

# CPC COOPERATIVE PATENT CLASSIFICATION

## H ELECTRICITY

(NOTE omitted)

## H02 GENERATION; CONVERSION OR DISTRIBUTION OF ELECTRIC POWER

## H02J CIRCUIT ARRANGEMENTS OR SYSTEMS FOR SUPPLYING OR DISTRIBUTING ELECTRIC POWER; SYSTEMS FOR STORING ELECTRIC ENERGY

### NOTES

1. This subclass covers:
  - ac or dc mains or distribution networks;
  - circuit arrangements for battery supplies, including charging or control thereof, or coordinated supply from two or more sources of any kind;
  - circuit arrangements or systems for wireless supply or distribution of electric power.
2. This subclass does not cover:
  - control of a single motor, generator or dynamo-electric converter, of the types covered by subclass [H01F](#) or [H02K](#), which is covered by subclass [H02P](#);
  - control of a single motor or generator, of the types covered by subclass [H02N](#), which is covered by that subclass.

### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

<p><b>1/00</b>    <b>Circuit arrangements for dc mains or dc distribution networks</b></p> <p>1/001    . {Hot plugging or unplugging of load or power modules to or from power distribution networks}</p> <p>1/002    . {Intermediate AC, e.g. DC supply with intermediated AC distribution}</p> <p>1/02     . Arrangements for reducing harmonics or ripples</p> <p>1/04     . Constant-current supply systems</p> <p>1/06     . Two-wire systems</p> <p>1/08     . Three-wire systems; Systems having more than three wires</p> <p>1/082    . . {Plural DC voltage, e.g. DC supply voltage with at least two different DC voltage levels}</p> <p>1/084    . . {for selectively connecting the load or loads to one or several among a plurality of power lines or power sources}</p> <p>1/086    . . . {for providing alternative feeding paths between load or loads and source or sources when the main path fails}</p> <p>1/10     . Parallel operation of dc sources</p> <p>1/102    . . {being switching converters (<a href="#">H02J 1/108</a>, <a href="#">H02J 1/12</a> take precedence)}</p> <p>1/106    . . {for load balancing, symmetrisation, or sharing}</p> <p>1/108    . . {using diodes blocking reverse current flow (<a href="#">H02J 1/12</a> takes precedence)}</p> <p>1/109    . . {Scheduling or re-scheduling the operation of the DC sources in a particular order, e.g. connecting or disconnecting the sources in sequential, alternating or in subsets, to meet a given demand}</p> <p>1/12     . . Parallel operation of dc generators with converters, e.g. with mercury-arc rectifier</p> <p>1/122    . . {Provisions for temporary connection of DC sources of essentially the same voltage, e.g. jumpstart cables}</p> <p>1/14     . Balancing the load in a network</p>	<p>1/16    . . using dynamo-electric machines coupled to flywheels</p> <p><b>3/00</b>    <b>Circuit arrangements for ac mains or ac distribution networks</b></p> <p>3/001    . {Methods to deal with contingencies, e.g. abnormalities, faults or failures}</p> <p>3/0012   . . {Contingency detection}</p> <p>3/00125 . . {Transmission line or load transient problems, e.g. overvoltage, resonance or self-excitation of inductive loads (<a href="#">H02J 3/01</a> takes precedence)}</p> <p>3/002    . {Flicker reduction, e.g. compensation of flicker introduced by non-linear load}</p> <p>3/003    . {Load forecast, e.g. methods or systems for forecasting future load demand}</p> <p>3/004    . {Generation forecast, e.g. methods or systems for forecasting future energy generation}</p> <p>3/007    . {Arrangements for selectively connecting the load or loads to one or several among a plurality of power lines or power sources (<a href="#">for providing uninterruptable power supply <a href="#">H02J 9/00</a></a>)}</p> <p>3/0073   . . {for providing alternative feeding paths between load and source when the main path fails, e.g. transformers, busbars}</p> <p>3/0075   . . {for providing alternative feeding paths between load and source according to economic or energy efficiency considerations, e.g. economic dispatch}</p> <p>3/008    . {involving trading of energy or energy transmission rights}</p> <p>3/01     . Arrangements for reducing harmonics or ripples</p> <p>3/02     . using a single network for simultaneous distribution of power at different frequencies; using a single network for simultaneous distribution of ac power and of dc power</p>
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- 3/04 . . for connecting networks of the same frequency but supplied from different sources
- 3/06 . . Controlling transfer of power between connected networks; Controlling sharing of load between connected networks
- 3/08 . . Synchronising of networks
- 3/10 . . Constant-current supply systems
- 3/12 . . for adjusting voltage in ac networks by changing a characteristic of the network load
- 3/14 . . by switching loads on to, or off from, network, e.g. progressively balanced loading
- 3/144 . . . {Demand-response operation of the power transmission or distribution network}
- 3/16 . . by adjustment of reactive power
- 3/18 . . Arrangements for adjusting, eliminating or compensating reactive power in networks (for adjustment of voltage [H02J 3/16](#))
- 3/1807 . . {using series compensators}
- 3/1814 . . . {wherein at least one reactive element is actively controlled by a bridge converter, e.g. unified power flow controllers [UPFC]}
- 3/1821 . . {using shunt compensators ([H02J 3/1807](#), [H02J 3/1878](#) take precedence)}
- 3/1828 . . . {with stepwise control, the possibility of switching in or out the entire compensating arrangement not being considered as stepwise control}
- 3/1835 . . . {with stepless control}
- 3/1842 . . . . {wherein at least one reactive element is actively controlled by a bridge converter, e.g. active filters}
- 3/185 . . . . . {wherein such reactive element is purely inductive, e.g. superconductive magnetic energy storage systems [SMES]}
- 3/1857 . . . . . {wherein such bridge converter is a multilevel converter}
- 3/1864 . . . . . {wherein the stepless control of reactive power is obtained by at least one reactive element connected in series with a semiconductor switch}
- 3/1871 . . . {Methods for planning installation of shunt reactive power compensators}
- 3/1878 . . {using tap changing or phase shifting transformers}
- 3/1885 . . {using rotating means, e.g. synchronous generators}
- 3/1892 . . {the arrangements being an integral part of the load, e.g. a motor, or of its control circuit}
- 3/20 . . in long overhead lines
- 3/22 . . in cables
- 3/24 . . Arrangements for preventing or reducing oscillations of power in networks (by control effected upon a single generator [H02P 9/00](#))
- 3/241 . . {The oscillation concerning frequency}
- 3/242 . . {using phasor measuring units [PMU]}
- 3/26 . . Arrangements for eliminating or reducing asymmetry in polyphase networks
- 3/28 . . Arrangements for balancing of the load in a network by storage of energy
- 3/30 . . using dynamo-electric machines coupled to flywheels
- 3/32 . . using batteries with converting means
- 3/322 . . . {the battery being on-board an electric or hybrid vehicle, e.g. vehicle to grid arrangements [V2G], power aggregation, use of the battery for network load balancing, coordinated or cooperative battery charging}
- 3/34 . . Arrangements for transfer of electric power between networks of substantially different frequency
- 3/36 . . Arrangements for transfer of electric power between ac networks via a high-tension dc link
- 2003/365 . . {Reducing harmonics or oscillations in HVDC}
- 3/38 . . Arrangements for parallelly feeding a single network by two or more generators, converters or transformers
- 3/381 . . {Dispersed generators}
- 3/388 . . {Islanding, i.e. disconnection of local power supply from the network}
- 3/40 . . Synchronising a generator for connection to a network or to another generator
- 3/42 . . . with automatic parallel connection when synchronisation is achieved
- 3/44 . . . with means for ensuring correct phase sequence
- 3/46 . . Controlling of the sharing of output between the generators, converters, or transformers
- 3/466 . . . {Scheduling the operation of the generators, e.g. connecting or disconnecting generators to meet a given demand}
- 3/472 . . . . {For selectively connecting the AC sources in a particular order, e.g. sequential, alternating or subsets of sources}
- 3/48 . . . Controlling the sharing of the in-phase component
- 3/50 . . . Controlling the sharing of the out-of-phase component
- 4/00** **Circuit arrangements for mains or distribution networks not specified as ac or dc**
- 5/00** **Circuit arrangements for transfer of electric power between ac networks and dc networks ([H02J 3/36](#) takes precedence)**
- 7/00** **Circuit arrangements for charging or depolarising batteries or for supplying loads from batteries**
- 7/00032 . . {characterised by data exchange}
- 7/00034 . . {Charger exchanging data with an electronic device, i.e. telephone, whose internal battery is under charge}
- 7/00036 . . {Charger exchanging data with battery}
- 7/00038 . . {using passive battery identification means, e.g. resistors or capacitors (identification by mechanical connections [H02J 7/0045](#))}
- 7/00041 . . . {in response to measured battery parameters, e.g. voltage, current or temperature profile}
- 7/00043 . . . {using switches, contacts or markings, e.g. optical, magnetic or barcode}
- 7/00045 . . {Authentication, i.e. circuits for checking compatibility between one component, e.g. a battery or a battery charger, and another component, e.g. a power source}
- 7/00047 . . {with provisions for charging different types of batteries}
- 7/0013 . . {acting upon several batteries simultaneously or sequentially ([H02J 7/1423](#) takes precedence)}
- 7/0014 . . {Circuits for equalisation of charge between batteries}
- 7/0016 . . . {using shunting, discharge or bypass circuits}

7/0018	. . . {using separate charge circuits}	7/06	. . . using discharge tubes or semiconductor devices
7/0019	. . . {using switched or multiplexed charge circuits}	7/08	. . . . using discharge tubes only
7/0024	. . {Parallel/serial switching of connection of batteries to charge or load circuit}	7/12	. . . using magnetic devices having controllable degree of saturation, i.e. transductors
7/0025	. . {Sequential battery discharge in systems with a plurality of batteries}	7/14	. for charging batteries from dynamo-electric generators driven at varying speed, e.g. on vehicle
7/0029	. {with safety or protection devices or circuits}	7/1407	. . {on vehicles not being driven by a motor, e.g. bicycles}
7/00302	. . {Overcharge protection}	7/1415	. . {with a generator driven by a prime mover other than the motor of a vehicle}
7/00304	. . {Overcurrent protection}	7/1423	. . {with multiple batteries}
7/00306	. . {Overdischarge protection}	7/143	. . {with multiple generators}
7/00308	. . {Overvoltage protection}	7/1438	. . {in combination with power supplies for loads other than batteries}
7/00309	. . {Overheat or overtemperature protection}	7/1446	. . {in response to parameters of a vehicle}
7/0031	. . {using battery or load disconnect circuits (H02J 9/002 takes precedence)}	7/1469	. . {Regulation of the charging current or voltage otherwise than by variation of field}
7/0032	. . . {disconnection of loads if battery is not under charge, e.g. in vehicle if engine is not running}	7/1476	. . . {by mechanical action on the generator}
7/0034	. . {using reverse polarity correcting or protecting circuits (mechanical means of polarity protection H02J 7/0045)}	7/1484	. . . {by commutation of the output windings of the generator}
7/0036	. . {using connection detecting circuits (H02J 7/0034 takes precedence)}	7/1492	. . . {by means of controlling devices between the generator output and the battery}
7/0042	. {characterised by the mechanical construction}	7/16	. . Regulation of the charging current or voltage by variation of field
7/0044	. . {specially adapted for holding portable devices containing batteries (H02J 7/0045 takes precedence)}	7/163	. . . {with special means for initiating or limiting the excitation current}
7/0045	. . {concerning the insertion or the connection of the batteries}	7/18	. . . due to variation of ohmic resistance in field circuit, using resistance switching in or out of circuit step by step
7/0047	. {with monitoring or indicating devices or circuits}	7/20	. . . due to variation of continuously variable ohmic resistor
7/0048	. . {Detection of remaining charge capacity or state of charge [SOC]}	7/22	. . . due to variation of make-to-break ratio of intermittently-operating contacts, e.g. using Tirrill regulator
7/0049	. . . {Detection of fully charged condition}	7/225	. . . . {characterised by the mechanical construction}
7/005	. . {Detection of state of health [SOH]}	7/24	. . . using discharge tubes or semiconductor devices
7/0063	. {with circuits adapted for supplying loads from the battery}	7/243	. . . . {with on/off action}
7/0068	. {Battery or charger load switching, e.g. concurrent charging and load supply (H02J 7/0013 takes precedence)}	7/2434	. . . . {with pulse modulation}
7/0069	. {Charging or discharging for charge maintenance, battery initiation or rejuvenation}	7/2437	. . . . {using thyristors or triacs as final control devices}
7/007	. {Regulation of charging or discharging current or voltage}	7/26	. . . using magnetic devices with controllable degree of saturation
7/0071	. . {with a programmable schedule}	7/28	. . . using magnetic devices with controllable degree of saturation in combination with controlled discharge tube or controlled semiconductor device
7/00711	. . {with introduction of pulses during the charging process}	7/30	. . . using armature-reaction-excited machines
7/00712	. . {the cycle being controlled or terminated in response to electric parameters}	7/32	. for charging batteries from a charging set comprising a non-electric prime mover {rotating at constant speed}
7/00714	. . . {in response to battery charging or discharging current}	7/34	. Parallel operation in networks using both storage and other dc sources, e.g. providing buffering (H02J 7/14 takes precedence)
7/00716	. . . . {in response to integrated charge or discharge current}	7/342	. . {The other DC source being a battery actively interacting with the first one, i.e. battery to battery charging (with circuits for polarity protection H02J 7/0034)}
7/00718	. . . . {in response to charge current gradient}	7/345	. . {using capacitors as storage or buffering devices}
7/007182	. . . {in response to battery voltage}	7/35	. . with light sensitive cells
7/007184	. . . . {in response to battery voltage gradient}	7/36	. Arrangements using end-cell switching
7/007186	. . . . {obtained with the battery disconnected from the charge or discharge circuit}	9/00	<b>Circuit arrangements for emergency or stand-by power supply, e.g. for emergency lighting</b>
7/007188	. . {the charge cycle being controlled or terminated in response to non-electric parameters}		
7/00719	. . . {in response to degree of gas development in the battery}		
7/007192	. . . {in response to temperature}		
7/007194	. . . . {of the battery}		
7/02	. for charging batteries from ac mains by converters		
7/04	. . Regulation of charging current or voltage		

- 9/002 . . . {in which a reserve is maintained in an energy source by disconnecting non-critical loads, e.g. maintaining a reserve of charge in a vehicle battery for starting an engine}
- 9/005 . . . {using a power saving mode (for copiers [G03G 15/5004](#))}
- 9/007 . . . {Detection of the absence of a load}
- 9/02 . . . in which an auxiliary distribution system and its associated lamps are brought into service
- 9/04 . . . in which the distribution system is disconnected from the normal source and connected to a standby source
- 9/06 . . . with automatic change-over {, e.g. UPS systems}
- 9/061 . . . {for DC powered loads}
- 9/062 . . . {for AC powered loads}
- 9/063 . . . . . {Common neutral, e.g. AC input neutral line connected to AC output neutral line and DC middle point}
- 9/065 . . . . . {for lighting purposes}
- 9/066 . . . . . {characterised by the use of dynamo-electric machines ([H02J 9/08](#) takes precedence)}
- 9/067 . . . . . {using multi-primary transformers, e.g. transformer having one primary for each AC energy source and a secondary for the loads}
- 9/068 . . . . . {Electronic means for switching from one power supply to another power supply, e.g. to avoid parallel connection}
- 9/08 . . . . . requiring starting of a prime-mover
- 11/00** **Circuit arrangements for providing service supply to auxiliaries of stations in which electric power is generated, distributed or converted**
- 13/00** **Circuit arrangements for providing remote indication of network conditions, e.g. an instantaneous record of the open or closed condition of each circuitbreaker in the network; Circuit arrangements for providing remote control of switching means in a power distribution network, e.g. switching in and out of current consumers by using a pulse code signal carried by the network**
- 13/00001 . . . {characterised by the display of information or by user interaction, e.g. supervisory control and data acquisition systems [SCADA] or graphical user interfaces [GUI]}
- 13/00002 . . . {characterised by monitoring}
- 13/00004 . . . {characterised by the power network being locally controlled}
- 13/00006 . . . {characterised by information or instructions transport means between the monitoring, controlling or managing units and monitored, controlled or operated power network element or electrical equipment}
- 13/00007 . . . {using the power network as support for the transmission}
- 13/00009 . . . . . {using pulsed signals}
- 13/0001 . . . . . {using modification of a parameter of the network power signal}
- 13/00012 . . . . . {using an auxiliary transmission line}
- 13/00014 . . . . . {carrying signals having the network frequency or DC signals}
- 13/00016 . . . . . {using a wired telecommunication network or a data transmission bus}
- 13/00017 . . . . . {using optical fiber}
- 13/00018 . . . . . {using phone lines}
- 13/00019 . . . . . {using optical means}
- 13/0002 . . . . . {using ultrasonic means}
- 13/00022 . . . . . {using wireless data transmission}
- 13/00024 . . . . . {by means of mobile telephony}
- 13/00026 . . . . . {involving a local wireless network, e.g. Wi-Fi, ZigBee or Bluetooth}
- 13/00028 . . . . . {involving the use of Internet protocols}
- 13/00032 . . . . . {Systems characterised by the controlled or operated power network elements or equipment, the power network elements or equipment not otherwise provided for (circuits specially adapted for remote switching of lighting via the power line [H05B 47/185](#))}
- 13/00034 . . . . . {the elements or equipment being or involving an electric power substation}
- 13/00036 . . . . . {the elements or equipment being or involving switches, relays or circuit breakers (circuits for indication of single switches [H01H 9/167](#))}
- 13/0004 . . . . . {involved in a protection system}
- 13/0005 . . . . . {the elements or equipment being or involving power plugs or sockets}
- 15/00** **Systems for storing electric energy (mechanical systems therefor [F01-F04](#); in chemical form [H01M](#))**
- 15/003 . . . . . {in the form of hydraulic energy}
- 15/006 . . . . . {in the form of pneumatic energy, e.g. compressed air energy storage [CAES] (accumulators for supplying fluid under pressure [F15B 1/04](#))}
- 15/007 . . . . . {involving storage in the form of mechanical energy, e.g. fly-wheels}
- 15/008 . . . . . {using hydrogen as energy vector}
- 50/00** **Circuit arrangements or systems for wireless supply or distribution of electric power**
- NOTE**
- In this main group, the specific types of wireless technology used for the power transmission are covered in groups [H02J 50/05-H02J 50/30](#), while aspects relevant to the circuit arrangements or systems thereof are covered in groups [H02J 50/40-H02J 50/90](#).
- 50/001 . . . . . {Energy harvesting or scavenging}
- 50/005 . . . . . {Mechanical details of housing or structure aiming to accommodate the power transfer means, e.g. mechanical integration of coils, antennas or transducers into emitting or receiving devices}
- 50/05 . . . . . using capacitive coupling
- 50/10 . . . . . using inductive coupling
- 50/12 . . . . . of the resonant type
- 50/15 . . . . . using ultrasonic waves
- 50/20 . . . . . using microwaves or radio frequency waves
- 50/23 . . . . . characterised by the type of transmitting antennas, e.g. directional array antennas or Yagi antennas
- 50/27 . . . . . characterised by the type of receiving antennas, e.g. rectennas
- 50/30 . . . . . using light, e.g. lasers
- 50/40 . . . . . using two or more transmitting or receiving devices ([H02J 50/50](#) takes precedence)
- 50/402 . . . . . {the two or more transmitting or the two or more receiving devices being integrated in the same unit, e.g. power mats with several coils or antennas with several sub-antennas}



- 50/50 . using additional energy repeaters between transmitting devices and receiving devices
- 50/502 . . {the energy repeater being integrated together with the emitter or the receiver}
- 50/60 . responsive to the presence of foreign objects, e.g. detection of living beings
- 50/70 . involving the reduction of electric, magnetic or electromagnetic leakage fields
- 50/80 . involving the exchange of data, concerning supply or distribution of electric power, between transmitting devices and receiving devices
- 50/90 . involving detection or optimisation of position, e.g. alignment
- 2203/00 Indexing scheme relating to details of circuit arrangements for AC mains or AC distribution networks**
- 2203/10 . Power transmission or distribution systems management focussing at grid-level, e.g. load flow analysis, node profile computation, meshed network optimisation, active network management or spinning reserve management
- 2203/20 . Simulating, e.g. planning, reliability check, modelling or computer assisted design [CAD]
- 2207/00 Indexing scheme relating to details of circuit arrangements for charging or depolarising batteries or for supplying loads from batteries**
- 2207/10 . Control circuit supply, e.g. means for supplying power to the control circuit
- 2207/20 . Charging or discharging characterised by the power electronics converter
- 2207/30 . Charge provided using DC bus or data bus of a computer
- 2207/40 . adapted for charging from various sources, e.g. AC, DC or multivoltage
- 2207/50 . Charging of capacitors, supercapacitors, ultra-capacitors or double layer capacitors (using capacitors as storage or buffering device in cooperation with batteries [H02J 7/345](#))
- 2213/00 Indexing scheme relating to details of circuit arrangements for providing remote indication of network conditions of for circuit arrangements for providing remote control of switching means in a power distribution network**
- 2213/10 . using simultaneously two or more different transmission means
- 2300/00 Systems for supplying or distributing electric power characterised by decentralized, dispersed, or local generation**
- 2300/10 . The dispersed energy generation being of fossil origin, e.g. diesel generators
- 2300/20 . The dispersed energy generation being of renewable origin
- 2300/22 . . The renewable source being solar energy
- 2300/24 . . . of photovoltaic origin
- 2300/26 . . . . involving maximum power point tracking control for photovoltaic sources ([maximum power point systems in particular G05F 1/67](#))
- 2300/28 . . The renewable source being wind energy ([wind motors F03D](#))
- 2300/30 . The power source being a fuel cell
- 2300/40 . wherein a plurality of decentralised, dispersed or local energy generation technologies are operated simultaneously
- 2310/00 The network for supplying or distributing electric power characterised by its spatial reach or by the load**
- 2310/10 . The network having a local or delimited stationary reach
- 2310/12 . . The local stationary network supplying a household or a building
- 2310/14 . . . The load or loads being home appliances
- 2310/16 . . . The load or loads being an Information and Communication Technology [ICT] facility
- 2310/18 . . The network being internal to a power source or plant
- 2310/20 . . The network being internal to a load
- 2310/22 . . . The load being a portable electronic device
- 2310/23 . . . The load being a medical device, a medical implant, or a life supporting device
- 2310/40 . The network being an on-board power network, i.e. within a vehicle
- 2310/42 . . for ships or vessels
- 2310/44 . . for aircrafts
- 2310/46 . . for ICE-powered road vehicles
- 2310/48 . . for electric vehicles [EV] or hybrid vehicles [HEV]
- 2310/50 . for selectively controlling the operation of the loads
- 2310/52 . . The controlling of the operation of the load not being the total disconnection of the load, i.e. entering a degraded mode or in current limitation
- 2310/54 . . according to a pre-established time schedule
- 2310/56 . . characterised by the condition upon which the selective controlling is based
- 2310/58 . . . The condition being electrical
- 2310/60 . . . . Limiting power consumption in the network or in one section of the network, e.g. load shedding or peak shaving
- 2310/62 . . . The condition being non-electrical, e.g. temperature
- 2310/64 . . . . The condition being economic, e.g. tariff based load management
- 2310/66 . . one of the loads acting as master and the other or others acting as slaves
- 2310/70 . Load identification