

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](#))

NOTE

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.

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-converters \[H02M\]\(#\)](#))
- 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 ([inverter means associated with the PV module \[H02S 40/32\]\(#\)](#)) }
- 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 }

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| 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 } |
| 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 15/00C1](#)) }
- [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

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| | | 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 |