "capacitor,"

etc., is sufficient basis for classification herein. If, however, the load is recited as an "electric device," an "electric load," a "translation device," etc., classification is based upon another significant limitation and not on the basis of the disclosure of the particular load device, unless there is no appropriate place for the classification elsewhere.

(6) Note. If a supply source for a single load is disclosed as a battery or capacitor and the load is not specified or limited to a particular art, claimed recitation of the source as a "battery" or "capacitor" is sufficient basis for classification herein. However, classification of the same is elsewhere if the claimed recitation of the load is in general terminology, e.g., "a source," "a source of emf," "a source of voltage or current," etc., where proper classification is based upon a limitation other than the claimed source.

(7) Note. A method or apparatus for manufacturing a battery, capacitor, or part thereof is classified elsewhere (see References to Other Classes, below), even if combined with charging or discharging. However, an apparatus for charging or discharging, per se, is classified in this class even if an intended use is recited for charging or discharging, per se, during, or as a subcombination of, a manufacturing process. This should be contrasted with a method for charging or discharging which is limited to being incident to manufacture, which is excluded from this class and controls classification when subject matter for this class is also claimed.

(8) Note. Where there is a combination of charging and discharging recited: (a) there may be one or more sources of charge energy, which may include one or more cells, batteries, or capacitors; (b) a cell, battery, or capacitor to be charged may be the cell, battery, or capacitor to be discharged; (c) a source of charge energy other than a cell, battery or capacitor (hereinafter nonbattery source) may supply a load or discharge circuit simultaneously with a cell, battery, or capacitor to be discharged, except where: (i) the cell, battery or capacitor to be discharged can supply the load or discharge circuit only when the nonbattery source is connected to supply the load or discharge circuit; (ii) the nonbattery source can energize the load or discharge circuit without the cell, battery, or capacitor to be discharged.

(9) Note. Where no subclass specifically provides for a method appropriate for this class, classification is proper in a subclass that provides for a device to practice the method.

STATEMENT CONCERNING THE SEARCH CLASS NOTES IN REFERENCES TO OTHER CLASSES, BELOW

Since substantially any electrical system or any special-art combination in which an electrical system is a part may charge or discharge a battery or capacitor, whereby said charging or discharging is inherent in the operation thereof, the following SEARCH CLASS notes in References to Other Classes, below, are not represented as being exhaustive of such subject matter.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

136, Batteries: Thermoelectric and Photoelectric, for a structure for converting heat or light directly into electrical energy.

204, Chemistry: Electrical and Wave Energy, for a process involving the use of electrolysis or wave energy, a product solely disclosed as made by such process, apparatus for performing such process, or an electrolyte composition for use in such process.

290, Prime-Mover Dynamo Plants, for a combination of a prime mover (other than a dynamoelectric machine) and a dynamoelectric machine which supplies energy to or absorbs energy from a battery, particularly subclass 16 and 50 and the subclasses indicating that the dynamoelectric machine is for starting purposes.

307, Electrical Transmission or Interconnection Systems, subclasses 9.1+ for an electrical system for a vehicle, such as railway car or automobile, which typically include a storage battery therein; subclass 46 for an electrical system having plural sources, one of which is a battery connected to the system through an

intervening converter; subclasses 48+ for an electrical system in which a storage battery floats across another source of current; subclasses 66+ in which a storage battery serves as an emergency or substitute source of current; subclass 108 for an electrical system for producing a pulse by use of a capacitor; and subclasses 109+ for an electrical system that includes a capacitor for a purpose such as a voltage dropping impedance or a voltage doubler.

315, Electric Lamp and Discharge Devices: Systems, for an electric lamp or discharge device as a load into which a battery or condenser discharges, particularly subclasses 33 and 86 through 87 for a battery combination, and appropriate subclasses for a capacitor combination.

318, Electricity: Motive Power Systems, subclass 139 for an electric motor system wherein the motor is supplied only by a primary or secondary battery and subclasses 440+ for an electric motor system wherein the motor is supplied by plural sources, one of which might be a primary or secondary battery.

322, Electricity: Single Generator Systems, for a generator system that supplies a single load circuit.

323, Electricity: Power Supply or Regulation Systems, for voltage-magnitude control system.

324, Electricity: Measuring and Testing, subclasses 425+ for testing an electrolytic device such as a battery.

330, Amplifiers, appropriate subclasses for amplifier circuitry, per se.

331, Oscillators, particularly subclasses 111+, 129+, and 143+ for a relaxation oscillator that utilizes an RC time-constant network to determine the period of a pulse or oscillation.

332, Modulators, appropriate subclass, for a modulator circuit, per se.

333, Wave Transmission Lines and Networks, particularly subclasses 175+ for a wave filter for passing electrical energy of one frequency or range of frequencies, while attenuating electrical energy of another frequency or range of frequencies.

361, Electricity: Electrical Systems and Devices, subclasses 271+ for an electrostatic capacitor and subclasses 502+ for an electrolytic capacitor.

362, Illumination, particularly subclasses 459+ for battery-supplied vehicle lighting and subclasses 157+ for a portable, self-contained, battery-supplied illuminating device.

363, Electric Power Conversion Systems, subclasses 13+ (and subclasses mentioned in the notes thereto) for a rectifying system.

378, X-Ray or Gamma Ray Systems or Devices, subclass 103 for an X-ray electrical system with capacitor discharge.

429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, for pertinent subclass (es) as determined by schedule rewiew.

441, Buoys, Rafts, and Aquatic Devices, subclass 18 for a buoy having a battery-supplied illuminating means.

607, Surgery: Light, Thermal, and Electrical Application, for medical application of electric energy to the body, particularly subclass 149 for body wear that includes electrodes of dissimilar materials which form a battery with body perspiration as the electrolyte.

SECTION III - GLOSSARY

BATTERY

A unit source of D.C. voltage consisting of a plurality of voltaic cells electrically connected in series, parallel, or both, to increase available voltage or power from a single *cell*. "Plural batteries" include a combination or association of two or more structurally dependent, or independent, battery units.

CAPACITOR

An electrical energy storage device consisting essentially of two electrically conductive surfaces (e.g., plates, electrodes, etc.) separated by an insulator or dielectric (e.g., air, paper, mica glass, plastic, oil, etc.), whereby an electric charge, in the form of a direct voltage between said conductive surfaces, can be either stored on said surfaces or released therefrom to a load. "Plural capacitors" include a combination or association of two or more structurally dependent, or independent, capacitor units.

CELL

Short for, or used interchangeably with, a *voltaic cell* only in this class.

CHARGE: BATTERY OR CELL

The *act* of adding electrical energy (e.g., supplying cur-

rent, etc.) into a battery or cell from a diverse source of electrical energy to increase the amount of useful and available chemical energy stored in the battery or cell; or, the *amount* of chemical energy stored in a battery or cell that is available for useful conversion to electrical energy for supplying an electric load.

CHARGE: CAPACITOR

The *act* of applying an electric potential across the electrodes or plates of a capacitor from a diverse source of electrical energy to increase the amount of useful and available electrical energy stored in the capacitor, or the *amount* of energy stored in a capacitor that is available for release to usefully supply electrical energy to an electric load.

CHARGING CIRCUIT

The electric circuit or path that extends from a charging source to a battery, cell, or capacitor to be charged.

CHARGING SOURCE

The immediate source from which electric energy is derived for addition into a battery, cell, or capacitor, where the polarity of the source is such as to cause current to flow in opposition to the normal polarity of the battery, cell, or capacitor, if the latter is polarized, and may be, for example: (1) a mere charging circuit; (2) means for collecting atmospheric, parasitic, or other stray electric charge or currents; (3) means for converting electrical energy having one or more particular electrical characteristics into electrical energy having a different characteristic (e.g., electrical converters such as a combination alternating current source and rectifier, where the rectifier is considered to be the "immediate source"; (4) means for converting energy, other than electrical, into electric energy (e.g., electrical generator, fuel cell, etc.).

CHARGING SOURCE CONTROL

Any control that effects the flow of energy from a charging source, including (a) direct control of the charging source itself or (b) the flow or delivery of energy from the charging source to a load.

CIRCUIT MAKING AND/OR BREAKING

Fully establishing and/or fully interrupting the conductivity of an electrical path between two or more points in an electrical circuit by physical movement of electrically conductive elements into and out of physical contact with each other.

CONDENSER

An obsolete or out-of-favor term for "capacitor." Although still used in the automotive field to refer to a capacitor used across ignition points to prevent arcing, it is interpreted as being synonymous with "capacitor" in this class, with no implied limitation to its use.

DEPOLARIZATION

The process of preserving or restoring a primary cell by partially or completely removing its increased resistance (i.e., polarization) as the potential of an electrode changes during electrolysis.

DISCHARGE

The act of removing available electrical energy from storage in a battery, cell, or capacitor via flow of electric current from the battery or capacitor to a load.

DISCHARGE CIRCUIT

An electrical device or path which allows flow of electrical current from a battery or capacitor to an electrical load, especially that path or device that controls or regulates said flow.

FUEL CELL

An electrochemical generator that uses the reaction of oxygen and a hydrocarbon fuel, or derivative thereof (e.g., hydrogen, etc.), to convert chemical energy into electricity. It is distinguishable from a *voltaic cell* because of its use of a hydrocarbon for fuel, and because it can operate continuously without a voltaic cell's inherent chemical degradation of electrodes, as long as fuel and oxygen are available or supplied.

LOAD, LOAD DEVICE, OR LOAD CIRCUIT

Any electrical device for usefully converting or consuming electrical energy other than those devices which are merely accessory, auxiliary, or appurtenant to the source and/or the circuit which supplies electric energy. [An accessory or auxiliary device is a device used to affect operation, control, or care of a source and/or supply circuit and may, for example, comprise a device employed: (i) to test, indicate, or measure a condition of or in a source or supply circuit, or (ii) to regulate or con-

trol the flow of electric energy from or through the source or supply circuit.]

PRIMARY CELL OR BATTERY

A *cell* or *battery* that cannot have its available charge usefully increased (i.e., recharged like a *secondary cell)* by an electric current passing through it after having been discharged from a usefully charged condition (i.e., the chemical reaction is not reversible). (See the definition of Depolarization, above).

REGULATION

Control of one or more characteristics or conditions whereby said characteristics or conditions can be maintained at some predetermined value, or can be varied over a plurality of values.

SECONDARY CELL OR BATTERY

A *cell* or *battery* that may have its available *charge* usefully increased (i.e., recharged) by an electric current passing through it after having been *discharged* from a usefully charged condition (i.e., the chemical reaction is reversible).

VOLTAIC CELL

An elementary unit source of electrical energy stored as chemical energy, comprising two separated dissimilar electrodes bridged by an electrolyte, wherein said unit source produces a potential difference across said electrodes in a chemical reaction involving said electrodes and electrolyte that converts chemical energy into electrical energy. [Synonymous with *cell*, but distinguished from a *fuel cell*, in which the electrodes are not required to be chemically involved in the primary reaction.]

SUBCLASSES

100 PRIMARY CELL DEPOLARIZATION:
This subclass is indented under the class definition. Subject matter for lowering the resistance of a primary cell by addition of electrical energy sufficient to remove a polarized coating from an electrode of the cell or battery.

SEE OR SEARCH CLASS:
429, Chemistry: Electrical Current Producing Apparatus, Product and Process, subclass 52 for activation of an inactive cell and subclasses 96 through 100 for cell support for a removable cell.

101 WIND, SOLAR, THERMAL, OR FUEL-CELL SOURCE:
This subclass is indented under the class definition. Subject matter including a charging source having means for deriving electrical energy from weather-related air flow, light energy, heat, or from an electrochemical generator in which chemical energy from the reaction of air or oxygen and a fuel (e.g., hydrocarbons, etc.) is converted directly into electricity.

SEE OR SEARCH THIS CLASS, SUBCLASS:
138, for plural or alternate sources for charging.
139, for pulse-controlled charging.

SEE OR SEARCH CLASS:
136, Batteries: Thermoelectric and Photoelectric, subclasses 291+ for applications of photoelectric.
323, Electricity: Power Supply or Regulation Systems, subclass 906 for solar cell systems.

102 With shuntless charging source control:
This subclass is indented under subclass 101. Subject matter including means for regulating only the flow of charging current in series between the charging source and the load (i.e., the means for regulating is absent any means to bypass charging current around the load).

SEE OR SEARCH THIS CLASS, SUBCLASS:
128, for battery charging and discharging.

SEE OR SEARCH CLASS:
136, Batteries: Thermoelectric and Photoelectric, subclasses 291+ for applications of photoelectric batteries.
307, Electrical Transmission or Interconnection Systems, subclasses 46, 64, and 66 for batteries being used as emergency sources.
323, Electricity: Power Supply or Regulation Systems, subclass 906 for solar cell systems.

103 ONE CELL OR BATTERY CHARGES ANOTHER:

This subclass is indented under the class definition. Subject matter wherein the charging source for charging a first cell or battery includes a second cell or battery.

SEE OR SEARCH THIS CLASS, SUBCLASS:

107, for the structure of the battery charger.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclasses 46, 64, and 66 for batteries being used as substitute sources.

104 Vehicle battery charging:

This subclass is indented under subclass 103. Subject matter wherein significance is attributed to the type of battery to be charged, wherein said battery is intended for use with a conveying device (e.g., automobile, etc.).

(1) Note. Commonly, the battery being charged is six volts or a multiple thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

116, for batteries connected in series.

139+, for pulse control during battery charging.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclasses 149+ for miscellaneous systems which include power packs.

105 Employing "jumper" cable:

This subclass is indented under subclass 104. Subject matter wherein use is made of a charging circuit between the first battery and the second battery that includes a pair of conductors, each of which includes an end connector (e.g., alligator clip, etc.) adapted to be removably connected to a vehicle battery terminal to supply charging current thereto, the pair of conductors being commonly referred to as "jumper cables."

SEE OR SEARCH THIS CLASS, SUBCLASS:

107, for the structure of the battery charger.

SEE OR SEARCH CLASS:

191, Electricity: Transmission to Vehicles, subclass 12.4 for flexible extensions with a connector plug or receptacle.

307, Electrical Transmission or Interconnection Systems, subclasses 10.1+ for battery protection in vehicle mounted systems..

340, Communications: Electrical, subclasses 636.1 through 636.21 for a condition responsive indicating system for a battery.

439, Electrical Connectors, subclass 504 for a connector with a flaccid conductor and with an additional connector spaced there along adapted to connect a battery and subclass 624 for plural contacts at the end of a cable having sheath enclosing insulated conductors.

106 MEANS TO IDENTIFY CELL OR BATTERY TYPE:

This subclass is indented under the class definition. Subject matter including a sensor for determining or recognizing the general attributes of a cell or battery to be charged (e.g., rechargeable vs. nonrechargeable, chemical makeup, charge capacity, etc.).

(1) Note. This subclass provides for determining battery size by means other than merely ascertaining whether the battery physically fits a charging structure aperture shape or cell holder size.

(2) Note. The identifying means of this subclass enables a charging system to proceed with charging or for preventing such an attempt where, for example, the charging system determines that the cell or battery is not of a compatible type to be charged by the charging system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

110, for the structure of a battery charger which will accept different size batter-

ies merely by how the battery physically fits the charger structure.

125, for diverse charging or discharging rates for plural batteries.

138, for plural or alternate sources.

SEE OR SEARCH CLASS:

429, Chemistry: Electrical Current Producing Apparatus, Product and Process, subclass 1 for a battery with a nonbattery electrical component electrically connected within the cell casing other than testing or indicating components, subclass 9 for diverse cells in a support means and subclass 99 for support for plural cells.

455, Telecommunications, subclass 89 for portable transmitter and receiver.

107 CELL OR BATTERY CHARGER STRUCTURE:

This subclass is indented under the class definition. Subject matter including battery charger mechanical arrangement or design.

SEE OR SEARCH CLASS:

429, Chemistry: Electrical Current Producing Apparatus, Product and Process, subclass 52 for activation of an inactive cell and subclasses 99 through 100 for support for a plurality of cells and the support itself.

108 Charger inductively coupled to cell or battery:

This subclass is indented under subclass 107. Subject matter wherein the charging circuit includes a transformer to transfer electrical energy between the charging source and the load to be charged (e.g., with the primary winding of the transformer connected to the charging source and the secondary winding of the transformer connected to the battery).

SEE OR SEARCH THIS CLASS, SUBCLASS:

109, for charging station for electric vehicles.

139, for pulse control battery charging.

SEE OR SEARCH CLASS:

336, Inductor Devices, Dig. 2 for separable inductor devices.

109 Charging station for electrically powered vehicle:

This subclass is indented under subclass 107. Subject matter including charging structure constructed and arranged to charge a battery of the type constructed and intended to provide electrical energy for a vehicle having an electrodynamic prime mover, whether or not the battery is mounted in the vehicle or removed therefrom.

SEE OR SEARCH CLASS:

104, Railways, subclass 34 for vehicle battery replacer.

180, Motor Vehicles, subclass 65.1 for electric motor vehicles.

191, Electricity: Transmission to Vehicles, subclasses 2+ for systems of distributions.

307, Electrical Transmission or Interconnection Systems, subclasses 10.1+ for vehicle mounted systems in an automobile.

414, Material or Article Handling, subclasses 281+ for charging or discharging means including elevating devices.

110 For diverse sizes of cells, batteries, or battery packs:

This subclass is indented under subclass 107. Subject matter including means structurally adapted to accommodate -- or structurally adaptable or rearrangeable to accommodate -- for charging purposes, cells, batteries, or assemblages of plural batteries (i.e., battery packs) having different physical dimensions.

SEE OR SEARCH THIS CLASS, SUBCLASS:

106, for a battery characteristic determined for other than aperture shape or cell holder size of the battery charger, or for other battery-type determinations other than physical size.

113, for a battery pack with a charger stand or base.

125, for diverse charging or discharging rates for plural batteries or cells, without charger structure.

SEE OR SEARCH CLASS:

429, Chemistry: Electrical current Producing Apparatus, Product and Process, subclasses 99 through 100 for support for a plurality of cells and the support itself.

455, Telecommunications, subclasses 89 through 90 for portable transmitter and receiver and the housing for the transmitter and receiver, respectively.

111 Having plug for A-C receptacle:

This subclass is indented under subclass 107. Subject matter wherein the charger structure includes a male connector constructed and arranged to connect to a conventional household alternating-current outlet jack.

SEE OR SEARCH CLASS:

219, Electrical Heating, subclass 225 for a tool or instrument with heated clamp means.

362, Illumination, subclass 183 for a container for a rechargeable electrical source with external connections.

112 For battery pack:

This subclass is indented under subclass 107. Subject matter wherein the charger structure is constructed and arranged to charge or discharge an assemblage of plural batteries.

SEE OR SEARCH CLASS:

362, Illumination, subclass 183 for a container for a rechargeable electrical source with external connections.

429, Chemistry: Electrical Current Producing Apparatus, Product and Process, subclasses 96+ for cell support for a removable cell.

455, Telecommunications, subclass 573 for battery charging in a radiotelephone.

113 With charger stand or base adapted to hold battery pack:

This subclass is indented under subclass 112. Subject matter further including a supporting structure for the charger structure, said supporting structure having further means for supporting the battery pack during charging.

SEE OR SEARCH CLASS:

362, Illumination, subclass 183 for a container for a rechargeable electrical source with external connections.

429, Chemistry: Electrical Current Producing Apparatus, Product and Process, subclasses 96+ for cell support for a removable cell.

114 For handheld device:

This subclass is indented under subclass 107. Subject matter including means constructed and arranged to charge a battery or cell in a handheld device.

(1) Note. The means constructed to charge a battery may be integral with the handheld device.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, Dig. 1 for rechargeable devices.

30, Cutlery, Dig. 1 for rechargeable cutting devices.

310, Electric Generator or Motor Structure, subclass 50 for a dynamoelectric portable or hand tool.

362, Illumination, subclass 183 for a container (e.g., flashlight, etc.) for a rechargeable electrical source with external connections.

455, Telecommunications, subclass 573 for battery charging in a radiotelephone.

115 With charger stand or base:

This subclass is indented under subclass 114. Subject matter further including a supporting structure for the charger structure, said supporting structure having further means for supporting the battery pack during charging.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, Dig. 1 for rechargeable devices.

30, Cutlery, Dig. 1 for rechargeable cutting devices.

310, Electric Generator or Motor Structure, subclass 50 for a dynamoelectric portable or hand tool.

362, Illumination, subclass 183 for a container (e.g., flashlight, etc.) for a

rechargeable electrical source with external connections.

116 SERIALLY CONNECTED BATTERIES OR CELLS:

This subclass is indented under the class definition. Subject matter wherein plural individual cells or batteries are recited as being electrically attached to each other in succession or end-to-end relationship such that a single path is provided for flow of current.

SEE OR SEARCH THIS CLASS, SUBCLASS:

124, for sequential charging or sequential discharging of batteries or cells.

117 Switchable to parallel connection:

This subclass is indented under subclass 116. Subject matter wherein the plural individual batteries or cells are recited as being switchable between a series-connected relationship and a parallel-connected relationship.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 10.1 for vehicle mounted systems for an automobile, subclass 48 for storage battery or accumulator-type source, subclass 66 for a storage battery or accumulator being used as a substitute or emergency source, and subclass 71 for series-parallel connections of sources.

118 With discharge of cells or batteries:

This subclass is indented under subclass 116. Subject matter wherein electrical energy is released from the series-connected cells or batteries.

SEE OR SEARCH THIS CLASS, SUBCLASS:

124, for sequential charging or sequential discharging of batteries.

127, for battery discharging or battery discharging and charging.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 66 for a storage battery or accumulator being used as a substitute or emergency source.

119 With individual charging of plural batteries or cells:

This subclass is indented under subclass 116. Subject matter wherein each one of plural serially-connected batteries or cells is separately charged by use of multiple charging circuits.

SEE OR SEARCH THIS CLASS, SUBCLASS:

122, for bypassing certain cells, usually those fully charged, while charging a plural cell battery.

125, for diverse charging or discharging rates for plural batteries or cells.

124, for sequential charging or sequential discharging of batteries or cells.

128+, for battery discharging and charging.

120 Having variable number of cells or batteries in series:

This subclass is indented under subclass 116. Subject matter wherein the total quantity of individual cells or batteries connected in series is changeable.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 36 for serially connected load circuits and subclass 41 for sequential or alternating connections of load circuits.

121 Switchable cells (e.g., for voltage regulation, etc.):

This subclass is indented under subclass 120. Subject matter including means for switching a cell or cells into or out of serially-connected relationship with another cell or cells.

SEE OR SEARCH THIS CLASS, SUBCLASS:

135, for battery discharging with the regulation of the output.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclass 41 for sequential or alternation connections of load circuits.

122 Bypassable battery cell:
This subclass is indented under subclass 120. Subject matter including means for shunting charging current away from an individual cell in a plurality of serially-connected cells to another cell or cells when the individual cell is fully charged.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for charging series connected cells or batteries individually and independently using multiple charging lines.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 48+ for storage battery or accumulator-type source, subclass 53 for load current division, and subclass 77 for series connected sources.
361, Electricity, Electrical Systems and Devices, subclasses 54+ for load shunting by fault responsive means.

123 With generator charging source:
This subclass is indented under subclass 116. Subject matter wherein a means for converting mechanical energy into electrical energy is employed as a charging source for the serially-connected cells or batteries.

SEE OR SEARCH THIS CLASS, SUBCLASS:
138, for plural or alternate source for battery charging.
139, for pulse control battery charging.

124 SEQUENTIAL CHARGING OR DISCHARGING OF BATTERIES OR CELLS:
This subclass is indented under the class definition. Subject matter including successive charging or discharging of plural batteries or cells.

SEE OR SEARCH THIS CLASS, SUBCLASS:
119, for charging individual cells in series.
128+, for battery discharging and charging.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 64 and 66 for substitute or emergency sources.

125 DIVERSE CHARGING OR DISCHARGING RATES FOR PLURAL BATTERIES:
This subclass is indented under the class definition. Subject matter including the addition (or release) of electrical energy from multiple batteries at different energy flow per unit time.

SEE OR SEARCH THIS CLASS, SUBCLASS:
122, for collectively charging series-connected cells while bypassing a fully charged cell.
160, for multi-rate charging.

126 PARALLEL CONNECTED BATTERIES:
This subclass is indented under the class definition. Subject matter wherein the positive and negative terminals of each of a plurality of batteries to be charged or discharged are electrically connected, respectively, to the positive and negative terminals of the other batteries.

SEE OR SEARCH THIS CLASS, SUBCLASS:
124, for sequential charging or discharging of batteries or cells connected in parallel.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclass 56 for load current control of diverse sources and subclass 66 for accumulator substitute sources.

127 BATTERY OR CELL DISCHARGING:
This subclass is indented under the class definition. Subject matter including the release of stored energy from a battery or cell.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 426+ for using a battery testing device.

340, Communications: Electrical, subclasses 636.1 through 636.21 for a condition responsive indicating system for a battery.

128 With charging:
This subclass is indented under subclass 127. Battery or cell discharging further including addition of electrical energy into the battery or cell sufficient to increase the chemical energy of the battery or cell.

SEE OR SEARCH THIS CLASS, SUBCLASS:
135+, for battery discharging with regulation of the output.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclass 66 for a battery or accumulator employed as a substitute or emergency source.

129 Pulsed discharge:
This subclass is indented under subclass 128. Subject matter wherein a momentary burst (i.e., pulse)of stored energy is removed from a battery or cell during the charging thereof (e.g., as in a discharge pulse between charging pulses).

SEE OR SEARCH THIS CLASS, SUBCLASS:
139+, for pulse control during charging.
164+, for time control of charging.

130 Cycling (e.g., discharge/charge cycle, etc.):
This subclass is indented under subclass 128. Subject matter wherein the battery or cell is repeatedly fully discharged prior to full recharging.

SEE OR SEARCH THIS CLASS, SUBCLASS:
164+, for time control of charging.

131 Deep discharge (e.g., conditioning, etc.):
This subclass is indented under subclass 130. Subject matter wherein all, or substantially all, of the stored energy in a battery or cell is removed from the battery or cell in the discharge portion of the cycle (e.g., to condition the battery or cell for charging, etc.).

SEE OR SEARCH CLASS:
324, Electricity, Measuring and Testing, subclasses 426+ for using a battery testing device.

132 With state-of-charge detection:
This subclass is indented under subclass 130. Subject matter wherein the quantity of energy stored in the battery or cell is determined within the discharge/charge cycle.

SEE OR SEARCH THIS CLASS, SUBCLASS:
149, for detecting the integral of current or voltage to determine the total charge.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 426+ for using a battery testing device.
340, Communications: Electrical, subclasses 636.1 through 636.21 for battery condition indication.

133 Time control:
This subclass is indented under subclass 130. Subject matter including means for regulating an interval of charging or discharging.

SEE OR SEARCH THIS CLASS, SUBCLASS:
155+, for time control of charging.

134 With battery or cell condition monitoring (e.g., for protection from overcharging, heating, etc.):
This subclass is indented under subclass 128. Subject matter wherein a physical characteristic (e.g., state of charge, temperature, etc.) of a battery or cell is determined during charging or discharging thereof.

(1) Note. Battery or cell monitoring is common to prevent degradation or destruction of the battery or cell during charging or discharging (e.g., due to deep discharge, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:
149, for detecting the integral of current or voltage to determine the total charge.

155, for detecting the differential of the voltage or current.

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 426+ for using a battery testing device.
340, Communications: Electrical, subclasses 636.1 through 636.21 for a condition responsive indicating system for a battery.

135 Regulated discharging:
This subclass is indented under subclass 127. Subject matter including means for controlling the release of stored energy from a battery or cell.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclass 92 for safety and protection of systems and devices against under voltage.

136 With battery or cell condition monitoring (e.g., for protection from overcharging, heating, etc.):
This subclass is indented under subclass 135. Subject matter wherein a physical characteristic (e.g., state of charge, temperature, etc.) of a battery or cell is determined during discharge thereof.

(1) Note. Battery or cell monitoring is common to prevent degradation or destruction of the battery or cell during charging or discharging (e.g., due to deep discharge, etc.).

SEE OR SEARCH CLASS:
324, Electricity: Measuring and Testing, subclasses 426+ for using a battery testing device.
340, Communications: Electrical, subclasses 636.1 through 636.21 for a condition responsive indicating system for a battery.

137 BATTERY OR CELL CHARGING:
This subclass is indented under the class definition. Subject matter including means to add electrical energy into a battery or cell sufficient to increase the useful and available chemical energy stored therein.

138 Plural charging sources:
This subclass is indented under subclass 137. Subject matter including means to enable use of two or more diverse charging sources, or means for selectively enabling one or more diverse charging sources to add electrical energy into a battery or cell.

(1) Note. This feature would commonly be used to, for example, allow a charger to have the flexibility to use charging sources of different voltages, current (i.e., AC or DC), or availability for use, etc.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclasses 44+ for one source compensating for another source.

139 Pulsed:
This subclass is indented under subclass 137. Subject matter wherein the electrical energy is added in a series of current bursts (i.e., pulses).

SEE OR SEARCH THIS CLASS, SUBCLASS:
155+, for time control.
162+, for amplitude of current or voltage detected.

140 With DC-DC converter (e.g., flyback supply, etc.):
This subclass is indented under subclass 139. Subject matter including detailed structure of means for creating direct-current pulses from a direct-current supply.

(1) Note. The direct-current supply may in turn be derived from a rectified alternating current source.

SEE OR SEARCH THIS CLASS, SUBCLASS:
157, for peak of current or voltage detected without pulse control.

SEE OR SEARCH CLASS:
363, Electrical Power Conversion Systems, subclasses 15+ for current conversion including DC-AC-DC converter.

141 Pulse modulation:
This subclass is indented under subclass 139. Subject matter including means for actively varying a characteristic (e.g., width, amplitude, duty cycle, etc.) of the pulses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
162+, for detecting the amplitude of current or voltage.

142 Phase controlled:
This subclass is indented under subclass 141. Subject matter including means for switching the pulses on and off based upon the phase of an alternating current source utilized to supply energy for the pulses (e.g., using silicon controlled rectifiers, etc.).

SEE OR SEARCH THIS CLASS, SUBCLASS:
150, for thermal condition detected.

143 With voltage compensation:
This subclass is indented under subclass 142. Subject matter further including means to adjust the phase control (e.g., SCR conduction, etc.) based upon the voltage of a battery or cell being charged.

144 And temperature compensation:
This subclass is indented under subclass 143. Subject matter further including means to adjust the phase control (e.g., SC conduction, etc.) based upon the temperature of a battery or cell being charged.

145 Pulse-width modulation:
This subclass is indented under subclass 141. Subject matter wherein the pulse characteristic varied is the time duration of the pulses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
148, for peak of current or voltage detected.
150+, for thermal condition detected.
155+, for time control.
162+, for amplitude of current or voltage detected.

146 Hysteresis type (e.g., antichattering, etc.):
This subclass is indented under subclass 139. Subject matter including control means for starting and stoppingcharging (or changing the rate of charging) of a battery or cell at, respectively, different battery or cell voltage levels.

(1) Note. Typically, a battery-voltage control "window" is used to prevent instability or oscillation in a charger on/off cycle or a fast charge/trickle charge cycle.

SEE OR SEARCH THIS CLASS, SUBCLASS:
162+, for amplitude or voltage detected.

147 Gas controlled:
This subclass is indented under subclass 137. Subject matter including means for varying the rate of charging based upon the rate or amount of gas evolution in a battery or cell during charging.

SEE OR SEARCH CLASS:
429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, subclass 58 for a sealed cell having gas prevention or elimination means and subclasses 61+ for control means responsive to battery condition sensing means.

148 With peak detection of current or voltage (e.g., delta-V or delta-I utilized, etc.):
This subclass is indented under subclass 137. Subject matter wherein the peak magnitude of charging current or battery or cell voltage is determined during charging to indicate when a state of full charge of the battery or cell is reached.

SEE OR SEARCH THIS CLASS, SUBCLASS:
155+, for time control charging.
160+, for multi-rate charging.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclass for signal discriminating, per se, based upon signal waveshape, amplitude, etc.

149 With detection of current or voltage integral (e.g., total charge, etc.):
This subclass is indented under subclass 137. Subject matter wherein the integrated magnitude of charging current or battery or cell voltage is determined during charging to determine the state of charge of the battery or cell.

SEE OR SEARCH THIS CLASS, SUBCLASS:
155+, for time control charging.
160, for multi-rate charging.

150 With thermal condition detection:
This subclass is indented under subclass 137. Subject matter means to determine, or means responsive to, the temperature of a battery or cell during charging.

SEE OR SEARCH THIS CLASS, SUBCLASS:
154, for employment of a thermal switch, such as a thermostat.
160, for multi-rate charging.

SEE OR SEARCH CLASS:
429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, subclasses 61 and 62 for control means responsive to battery condition sensing means including temperature control.

151 Detection of current or voltage differential (e.g., slope, etc.):
This subclass is indented under subclass 150. Subject matter including means to determine the time-rate-of-change of the magnitude of charging current or battery or cell voltage to determine the state of charge of the battery or cell.

152 Detection of current or voltage amplitude:
This subclass is indented under subclass 150. Subject matter including means to measure the magnitude of charging current or the battery or cell voltage to determine the state-of-charge of the battery or cell.

SEE OR SEARCH THIS CLASS, SUBCLASS:
157+, for amplitude of voltage or current detection combined with time control.
160, for multi-rate charging.
162, for amplitude of current or voltage detection.

153 Temperature compensation:
This subclass is indented under subclass 152. Subject matter including means to vary a parameter of charging in response to detected temperature.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, subclass 907 for temperature compensation of a semiconductor.

154 Thermal switch (e.g., thermostat, bimetallic switch, etc.):
This subclass is indented under subclass 150. Subject matter wherein the means to detect temperature includes a heat-actuated switch.

SEE OR SEARCH CLASS:
429, Chemistry: Electrical Current Producing Apparatus, Product, and Process, subclasses 61 and 62 for control means responsive to battery condition sensing means.

155 Time control:
This subclass is indented under subclass 137. Subject matter means to regulate charging based upon a predetermined period of time.

156 Detection of current or voltage differential (e.g., slope, etc.):
This subclass is indented under subclass 155. Subject matter including means to determine the time-rate-of-change of the magnitude of charging current or battery or cell voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:
151, for differentiating the detected charging current or voltage to determine the state of charge in addition to detecting the thermal condition.
160, for multi-rate charging.

157 Detection of current or voltage amplitude:
This subclass is indented under subclass 155. Subject matter including means to measure the magnitude of charging current or the battery or

cell voltage to determine the state-of-charge of the battery or cell.

SEE OR SEARCH THIS CLASS, SUBCLASS:
152, for detecting the amplitude of the current or voltage in addition to detecting the thermal condition.
160, for multi-rate charging without time control.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclass 116 for condition responsive switching systems and subclass 141 for switch actuation with time delay or retardation means.

158 Having solid-state control device:
This subclass is indented under subclass 155. Subject matter wherein the means to regulate charging includes a semiconductor control element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
160, for multi-rate charging without time control.

159 Detection of current and voltage amplitude:
This subclass is indented under subclass 158. Subject matter including means to measure the magnitude of charging current and the magnitude of battery or cell voltage to determine the state-of-charge of the battery or cell.

SEE OR SEARCH THIS CLASS, SUBCLASS:
160, for detection of current and voltage in multi-rate charging without time control.

160 Multi-rate charging (e.g., plural charge rates before a maintenance charge, etc.):
This subclass is indented under subclass 137. Subject matter wherein the quantity of energy added per unit time (i.e., charge rate) is changed to another charge rate during a charge to rated capacity.

(1) Note. The change of charge rate, for purposes of placement in this subclass, does not include a change of rates from a charging to rated capacity and a rate employed only for keeping a battery or cell in a fully charged condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
162+, for detection of current or voltage amplitude.

161 With detection of current or voltage differential (e.g., slope, etc.):
This subclass is indented under subclass 137. Subject matter including means to determine the time-rate-of-change of the magnitude of charging current or battery or cell voltage to determine the state-of-charge of the battery or cell.

SEE OR SEARCH THIS CLASS, SUBCLASS:
151, for differential of current or voltage detection in addition to thermal condition detection.
156, for differential of current or voltage detection in addition to time control.

162 With detection of current or voltage amplitude:
This subclass is indented under subclass 137. Subject matter including means to measure the magnitude of charging current or the battery or cell voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:
152, for detecting the amplitude of the current or voltage in addition to detecting the thermal condition.
157, for detecting the amplitude of the current or voltage in addition to having time control.

163 Having solid-state control device:
This subclass is indented under subclass 162. Subject matter including a semiconductor regulating element.

164 Detection of current and voltage amplitude:
This subclass is indented under subclass 163. Subject matter including means to measure the magnitude of charging current and the magnitude of battery or cell voltage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

159, for detecting the amplitude of both current and voltage in addition to time control.

165 With current sensing to detect proper battery connection (e.g., polarity, ripple, reverse current, etc.):

This subclass is indented under subclass 137. Subject matter for sensing the current to detect a proper battery connection.

SEE OR SEARCH CLASS:

324, Electricity: Measuring and Testing, subclass 133 for nonquantitative measuring, testing, or sensing of electricity (i.e., polarity tester).

361, Electricity: Electrical Systems and Devices, subclasses 245+ for polarity reversing, manual and automatic.

166 CAPACITOR CHARGING OR DISCHARGING:

This subclass is indented under the class definition. Subject matter for increasing or decreasing the amount of stored electrical energy in a capacitor.

SEE OR SEARCH CLASS:

307, Electrical Transmission or Interconnection Systems, subclasses 109+ for charging and discharging capacitors.

363, Electrical Power Conversion Systems, subclasses 59+ for current conversion with voltage multiplication means.

167 For large capacitance (e.g., "super" capacitor, memory backup capacitor, etc.):

This subclass is indented under subclass 166. Subject matter for charging or discharging a capacitor which, via a high-capacity storage characteristic (e.g., on the order of a Farad, etc.), has utility as a battery or cell in terms of energy storage.

FOREIGN ART COLLECTIONS

The definitions for FOR 100 through FOR 171 below correspond to the definitions of the abolished subclasses under Class 320 from which these collections were formed. See the Foreign Art Collections in the Class 320 schedule for specific correspondences. [**Note**: The titles and definitions for ***indented*** art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 CONDENSER CHARGING AND/OR DISCHARGING:

Foreign art collection for condenser charging and/or discharging.

FOR 101 BATTERY CHARGING AND/OR DISCHARGING:

Foreign art collection for battery charging and/or discharging.

FOR 102 Including dry cells or primary batteries:

Foreign art collection in which the battery is of the primary type; i.e., battery of the type which produces electric energy as a result of electrochemical action, which action, is not efficiently reversible and, hence, the battery when discharged cannot be efficiently recharged by electric current.

FOR 103 "Recharging", depolarizing and/or reconditioning:

Foreign art collection in which means are provided for passing an electric current through the primary battery to thereby improve its ability and/or its operation as a source of voltage or current.

FOR 104 Combined charging and discharging:

Foreign art collection in which means are provided for both charging and discharging.

FOR 105 Plural, diversely treated batteries:

Foreign art collection in which there are two or more batteries, structurally dependent or independent, and (a) in which means operate to treat at least one battery differently (with respect to time, mode or character, of treatment) than at least one other battery, or (b) in which any battery has a circuit controlling element not included in the circuit of another battery, or (c) in which all batteries are treated in one relationship at one time and all are treated in another relationship at another time.

FOR 106 Series-parallel connections thereof:

Foreign art collection in which means are provided for connecting the batteries in series, with respect to one another, at one time and in parallel at another time, or for

connecting some in series and others in parallel at the same time.

FOR 107 Transposition between charging and discharging circuits:
Foreign art collection in which means are provided (a) for effectively removing one or more batteries from a charging circuit and placing the same in a discharging circuit, (b) for effectively removing one or more other batteries from a discharging circuit and placing the same in a charging circuit, (c) or both.

FOR 108 Combined regulation of charging source or circuit and discharging circuit:
Foreign art collection in which means are provided for regulating both (a) the charging circuit or charging source, and (b) the discharging circuit, simultaneously or otherwise.

FOR 109 Charging source and/or circuit controlled by discharging circuit:
Foreign art collection in which means are provided for controlling the charging source and/or the charging circuit as a result of the operating of, or conditions in, the discharging circuit.

FOR 110 Starting and/or stopping of battery charging:
Foreign art collection in which means operate to start and/or stop battery charging.

FOR 111 Charging generator control:
Foreign art collection in which means operate to control the charging generator.

FOR 112 Discharging circuit regulation:
Foreign art collection in which there are means which effect regulation of the discharging circuit.

FOR 113 Alternately charging and discharging:
Foreign art collection in which there are means which effect alternate (never simultaneous) charging and discharging.

FOR 114 Plural, diversely treated, batteries:
Foreign art collection in which there are two or more batteries, structurally dependent or independent, and (a) in which means operate to treat at least one battery differently (with respect to time, mode, or character, of treatment) than at least one battery and/or (b) in which any battery has a circuit controlling element not included in the circuit of another battery, and/or in which all of the batteries are connected in one relationship at one time and all are connected in another relationship at another time.

FOR 115 Series-parallel connections thereof:
Foreign art collection in which means operate to connect the batteries in series, relative to each other, at one time and to connect them in parallel at another time, or to connect some of the batteries in series and others in parallel at the same time.

FOR 116 Series-connected batteries:
Foreign art collection in which means operate to connect the batteries so that the current which passes through one battery also passes, in whole or in part, through each of the other batteries connected in the circuit; while at no time can the current divide so that part passes through one battery and another part of the current passes through another battery.

FOR 117 Variable number in series:
Foreign art collection in which means operate to vary the number of batteries which are connected in series.

FOR 118 Periodic or intermittent charging or discharging:
Foreign art collection in which means operate to charge or discharge the batteries at successive intervals, said intervals being spaced by other intervals during which the battery current is substantially zero.

FOR 119 High-rate, short-time charging systems:
Foreign art collection in which means operate to charge a battery at a high rate in a short period of time.

FOR 120 Periodic or intermittent charging or discharging:
Foreign art collection in which means operate to charge or discharge a battery at successive intervals of time, said intervals being spaced by other intervals during which the battery current is substantially zero.

FOR 121 Plural rates of charging or discharging:
Foreign art collection in which means operate to either charge or discharge the battery at two or more rates other than zero.

FOR 122 Decreasing rates of charging:
Foreign art collection in which means operate to reduce the rate of charging.

FOR 123 Three or more rates:
Foreign art collection in which means operate to effect three or more rates of charging other than zero rate.

FOR 124 With polarity control:
Foreign art collection in which means are provided to control the polarity of (a) the charging source and/or charging circuit relative to the battery, or (b) the battery relative to the discharging circuit and/or the load device.

FOR 125 By means of reversing switches:
Foreign art collection in which reversing switches control the polarity.

FOR 126 Combined control of source and charging circuit:
Foreign art collection in which there are means for controlling the charging source and additional means for controlling the circuit extending from the source to the battery.

FOR 127 Including charging circuit-making and/or breaking:
Foreign art collection in which the means for controlling the circuit extending from the source to the battery make and/or break the said circuit.

FOR 128 Combined circuit regulation and circuit-making and/or breaking:
Foreign art collection in which the means operate both (a) to regulate and (b) to make or break either the charging circuit or the discharging circuit.

FOR 129 Control responsive to predetermined conditions:
Foreign art collection in which means are provided for sensing a predetermined cause or condition (e.g., temperature, time, voltage, et cetera) which sensing means in turn initiate operation of additional means which perform some control function.

FOR 130 Plural, diverse conditions and/or with time-delay means:
Foreign art collection in which (1) means are provided for sensing two or more different predetermined conditions and/or (2) means are provided for sensing a predetermined condition and there is also provided means for a predetermined length of time after the sensing means respond to the predetermined condition.

FOR 131 Including voltage and current magnitudes:
Foreign art collection in which the sensing means will respond to both voltage and current magnitudes.

FOR 132 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break the charging circuit or the discharging circuit.

FOR 133 For battery circuit-making and/or breaking:
Foreign art collection in which at least one of the control means operates to make and/or break the charging circuit or the discharging circuit.

FOR 134 Thermal condition:
Foreign art collection in which the sensing means respond to temperature changes at any place.

FOR 135 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break either the charging circuit or the discharging circuit.

FOR 136 Instant of, or period of time:
Foreign art collection in which the sensing means respond upon the occurrence of a predetermined instant of time (e.g., 8:30 A.M., 5:00 P.M., et cetera), or upon the passage of a predetermined period of time (e.g., 10 sec., 8 hrs., et cetera).

FOR 137 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break either the charging circuit or the discharging circuit.

FOR 138 Voltage or current magnitude:
Foreign art collection in which the sensing means are responsive to a predetermined voltage magnitude or a predetermined current magnitude in any circuit.

FOR 139 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break either the charging circuit or the discharging circuit.

FOR 140 Speed or centrifugal forces:
Foreign art collection in which the sensing means respond to the linear or angular velocity of any body.

FOR 141 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break either the charging circuit or the discharging circuit.

FOR 142 Condition of battery charge:
Foreign art collection in which the sensing means operate in response to the state or degree of battery change.

FOR 143 Control by ampere-hour or watt-hour type of device:
Foreign art collection in which the sensing means include an ampere-hour or a watt-hour type of device, which device is so connected as to measure the energy input or the energy output of the battery being charged or discharged.

FOR 144 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break either the charging circuit or the discharging circuit.

FOR 145 Control by gas pressure-responsive means:
Foreign art collection in which the sensing means include a pressure responsive device which is so connected as to respond to the pressure generated by the gas liberated by a battery being charged or discharged.

FOR 146 For battery circuit-making and/or breaking:
Foreign art collection in which the control means operate to make and/or break either the charging circuit or the discharging circuit.

FOR 147 With indicating, signaling and/or testing means:
Foreign art collection in which means are provided to indicate, signal, measure, and/or test a result, condition, or circumstance immediately associated with the battery, its charging source or circuit, or its discharging circuit or load device.

FOR 148 Battery circuit control:
Foreign art collection in which means are provided for controlling either the charging circuit or the discharging circuit.

FOR 149 With bucking and/or boosting e.m.f. in charging circuit:
Foreign art collection in which there are two or more sources of e.m.f., simultaneously connected in series, relative to each other, in the charging circuit, in bucking and/or boosting relationship.

FOR 150 By impedance in charging or discharging circuit:
Foreign art collection in which an impedance is connected in the battery circuit.

FOR 151 Pressure-responsive type of impedance:
Foreign art collection in which the impedance is of the type in which the impedance to the flow of electric current therethrough varies with change in physical pressure applied thereto, and in which means are provided for applying a variable physical pressure to the impedance.

FOR 152 Unidirectionally conductive devices in battery circuit:

Foreign art collection in which a unidirectionally conductive means is connected in series with the charging or the discharging circuit, said conductive means offering appreciably more impedance to the flow of current therethrough in one direction than in the other.

FOR 153 Battery circuit-making and/or breaking:
Foreign art collection in which means are provided for substantially establishing and/or interrupting the conductivity of the battery circuit by relative physical movement of electrically conductive element into and out of physical contact with each other.

FOR 154 Plural circuit makers and/or breakers:
Foreign art collection in which two or more means are provided for establishing and/or interrupting the battery circuit in two or more places.

FOR 155 Plural, diverse or diversely treated sources of supply for charging:
Foreign art collection in which (a) two or more sources of supply of different kinds are provided in the charging circuit even though they receive the same character of treatment or (b) two or more sources of supply of either the same or different kinds are provided in the charging circuit where one or more of such sources are treated differently (with respect to time, mode or character of treatment) than one or more others of such sources.

FOR 156 Rectifying systems for battery charging:
Foreign art collection in which means are provided for receiving electric energy of alternating polarity, converting it into electrical energy of unidirectional polarity and delivering it to a battery charging circuit.

FOR 157 Dynamoelectric-type rectifier:
Foreign art collection in which the rectifying means are of the type which includes (a) an electric conductor, (b) means for producing magnetic lines of force, (c) means for producing relative motion between the conductor and the lines of force in a direction which extends at an angle to the lines of force, and (d) means for collecting and/or conducting current from the conductor to the battery charging circuit.

FOR 158 Undirectionally conductive-type rectifier:
Foreign art collection in which the rectifying means include conductive means connected to the charging circuit, which conductive means offer appreciably less impedance to the flow of current therethrough in one direction than in the other direction.

FOR 159 Space-discharge devices:
Foreign art collection in which the unidirectionally conductive type of rectifier includes devices having electrodes spaced apart in a gaseous or a vacuous medium and between which electrodes the electric current being rectified can be caused to flow.

FOR 160 Generation systems for battery charging:
Foreign art collection in which the source of supply for charging a battery comprises means for converting nonelectric energy into electric energy and for supplying the electric energy to the charging circuit.

FOR 161 Physical starting and/or stopping of generator:
Foreign art collection in which means are provided for physically starting and/or stopping the charging generator.

FOR 162 Generator used as starting means:
Foreign art collection in which means are provided for connecting the generator to a source of electric energy to start the motive power means which are used to drive the generator during charging operation.

FOR 163 Generator field-winding circuit control:
Foreign art collection in which the generator is of the type which comprises an armature or induced conductor, winding means for producing a magnetic field of force, and means for producing relative movement between the conductor and the field of force, and in which means are provided for controlling the circuit of the field producing winding.

FOR 164 Plural, diversely treated field windings:
Foreign art collection in which the means for controlling the circuit of the field winding comprise another magnetic flux producing winding; said last named winding being operated or treated differently with respect

to time, manner or electrical connection, or degree of control thereover, than the first named winding means.

FOR 165 Differentially related:
Foreign art collection in which one or more of the field windings are connected or energized so as to produce a magnetomotive force which opposes the magnetomotive force of one or more of the other field windings.

FOR 166 Auxiliary source or field circuit e.m.f.:
Foreign art collection in which two or more sources of e.m.f., are connected in series with each other and with the field producing winding.

FOR 167 Field-winding circuit impedance:
Foreign art collection in which the means for controlling the circuit of the field-producing winding comprise an impedance connected in the circuit.

FOR 168 Step short-circuited type:
Foreign art collection in which means are provided for short-circuiting the impedance, in whole or in part, by conducting means of negligible resistance which operate to short circuit the entire impedance in one step, or parts of the impedance in one or more major steps, i.e., without passing through intermediate and infinitesimal values of said impedance.

FOR 169 Pressure-responsive type of impedance:
Foreign art collection in which the impedance is of the type in which the resistance to the flow of current therethrough varies with change in physical pressure applied thereto, and in which means are provided for applying a variable physical pressure to the impedance.

FOR 170 Armature or generating circuit shorted or grounded:
Foreign art collection in which means are provided for substantially short-circuiting or grounding the terminals of the armature or generating conductors of the generator.

FOR 171 Generator structure control:
Foreign art collection in which means are provided for controlling the structure of the generator.

END