

**CPC****COOPERATIVE PATENT CLASSIFICATION****H02J**

**CIRCUIT ARRANGEMENTS OR SYSTEMS FOR SUPPLYING OR DISTRIBUTING ELECTRIC POWER; SYSTEMS FOR STORING ELECTRIC ENERGY** (for digital computers [G06F 1/18](#); circuits or apparatus for the conversion of electric power, arrangements for control or regulation of such circuits or apparatus [H02M](#); interrelated control of several motors, control of a prime-mover/generator combination [H02P](#); control of high-frequency power [H03L](#); additional use of power line or power network for transmission of information [H04B](#))

**NOTES**

1. This subclass covers:
  - ac or dc mains or distribution networks;
  - circuit arrangements for battery supplies, including charging or control thereof, or co-ordinated supply from two or more sources of any kind;
  - systems for supplying or distributing electric power by electromagnetic waves.
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**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups :

[H02J 7/10](#) covered by [H02J 7/0072](#)

**H02J 1/00****Circuit arrangements for dc mains or dc distribution networks**[H02J 2001/002](#)

. {Intermediate ac, e.g. dc supply with intermediated ac distribution}

[H02J 2001/004](#)

. {Distribution of power generated by fuel cells}

[H02J 2001/006](#)

. {Provisions for temporary connection of dc sources of essentially the same voltage, e.g. jumpstart cables}

[H02J 2001/008](#)

. {Plural dc voltage, e.g. dc supply voltage with at least two different dc voltage levels}

[H02J 1/02](#). Arrangements for reducing harmonics or ripples (in converters [H02M 1/14](#))[H02J 1/04](#)

. Constant-current supply systems

[H02J 1/06](#)

. Two-wire systems

[H02J 1/08](#)

. Three-wire systems; Systems having more than three wires

[H02J 1/10](#). Parallel operation of dc sources (involving batteries [H02J 7/34](#))[H02J 1/102](#). . {being switching converters ([H02J 1/108](#), [H02J 1/12](#) take precedence)}[H02J 2001/104](#)

. . . {for synchronisation}

[H02J 2001/106](#)

. . . {for load balancing or load symmetrisation}

- H02J 1/108 . . {using diodes blocking reverse current flow ([H02J 1/12](#) takes precedence)}
  - H02J 1/12 . . Parallel operation of dc generators with converters, e.g. with mercury-arc rectifier
  - H02J 1/14 . Balancing the load in a network ([by batteries H02J 7/34](#))
  - H02J 1/16 . . using dynamo-electric machines coupled to fly-wheels
- H02J 3/00** **Circuit arrangements for ac mains or ac distribution networks**
- H02J 2003/001 . {Emergency control, e.g. method to deal with contingencies}
  - H02J 2003/002 . {Flicker reduction, e.g. compensation of flicker introduced by non linear load}
  - H02J 2003/003 . {Load forecast, e.g. method and systems for forecasting future load demand}
  - H02J 3/005 . {Arrangements for selectively connecting the load to one among a plurality of power lines or power sources ([for providing uninterruptable power supply H02J 9/00](#))}
  - H02J 3/006 . . {for providing alternative feeding paths between load and source when the main path fails, e.g. transformers, busbars}
  - H02J 2003/007 . {Simulating, e. g. planning, reliability check, modeling}
  - H02J 3/008 . {involving trading of energy or energy transmission rights}
  - H02J 3/01 . Arrangements for reducing harmonics or ripples ([in converters H02M 1/12](#))
  - H02J 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
  - H02J 3/04 . for connecting networks of the same frequency but supplied from different sources
  - H02J 3/06 . . Controlling transfer of power between connected networks; Controlling sharing of load between connected networks
  - H02J 3/08 . . Synchronising of networks
  - H02J 3/10 . Constant-current supply systems
  - H02J 3/12 . for adjusting voltage in ac networks by changing a characteristic of the network load
  - H02J 3/14 . . by switching loads on to, or off from, network, e.g. progressively balanced loading
  - H02J 2003/143 . . . {Household appliances management}
  - H02J 2003/146 . . . {Tariff based load management}
  - H02J 3/16 . . by adjustment of reactive power
  - H02J 3/18 . Arrangements for adjusting, eliminating, or compensating reactive power in networks ([for adjustment of voltage H02J 3/12](#); [use of Petersen coils H02H 9/08](#))
  - H02J 3/1807 . . {using series compensators}
  - H02J 3/1814 . . . {wherein at least one reactive element is actively controlled by a bridge converter, e.g. unified power flow controllers [UPFC]}
  - H02J 3/1821 . . {using shunt compensators ([H02J 3/1807](#), [H02J 3/1878](#) take precedence)}
  - H02J 3/1828 . . . {with stepwise control, the possibility of switching in or out the entire compensating arrangement not being considered as stepwise control}
  - H02J 3/1835 . . . {with stepless control}
  - H02J 3/1842 . . . . {wherein at least one reactive element is actively controlled by a bridge converter, e.g. active filters}
  - H02J 3/185 . . . . . {wherein such reactive element is purely inductive, e.g. superconductive magnetic energy storage systems [SMES]}
  - H02J 3/1857 . . . . . {wherein such bridge converter is a multilevel converter}

- H02J 3/1864 . . . . {wherein the stepless control of reactive power is obtained by at least one reactive element connected in series with a semiconductor switch}
- H02J 3/1871 . . . {Methods for planning installation of shunt reactive power compensators}
- H02J 3/1878 . . {using tap changing or phase shifting transformers}
- H02J 3/1885 . . {using rotating means, e.g. synchronous generators}
- H02J 3/1892 . . {the arrangements being an integral part of the load, e.g. a motor, or of its control circuit}
- H02J 3/20 . . in long overhead lines
- H02J 3/22 . . in cables
- H02J 3/24 . Arrangements for preventing or reducing oscillations of power in networks (by control effected upon a single generator [H02P 9/00](#))
- H02J 3/26 . Arrangements for eliminating or reducing asymmetry in polyphase networks
- H02J 3/28 . Arrangements for balancing of the load in a network by storage of energy
- H02J 3/30 . . using dynamo-electric machines coupled to fly-wheels
- H02J 3/32 . . using batteries with converting means
- H02J 3/34 . Arrangements for transfer of electric power between networks of substantially different frequency (frequency-convertors [H02M](#))
- H02J 3/36 . Arrangements for transfer of electric power between ac networks via a high-tension dc link
- H02J 2003/365 . . {Reducing harmonics or oscillations in HVDC}
- H02J 3/38 . Arrangements for parallelly feeding a single network by two or more generators, converters or transformers
- H02J 3/381 . . {Dispersed generators}
- H02J 3/382 . . . {the generators exploiting renewable energy}
- H02J 3/383 . . . . {Solar energy, e.g. photovoltaic energy (generation of electric power by conversion of light [H02S](#))}
- H02J 3/385 . . . . . {Maximum power point tracking control for photovoltaic sources}
- H02J 3/386 . . . . {Wind energy (wind motors [F03D](#))}
- H02J 3/387 . . . {using fuel cells (fuel cells per se [H01M 8/00](#))}
- H02J 2003/388 . . {Islanding, i.e. disconnection of local power supply from the network}
- H02J 3/40 . . Synchronising a generator for connection to a network or to another generator
- H02J 3/42 . . . with automatic parallel connection when synchronisation is achieved
- H02J 3/44 . . . with means for ensuring correct phase sequence
- H02J 3/46 . . Controlling of the sharing of output between the generators, converters, or transformers
- H02J 3/48 . . . Controlling the sharing of the in-phase component
- H02J 3/50 . . . Controlling the sharing of the out-of-phase component
- H02J 4/00** **Circuit arrangements for mains of distribution networks not specified as ac or dc**
- H02J 5/00** **Circuit arrangements for transfer of electric power between ac networks and dc networks ([H02J 3/36](#) takes precedence)**
- H02J 5/005 . {with inductive power transfer (for charging [H02J 7/025](#))}

**H02J 7/00****Circuit arrangements for charging or depolarising batteries or for supplying loads from batteries**

- H02J 2007/0001 . {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}
- H02J 7/0003 . {with provision for charging different types of batteries}
- H02J 7/0004 . . {with data exchange between battery and charger ([H02J 7/0011](#) takes precedence)}
- H02J 7/0006 . . {using passive battery identification means, e.g. resistors, capacitors ([H02J 7/0011](#) takes precedence; identification by mechanical connections [H02J 7/0045](#))}
- H02J 7/0008 . . . {in response to measured battery parameters, e.g. voltage, current, temperature profile}
- H02J 7/0009 . . . {using switches, contacts or markings, e.g. optical, magnetic, barcode}
- H02J 7/0011 . . {with charge circuits contained within battery unit}
- H02J 7/0013 . {for charging several batteries simultaneously or sequentially ([H02J 7/1423](#) takes precedence)}
- H02J 7/0014 . . {Circuits for equalisation of charge between batteries}
- H02J 7/0016 . . . {using shunting, discharge or bypass circuits}
- H02J 7/0018 . . . {using separate charge circuits}
- H02J 7/0019 . . . {using switched or multiplexed charge circuits}
- H02J 7/0021 . . {Monitoring or indicating circuits ([H02J 7/0026](#) takes precedence)}
- H02J 7/0022 . . {Management of charging with batteries permanently connected to charge circuit ([H02J 7/0014](#) takes precedence)}
- H02J 7/0024 . . {Parallel/serial switching of connection of batteries to charge or load circuit}
- H02J 7/0026 . . {using safety or protection circuits, e.g. overcharge/discharge disconnection}
- H02J 7/0027 . . {Stations for charging mobile units, e.g. of electric vehicles, of mobile telephones ([H02J 7/0021](#), [H02J 7/0026](#) take precedence)}
- H02J 7/0029 . {with safety devices ([H02J 7/0026](#) takes precedence)}
- H02J 7/0031 . . {using battery or load disconnect circuits ([H02J 9/002](#) takes precedence)}
- H02J 7/0032 . . . {disconnection of loads if battery is not under charge, e.g. in vehicle if engine is not running}
- H02J 7/0034 . . {using reverse polarity correcting or protecting circuits (mechanical means of polarity protection [H02J 7/0045](#))}
- H02J 7/0036 . . {using connection detecting circuits ([H02J 7/0034](#) takes precedence)}
- H02J 2007/0037 . . {Overcharge protection}
- H02J 2007/0039 . . {Overcurrent protection}
- H02J 2007/004 . . {Overdischarge protection}
- H02J 7/0042 . {characterised by the mechanical construction ([H02J 7/355](#) takes precedence)}
- H02J 7/0044 . . {specially adapted for holding portable devices containing batteries ([H02J 7/0045](#) takes precedence)}
- H02J 7/0045 . . {concerning the insertion or the connection of the batteries (charging from ac mains using non-contact coupling [H02J 7/025](#))}
- H02J 7/0047 . {with indicating devices ([H02J 7/0021](#) takes precedence)}
- H02J 2007/0049 . . {Detection of fully charged condition}

- H02J 2007/005 . . {Detection of remaining charge capacity}
- H02J 7/0052 . {Charge circuits only ([H02J 7/0003](#), [H02J 7/0013](#), [H02J 7/007](#) take precedence)}
- H02J 7/0054 . . {Battery to battery charging (with circuits for polarity protection [H02J 7/0034](#))}
- H02J 7/0055 . . {adapted for charging from various sources, e.g. AC, DC, multivoltage}
- H02J 7/0057 . . {adapted for charge maintenance or battery rejuvenation ([H02J 7/0075](#) takes precedence)}
- H02J 2007/0059 . . {characterised by the converter}
- H02J 2007/006 . . {Charge provided using dc bus or data bus of a computer}
- H02J 2007/0062 . . {Charge provided using USB port connectors}
- H02J 7/0063 . {Circuits adapted for supplying loads only}
- H02J 7/0065 . . {using converters specially adapted for use with a battery}
- H02J 2007/0067 . . {Discharge management, i.e. discharge current reduction at low state of charge, sequential battery discharge in systems with a plurality of battery}
- H02J 7/0068 . {Battery or charger load switching, e.g. concurrent charging and load supply ([H02J 7/0013](#) takes precedence)}
- H02J 7/007 . {Regulation of charging current or voltage}
- H02J 7/0072 . . {using semiconductor devices only}
- H02J 7/0073 . . . {with a programmable charge schedule ([H02J 7/0093](#) takes precedence)}
- H02J 7/0075 . . . . {for charge maintenance, battery initiation or rejuvenation}
- H02J 7/0077 . . . {the charge cycle being terminated in response to electric parameters ([H02J 7/0093](#) takes precedence)}
- H02J 7/0078 . . . . {in response to discharge current, e.g. using a coulometer, pilot cell}
- H02J 7/008 . . . . {with the battery connected to the charge circuit}
- H02J 7/0081 . . . . . {and in response to battery voltage gradient}
- H02J 7/0083 . . . . . {and in response to charge current gradient}
- H02J 7/0085 . . . . . {with the battery disconnected from the charge circuit}
- H02J 7/0086 . . . . . {and in response to battery voltage}
- H02J 7/0088 . . . {the charge cycle being terminated in response to non-electric parameters ([H02J 7/0093](#) takes precedence)}
- H02J 7/009 . . . . {in response to degree of gas development in the battery}
- H02J 7/0091 . . . . {in response to temperature of the battery}
- H02J 7/0093 . . . {with introduction of pulses during the charging process}
- H02J 2007/0095 . {Control circuit supply, e.g. means for supplying power to the control circuit}
- H02J 2007/0096 . {Charger exchanging data with an electronic device, i.e. telephone, whose internal battery is under charge}
- H02J 2007/0098 . {Smart battery, e.g. battery with means for data exchanging with charger}
- H02J 7/02 . for charging batteries from ac mains by converters
- H02J 7/022 . . {characterised by the type of converter}
- H02J 7/025 . . . {using non-contact coupling, e.g. inductive, capacitive}
- H02J 7/027 . . {with safety or indicating device}
- H02J 7/04 . . Regulation of charging current or voltage
- H02J 7/041 . . . {with a programmable charge schedule}

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| H02J 7/042    | . . . {the charge cycle being controlled in response to a measured parameter}   |
| H02J 7/044    | . . . . {in response to integrated charge or discharge current}   |
| H02J 7/045    | . . . . {in response to voltage or current}   |
| H02J 7/047    | . . . . {in response to temperature}  |
| H02J 7/048    | . . . . {in response to degree of gas development in the battery}   |
| H02J 7/06     | . . . using discharge tubes or semiconductor devices  |
| H02J 7/08     | . . . . using discharge tubes only  |
| H02J 7/082    | . . . . . {with a programmable charge schedule}   |
| H02J 7/085    | . . . . . {the charge cycle being terminated in response to electric parameters}  |
| H02J 7/087    | . . . . . {the charge cycle being terminated in response to non-electric parameters}                                      |
| H02J 2007/10  | . . . . {using semiconductor devices only}  |
| H02J 2007/105 | . . . . . {with introduction of pulses during the charging process}   |
| H02J 7/12     | . . . using magnetic devices having controllable degree of saturation, i.e. transducers                                   |
| H02J 7/125    | . . . . {in combination with discharge tubes or semiconductor devices}  |
| H02J 7/14     | . for charging batteries from dynamo-electric generators driven at varying speed, e.g. on vehicle                         |
| H02J 7/1407   | . . {on vehicles not being driven by a motor, e.g. bicycles}  |
| H02J 7/1415   | . . {with a generator driven by a prime mover other than the motor of a vehicle}  |
| H02J 7/1423   | . . {with multiple batteries or generators}   |
| H02J 2007/143 | . . . {Multiple generators}   |
| H02J 7/1438   | . . {in combination with power supplies for loads other than batteries}   |
| H02J 7/1446   | . . {in response to parameters of a vehicle}  |
| H02J 7/1453   | . . {with temperature compensation}   |
| H02J 7/1461   | . . {with safety or indicating devices}   |
| H02J 7/1469   | . . {Regulation of the charging current or voltage otherwise than by variation of field}                                  |
| H02J 7/1476   | . . . {by mechanical action on the generator}   |
| H02J 7/1484   | . . . {by commutation of the output windings of the generator}  |
| H02J 7/1492   | . . . {by means of controlling devices between the generator output and the battery}                                      |
| H02J 7/16     | . . Regulation of the charging current or voltage by variation of field   |
| H02J 7/163    | . . . {with special means for initiating or limiting the excitation current}  |
| H02J 7/166    | . . . {with safety or indicating devices}   |
| H02J 7/18     | . . . due to variation of ohmic resistance in field circuit, using resistance switching in or out of circuit step by step |
| H02J 7/20     | . . . due to variation of continuously variable ohmic resistor  |
| H02J 7/22     | . . . due to variation of make-to-break ratio of intermittently-operating contacts, e.g. using Tirrill regulator          |
| H02J 7/225    | . . . . {characterised by the mechanical construction}  |
| H02J 7/24     | . . . using discharge tubes or semiconductor devices  |
| H02J 7/241    | . . . . {using discharge tubes only}  |



- H02J 7/242 . . . . {using semiconductor devices as final control devices}
- H02J 7/244 . . . . {with on/off action}
- H02J 7/245 . . . . {with pulse modulation}
- H02J 7/247 . . . . {using thyristors or triacs as final control devices}
- H02J 7/248 . . . . {characterised by the mechanical construction}
- H02J 7/26 . . . using magnetic devices with controllable degree of saturation
- H02J 7/28 . . . using magnetic devices with controllable degree of saturation in combination with controlled discharge tube or controlled semiconductor device
- H02J 7/30 . . . using armature-reaction-excited machines
- H02J 7/32 . for charging batteries from a charging set comprising a non-electric prime mover {rotating at constant speed}
- H02J 7/322 . . {by variation of field, using discharge tubes}
- H02J 7/324 . . {by variation of field, using semiconductor devices}
- H02J 7/326 . . {by variation of field, using armature-reaction-excited machines}
- H02J 7/328 . . {by variation of field, using magnetic devices having controllable degree of saturation}
- H02J 7/34 . Parallel operation in networks using both storage and other dc sources, e.g. providing buffering ([H02J 7/14 takes precedence](#))
- H02J 7/345 . . {using capacitors as storage or buffering devices}
- H02J 7/35 . . with light sensitive cells
- H02J 7/355 . . . {characterised by the mechanical construction}
- H02J 7/36 . Arrangements using end-cell switching
- H02J 9/00** **Circuit arrangement for emergency or standby power supply, e.g. for emergency lighting (with provision for charging standby battery [H02J 7/00](#))**
- H02J 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}
- H02J 9/005 . {using a power saving mode (for copiers [G03G 15/5004](#))}
- H02J 2009/007 . . {Detection of the absence of a load}
- H02J 9/02 . in which an auxiliary distribution system and its associated lamps are brought into service
- H02J 9/04 . in which the distribution system is disconnected from the normal source and connected to a standby source
- H02J 9/06 . . with automatic change-over
- H02J 9/061 . . . {characterised by the use of electronic means ([H02J 9/062](#) and [H02J 9/065 take precedence](#))}
- H02J 9/062 . . . {involving non rotating DC/AC converters}
- H02J 2009/063 . . . . {Common neutral, e.g. ac input neutral line connected to ac output neutral line and dc middle point}
- H02J 9/065 . . . . {for lighting purposes}
- H02J 9/066 . . . {characterised by the use of dynamo-electric machines ([H02J 9/08 takes precedence](#))}
- H02J 2009/067 . . . {using multi-primary transformers, e.g. transformer having one primary for each ac energy source and a secondary for the loads}

- H02J 2009/068 . . . {Electronic means for switching from one power supply to another power supply , e.g. to avoid parallel connection}
- H02J 9/08 . . . requiring starting of a prime-mover
- H02J 11/00** **Circuit arrangements for providing service supply to auxiliaries of stations in which electric power is generated, distributed, or converted** ([emergency or standby arrangements H02J 9/00](#))
- H02J 13/00** **Circuit arrangements for providing remote indication of network conditions, e.g. an instantaneous record of the open or closed condition of each circuit-breaker 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** [{\(circuits for indication of single switches H01H 9/167; circuits specially adapted for remote switching of lighting via the power line H05B 37/0263\)}](#)
- H02J 13/0003 . {for DC networks}
- H02J 13/0006 . {for single frequency AC networks}
- H02J 13/001 . . {characterised by the display, e.g. of data or controls}
- H02J 13/0013 . . {characterised by transmission structure between the control or monitoring unit and the controlled or monitored unit}
- H02J 13/0017 . . . {with direct transmission between the control or monitoring unit and the controlled or monitored unit}
- H02J 13/002 . . . . {using the power network as support for the transmission}
- H02J 13/0024 . . . . . {using pulsed signals}
- H02J 13/0027 . . . . . {Details of signals treatment means}
- H02J 13/0031 . . . . . {using static semiconductor means}
- H02J 13/0034 . . . . . {Transmitters}
- H02J 13/0037 . . . . . {Receivers}
- H02J 13/0041 . . . . . {using lamps or electromechanical means}
- H02J 13/0044 . . . . . {using DC signal superposition}
- H02J 13/0048 . . . . . {using modification of a parameter of the network power signal}
- H02J 13/0051 . . . . . {Zero-crossing time}
- H02J 13/0055 . . . . {using an auxiliary transmission line}
- H02J 13/0058 . . . . . {carrying signals having the network frequency or DC signals}
- H02J 13/0062 . . . . {using a data transmission bus}
- H02J 13/0065 . . . . {using optical means}
- H02J 13/0068 . . . . {using ultrasonic means}
- H02J 13/0072 . . . . {using phone lines}
- H02J 13/0075 . . . . {using radio means}
- H02J 13/0079 . . . {with transmission using an intermediate treatment level between the control or monitoring unit and the controlled or monitored unit}
- H02J 13/0082 . . . . {using the power network as transmission support}
- H02J 13/0086 . . . {with transmission using plurality of intermediate treatment level between the control or monitoring unit and the controlled or monitored unit}



- H02J 13/0089 . . . . {using the power network as transmission support}
- H02J 13/0093 . {for AC networks with plurality frequencies}
- H02J 13/0096 . {for networks combining AC and DC power}
  
- H02J 15/00** **Systems for storing electric energy** (mechanical systems therefor [F01](#) to [F04](#); in chemical form [H01M](#))
- H02J 15/003 . {in the form of hydraulic energy}
- H02J 15/006 . {in the form of pneumatic energy (accumulators for supplying fluid under pressure [F15B 1/04](#))}
  
- H02J 17/00** **Systems for supplying or distributing electric power by electromagnetic waves**