H02M  APPARATUS FOR CONVERSION BETWEEN AC AND AC, BETWEEN AC AND DC, OR BETWEEN DC AND DC, AND FOR USE WITH MAINS OR SIMILAR POWER SUPPLY SYSTEMS; CONVERSION OF DC OR AC INPUT POWER INTO SURGE OUTPUT POWER; CONTROL OR REGULATION THEREOF

NOTES

1. This subclass covers only circuits or apparatus for the conversion of electric power, or arrangements for control or regulation of such circuits or apparatus. The electrotechnical elements employed are dealt within the appropriate subclasses, e.g. inductors, transformers H01F, capacitors, electrolytic rectifiers H01G, mercury rectifying or other discharge tubes H01J, semiconductor devices H01L, impedance networks or resonant circuit not primarily concerned with the transfer of electric power H03H.

2. In this subclass, conversion, in respect of an electric variable, e.g. voltage or current, means the change of one or more of the parameters of the variable, e.g. amplitude, frequency, phase, polarity.

WARNINGS

1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

- H02M 9/00 covered by H03K 3/53
- H02M 9/02 covered by H03K 3/53
- H02M 9/04 covered by H03K 3/53
- H02M 9/06 covered by H03K 3/53

2. 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.

1/00 Details of apparatus for conversion

2001/0003  . . (Details of control, feedback and regulation circuits)

2001/0006  . . (Arrangements for supplying an adequate voltage to the control circuit of a converter)

2001/0009  . . (Devices and circuits for detecting current in a converter)

2001/0012  . . (Control circuits using digital or numerical techniques (in dc/dc converters H02M 3/157, H02M 3/33515; in dc-ac converters H02M 7/53873))

2001/0016  . . (Control circuits providing compensation of output voltage deviations using feedforward of disturbance parameter)

2001/0019  . . (the disturbance parameter being load current fluctuations)

2001/0022  . . (the disturbance parameter being input voltage fluctuations)

2001/0025  . . (Arrangements for modifying reference value, feedback value or error value in the control loop of a converter)

2001/0029  . . (Circuits or arrangements for limiting the slope ("slew rate") of switching signals)

2001/0032  . . (Control circuits allowing low power mode operation, e.g. "standby")

2001/0035  . . (by burst mode control)

2001/0038  . . (Circuits or arrangements for suppressing, e.g. by masking incorrect turn-on or turn-off signals, e.g. due to current spikes in current mode control)

2001/0041  . . (Control circuits in which a clock signal is selectively enabled or disabled)
tubes incorporated in static converters

of time that a converter's output will remain within
configuration}

Converters characterized by their input or output

Converter structures employing plural converter

units, other than for parallel operation of the units

on a single load)

Plural converter units in cascade (push-pull dc/ dc converters with preregulator H02M 3/3374; dc-ac converters following a dc-dc stage which includes a high frequency transformer H02M 7/4807, dc-ac converters following a dc-dc conversion stage which generates a periodically varying voltage H02M 7/4826)

Plural converter units whose inputs are connected in series)

Plural converter units whose outputs are connected in series)

Plural converter units for generating at least two independent, non-parallel outputs, e.g. systems with plural point of load switching regulators)

Converters characterized by their input or output configuration)

adapted for receiving as input a current source)

having more than one output with independent control (for dc-dc converter with intermediate ac H02M 3/33561)

wherein the output is created by adding a regulated voltage to or subtracting it from an unregulated input)

Means for increasing hold-up time, i.e. the duration of time that a converter's output will remain within regulated limits following a loss of input power)

Circuits specially adapted for the generation of grid-control or igniter-control voltages for discharge tubes incorporated in static converters

for tubes with grid control

wherein the phase of the control voltage is adjustable with reference to the AC voltage)

(for multiphase systems)

(for ignition at the zero-crossing of voltage or current)

Circuits specially adapted for rendering non-conductive gas discharge tubes or equivalent semiconductor devices, e.g. thyrats, thyristors

(for discharge tubes)

Circuits specially adapted for the generation of control voltages for semiconductor devices incorporated in static converters

(wherein the phase of the control voltage is adjustable with reference to the AC source)

(with digital control)

for the ignition at the zero crossing of the voltage or the current)

using a control circuit common to several phases of a multi-phase system

(digitally controlled (or with digital control))

for the simultaneous control of series or parallel connected semiconductor devices

the control signals being transmitted optically

the power supply of the control circuit being connected in parallel to the main switching element (H02M 1/092 takes precedence)

Arrangements incorporating converting means for enabling loads to be operated at will from different kinds of power supplies, e.g. from ac or dc

Arrangements for reducing harmonics from ac input or output

( Suppression of common mode voltage or current)

(using passive filters)

Arrangements for reducing ripples from dc input or output

(using compensating arrangements (for reducing noise from the supply in transmission systems H04B 15/0005))

(using discharge tubes)

using active elements

Means for providing current step on switching, e.g. with saturable reactor

Contact mechanisms of dynamic converters

incorporating collectors and brushes

incorporating rolling or tumbling contacts

incorporating cam-operated contacts

incorporating electromagnetically-operated vibrating contacts

incorporating liquid contacts

Means for protecting converters other than automatic disconnection (emergency protective circuit arrangements specially adapted for converters with automatic disconnection H02H 7/10)

(Means for rapidly discharging a capacitor of the converter, in order to protect electrical components or prevent electrical shock)

(with means for allowing continuous operation despite a fault, i.e. fault tolerant converters)

against abnormal temperatures

Snubber circuits

Active non-dissipative snubbers

Active dissipative snubbers

Passive non-dissipative snubbers

Passive dissipative snubbers

Means for starting or stopping converters

Means for preventing simultaneous conduction of switches
Conversion of dc power input into dc power output
(converters specially adapted for use in combination with a battery H021 7/0065)

3/005 . . . [using Cuk converters]
3/02 . . . without intermediate conversion into ac
3/04 . . . by static converters
3/06 . . . using resistors or capacitors, e.g. potential divider
3/07 . . . using capacitors charged and discharged alternately by semiconductor devices with control electrode, e.g. charge pumps (for substrate bias voltage generators G05F 3/205; for static stores G11C 5/145, G11C 16/06; charge pumping structures for internal polarisation H01L 27/0222)

2003/071 . . . [adapted to generate a negative voltage output from a positive voltage source]
2003/072 . . . [adapted to generate an output voltage whose value is lower than the input voltage]
3/073 . . . [Charge pumps of the SCHENKEL type]
3/075 . . . [including a plurality of stages and two sets of clock signals, one set for the odd and one set for the even numbered stages]
3/076 . . . [the clock signals being boosted to a value which is higher than input voltage value]
3/077 . . . [with parallel connected charge pump stages]
3/22 . . . . . . . . . with intermediate conversion into ac
3/24 . . . . . . . . . by static converters
3/26 . . . . . . . . . using discharge tubes without control electrode or semiconductor devices without control electrode to produce the intermediate ac
3/28 . . . . . . . . . using discharge tubes with control electrode or semiconductor devices with control electrode to produce the intermediate ac
3/285 . . . . . . . . . [Single converters with a plurality of output stages connected in parallel (parallel operation of a plurality of converters in dc distribution networks (H02J 1/10))
3/305 . . . . . . . . . using devices of a thyatron or thyristor type requiring extinguishing means
3/31 . . . . . . . . . using discharge tubes only
3/315 . . . . . . . . . using semiconductor devices only
3/3155 . . . . . . . . . [with automatic control of the output voltage or current
3/325 . . . . . . . . . using devices of a triode or a transistor type requiring continuous application of a control signal
3/33 . . . . . . . . . using discharge tubes only
3/335 . . . . . . . . . using semiconductor devices only
3/33507 . . . . . . . . . [with automatic control of the output voltage or current (H02M 3/33561, H02M 3/33562 take precedence)]
3/33515 . . . . . . . . . [with galvanic isolation between input and output]
3/33523 . . . . . . . . . [with digital control]
3/3353 . . . . . . . . . [having at least two simultaneously operating switches on the input side, e.g. "double forward" or "double (switched) flyback" converter]
3/33538 . . . . . . . . . [of the forward type (H02M 3/3353, H02M 3/33562 take precedence)]
3/33546 . . . . . . . . . [with automatic control of the output voltage or current (H02M 3/33561 take precedence)]
3/33553 . . . . . . . . . [with galvanic isolation between input and output]
3/33561 . . . . . . . . . [having more than one output with independent control]
3/33569 . . . . . . . . . [having several active switching elements (H02M 3/3353 takes precedence)]
3/33567 . . . . . . . . . [having at least one active switching element at the secondary side of an isolation transformer]
3/33568 . . . . . . . . . [Bidirectional converters]
3/33592 . . . . . . . . . [having a synchronous rectifier circuit or a synchronous freewheeling circuit at the secondary side of an isolation transformer]
3/337 . . . . . . . . . in push-pull configuration ([H02M 3/3376 takes precedence; with self-oscillating arrangements H02M 3/3382 and H02M 3/3385])
3/3372 . . . . . . . . . [of the parallel type]
3/3374 . . . . . . . . . [with preregulator, e.g. current injected push-pull]
3/3376 . . . . . . . . . [with automatic control of output voltage or current]
Conversion of ac power input into dc power output; Conversion of dc power input into ac power output

7/00 . . . . . [Constructional details, e.g. physical layout, assembly, wiring, busbar connections]
7/003 . . . . . [using discharge tubes]
7/006 . . . . . [using transformers or inductors only]
7/02 . . . . . Conversion of ac power input into dc power output without possibility of reversal
7/04 . . . . . by static converters
7/043 . . . . . [using static converters]
7/046 . . . . . [using discharge tubes]

7/06 . . . . . using discharge tubes without control electrode or semiconductor devices without control electrode
7/062 . . . . . [Avoiding or suppressing excessive transient voltages or currents]
7/064 . . . . . [with several outputs]
7/066 . . . . . [particular circuits having a special characteristic]
7/068 . . . . . [mounted on a transformer]
7/08 . . . . . arranged for operation in parallel
7/10 . . . . . arranged for operation in series, e.g. for multiplication of voltage
7/103 . . . . . [Containing passive elements (capacitively coupled) which are ordered in cascade on one source]
7/106 . . . . . [With physical arrangement details]
7/12 . . . . . using discharge tubes with control electrode or semiconductor devices with control electrode
7/125 . . . . . [Avoiding or suppressing excessive transient voltages or currents]
7/145 . . . . . using devices of a thyatron or thyristor type requiring extinguishing means
7/15 . . . . . using discharge tubes only
7/151 . . . . . [with automatic control (H02M 7/153 takes precedence)]
7/153 . . . . . [arranged for operation in parallel]
7/155 . . . . . using semiconductor devices only
7/1552 . . . . . [in a biphase or polyphase arrangement (voltage multipliers H02M 7/193)]
7/1555 . . . . . [with control circuit]
7/1557 . . . . . [with automatic control of the output voltage or current]
7/162 . . . . . in a bridge configuration
7/1623 . . . . . [with control circuit]
7/1626 . . . . . [with automatic control of the output voltage or current]
7/1629 . . . . . [with automatic control of the output voltage or current]
7/17 . . . . . arranged for operation in parallel
7/19 . . . . . arranged for operation in series, e.g. for voltage multiplication
7/21 . . . . . using devices of a triode or transistor type requiring continuous application of a control signal
7/213 . . . . . using discharge tubes only
7/217 . . . . . using semiconductor devices only
7/2173 . . . . . [in a biphase or polyphase circuit arrangement (H02M 7/2176 takes precedence; voltage multipliers H02M 7/253)]
7/2176 . . . . . [comprising a passive stage to generate a rectified sinusoidal voltage and a controlled switching element in series between such stage and the output]
7/219 . . . . . in a bridge configuration
7/23 . . . . . arranged for operation in parallel
7/25 . . . . . arranged for operation in series, e.g. for multiplication of voltage
7/26 . . . . . using open-spark devices, e.g. Marx rectifier
7/28 . . . . . using electrolytic rectifiers
7/30 . . . . . by dynamic converters

5/273 . . . . . {with digital control}
5/275 . . . . . using devices of a triode or transistor type requiring continuous application of a control signal ([H02M 5/225], H02M 5/297 take precedence)
5/29 . . . . . using discharge tubes only
5/293 . . . . . using semiconductor devices only
2005/2932 . . . . . [with automatic control of output voltage, current or power]
2005/2935 . . . . . [using reverse phase control, i.e. turn-off of switch in series with load at zero crossing of input voltage, turn-off before next zero crossing]
2005/2937 . . . . . [using whole cycle control, i.e. switching an integer number of whole (half) cycles of the ac input voltage]
5/297 . . . . . for conversion of frequency
5/32 . . . . . . by dynamic converters
5/34 . . . . . . using mechanical contact-making and breaking parts
5/36 . . . . . . wherein the parts are rotating and collectors co-operate with brushes or rollers
5/38 . . . . . . by combination of static with dynamic converters; by combination of dynamo-electric with other dynamic or static converters
5/40 . . . . . . with intermediate conversion into dc
5/42 . . . . . . by static converters
5/44 . . . . . . using discharge tubes or semiconductor devices to convert the intermediate dc into ac
5/443 . . . . . using devices of a thyatron or thyristor type requiring extinguishing means
5/447 . . . . . using discharge tubes only
5/45 . . . . . . using semiconductor devices only
5/4505 . . . . . [having a rectifier with controlled elements]
5/451 . . . . . with automatic control of output voltage or frequency
5/452 . . . . . with automatic control of output waveform
5/453 . . . . . using devices of a triode or transistor type requiring continuous application of a control signal
5/456 . . . . . using discharge tubes only
5/458 . . . . . using semiconductor devices only
5/4585 . . . . . [having a rectifier with controlled elements]
5/46 . . . . . . by dynamic converters
5/48 . . . . . . by combination of static with dynamic converters; by combination of dynamo-electric with other dynamic or static converters

5/460 . . . . . using semiconductor devices only
5/462 . . . . . using devices of a triode or transistor type requiring continuous application of a control signal
5/464 . . . . . using static converters
5/466 . . . . . by dynamic converters
5/468 . . . . . by combination of static with dynamic converters; by combination of dynamo-electric with other dynamic or static converters

5/470 . . . . . using semiconductor devices only
5/472 . . . . . using devices of a triode or transistor type requiring continuous application of a control signal
5/474 . . . . . using dynamic converters
5/476 . . . . . by combination of static with dynamic converters; by combination of dynamo-electric with other dynamic or static converters

H02M
7/32 . . . using mechanical contact-making and -breaking parts
7/34 . . . wherein the parts are rotating and collectors co-operate with brushes or rollers
7/36 . . . with electromagnetically-operated vibrating contacts, e.g. chopper (self-interrupters in general H01H 51/34)
7/38 . . . using one or more sparking electrodes rotating over counter-electrodes
7/40 . . . by combination of static with dynamic converters; by combination of dynamo-electric with other dynamic or static converters
7/42 . Conversion of dc power input into ac power output without possibility of reversal
7/44 . . . by static converters
7/46 . . . using discharge tubes without control electrode or semiconductor devices without control electrode
7/48 . . . using discharge tubes with control electrode or semiconductor devices with control electrode
7/501 . . . sinusoidal output voltages being obtained by combination of several voltages being out of phase
7/505 . . . using devices of a thyatron or thyristor type requiring extinguishing means (H02M 7/4807, H02M 7/483 and H02M 7/4826 take precedence)
7/51 . . . using discharge tubes only
7/515 . . . using semiconductor devices only
7/5152 . . . . . . with separate extinguishing means
7/5155 . . . . . . wherein each commutation element has its own extinguishing means
7/5157 . . . . . . wherein the extinguishing of every commutation element will be obtained by means of a commutation inductance, by starting another main commutation element in series with the first
7/516 . . . Self-oscillating arrangements
7/517 . . . with special starting equipment
7/519 . . . in a push-pull configuration (H02M 7/517 takes precedence)
7/521 . . . in a bridge configuration
7/523 . . . with LC-resonance circuit in the main circuit
7/5233 . . . . . . [the commutation elements being in a push-pull arrangement]
7/5236 . . . . . . (in a series push-pull arrangement)
7/525 . . . with automatic control of output waveform or frequency (H02M 7/517 - H02M 7/523 take precedence)
7/527 . . . by pulse width modulation
7/529 . . . . . . using digital control
7/53 . . . using devices of a triode or transistor type requiring continuous application of a control signal (H02M 7/4807, H02M 7/493 and H02M 7/4826 take precedence)
7/533 . . . using discharge tubes only
7/537 . . . using semiconductor devices only, e.g. single switched pulse inverters
7/5375 . . . with special starting equipment
7/538 . . . in a push-pull configuration (H02M 7/5375 takes precedence
7/53806 . . . . . . (in a push-pull configuration of the parallel type)
7/5381 . . . Parallel type
7/5383 . . . in a self-oscillating arrangement (H02M 7/5383 takes precedence)
7/53832 . . . . . . (in a push-pull arrangement)
7/53835 . . . . . . (of the parallel type)
7/53838 . . . . . . using a single commutation path
7/53846 . . . . . . Control circuits

**WARNING**

Group H02M 7/53846 and subgroups is not complete, see provisionally also H02M 7/5383 and subgroups

7/538463 . . . . . . [for thyristor type converters]
7/538466 . . . . . . [for transistor type converters]
7/53854 . . . . . . using thyristor type converters
7/53862 . . . . . . using transistor type converters
7/5387 . . . in a bridge configuration
7/53871 . . . . . . (with automatic control of output voltage or current)
7/53873 . . . . . . [with digital control]
{ with analogue control of three-phase output }

{ based on synthetising a desired voltage vector via the selection of appropriate fundamental voltage vectors, and corresponding dwelling times }

{ by time shifting switching signals of one diagonal pair of the bridge with respect to the other diagonal pair }

with asymmetrical configuration of switches

WARNING

Group H02M 7/5388 is not complete, see provisionally also H02M 7/5387 and subgroups

with automatic control of output wave form or frequency

by pulse-width modulation

by dynamic converters

using mechanical parts to select progressively, or to vary continuously, the input potential

wherein the parts are rotating and collectors co-operate with brushes or rollers

with electromagnetically-operated vibrating contacts, e.g. chopper (self-interrupters in general H01H 51/34)

by combination of static with dynamic converters; by combination of dynamo-electric with other dynamic or static converters

with possibility of reversal

by static converters

using discharge tubes without control electrode or semiconductor devices without control electrode

using discharge tubes with control electrode or semiconductor devices with control electrode

using devices of a thyatron or thyristor type requiring extinguishing means (H02M 7/77 takes precedence)

using discharge tubes only

using semiconductor devices only

{ for high voltage direct transmission link }

with automatic control of output waveform or frequency

arranged for operation in parallel

using devices of a triode or transistor type requiring continuous application of a control signal (H02M 7/81 takes precedence)

using discharge tubes only

using semiconductor devices only

arranged for operation in parallel

using open-spark devices, e.g. Marx rectifier

using electrolytic rectifiers

by dynamic converters

using mechanical parts to select progressively or to vary continuously the input potential

Power conversion systems not covered by the preceding groups