

CPC COOPERATIVE PATENT CLASSIFICATION

H02K DYNAMO-ELECTRIC MACHINES (dynamo-electric relays [H01H 53/00](#); conversion of DC or AC input power into surge output power {[H03K 3/53](#)})

NOTES

1. This subclass covers the structural adaptation of dynamo-electric machines for the purpose of their control.
2. This subclass does not cover starting, regulating, electronically commutating, braking, or otherwise controlling motors, generators or dynamo-electric converters, in general, which are covered by subclass [H02P](#).
3. Attention is drawn to the Notes following the titles of class [B81](#) and subclass [B81B](#) relating to "micro-structural devices" and "micro-structural systems".

1/00	Details of the magnetic circuit (magnetic circuits or magnets in general, magnetic circuits for transformers for power supply H01F ; magnetic circuits for relays H01H 50/16)	1/27	. . . Rotor cores with permanent magnets {(rotor cores for synchronous machines with means for mechanical adjustment of the excitation flux H02K 21/021)}
1/02	. characterised by the magnetic material	1/2706	. . . . {Inner rotor}
1/04	. characterised by the material used for insulating the magnetic circuit or parts thereof (insulation of windings H02K 3/30)	1/2713	. . . . {where the magnetisation axis of the magnets is axial}
1/06	. characterised by the shape, form or construction	1/272	. . . . {where the magnetisation axis of the magnets is radial or tangential}
1/08	. . Salient poles	1/2726	. . . . . {consisting of a single magnet or of a plurality of axially juxtaposed single magnets}
1/10	. . . Commutating poles	1/2733	. . . . . {Annular magnets}
1/12	. . Stationary parts of the magnetic circuit	1/274	. . . . . {consisting of a plurality of circumferentially positioned magnets}
1/14	. . . Stator cores with salient poles	1/2746	. . . . . {consisting of magnets arranged with the same polarity}
1/141	. . . . {consisting of C-shaped cores}	1/2753	. . . . . {consisting of magnets or groups of magnets arranged with alternating polarity}
1/143	. . . . . {of the horse-shoe type}	1/276	. . . . . {Magnets embedded in the magnetic core}
1/145	. . . . {having an annular coil, e.g. of the claw-pole type}	1/2766	. . . . . {having a flux concentration effect}
1/146	. . . . {consisting of a generally annular yoke with salient poles}	1/2773	. . . . . {consisting of tangentially magnetized radial magnets}
1/148	. . . . . {Sectional cores (H02K 1/141 takes precedence)}	1/278	. . . . . {Surface mounted magnets; Inset magnets}
1/16	. . . Stator cores with slots for windings	1/2786	. . . . {Outer rotor}
1/165	. . . . {Shape, form or location of the slots}	1/2793	. . . . {Rotor axially facing stator}
1/17	. . . Stator cores with permanent magnets	1/28	. . . Means for mounting or fastening rotating magnetic parts on to, or to, the rotor structures
1/18	. . . Means for mounting or fastening magnetic stationary parts on to, or to, the stator structures	1/30	. . . . using intermediate parts, e.g. spiders
1/182	. . . . {to stators axially facing the rotor, i.e. with axial or conical air gap}	1/32	. . . with channels or ducts for flow of cooling medium
1/185	. . . . {to outer stators}	1/325	. . . . {between salient poles}
1/187	. . . . {to inner stators}	1/34	. . Reciprocating, oscillating or vibrating parts of the magnetic circuit
1/20	. . . with channels or ducts for flow of cooling medium		
1/22	. . Rotating parts of the magnetic circuit	3/00	Details of windings (coils in general H01F 5/00)
1/223	. . . {Rotor cores with windings and permanent magnets (for additional excitation in synchronous motors or generators H02K 21/042 ; in synchronous motors having additional short-circuited winding for starting as an asynchronous motor H02K 21/46)}	3/02	. Windings characterised by the conductor material (conductors in general H01B 1/00 , H01B 5/00)
1/226	. . . . {of the claw-pole type}	3/04	. Windings characterised by the conductor shape, form or construction, e.g. with bar conductors
1/24	. . . Rotor cores with salient poles; {Variable reluctance rotors}	3/12	. . arranged in slots
1/243	. . . . {of the claw-pole type}	3/14	. . . with transposed conductors, e.g. twisted conductors
1/246	. . . . {Variable reluctance rotors}	3/16	. . . for auxiliary purposes, e.g. damping or commutating
1/26	. . . Rotor cores with slots for windings		
1/265	. . . . {Shape, form or location of the slots}		

- 3/18 . . Windings for salient poles
- 3/20 . . . for auxiliary purposes, e.g. damping or commutating
- 3/22 . . consisting of hollow conductors
- 3/24 . . with channels or ducts for cooling medium between the conductors
- 3/26 . . consisting of printed conductors
- 3/28 . . Layout of windings or of connections between windings ([windings for pole-changing H02K 17/06, H02K 17/14, H02K 19/12, H02K 19/32](#))
- 3/30 . Windings characterised by the insulating material ([insulating bodies in general H01B 3/00, H01B 17/00](#))
- 3/32 . Windings characterised by the shape, form or construction of the insulation {[\(H02K 3/46 takes precedence\)](#)}
- 3/325 . . {for windings on salient poles, such as claw-shaped poles}
- 3/34 . . between conductors or between conductor and core, e.g. slot insulation
- 3/345 . . . {between conductor and core, e.g. slot insulation}
- 3/38 . . around winding heads, equalising connectors, or connections thereto
- 3/40 . . for high voltage, e.g. affording protection against corona discharges
- 3/42 . Means for preventing or reducing eddy-current losses in the winding heads, e.g. by shielding
- 3/44 . Protection against moisture or chemical attack; Windings specially adapted for operation in liquid or gas
- 3/46 . Fastening of windings on the stator or rotor structure
- 3/47 . . Air-gap windings, i.e. iron-free windings
- 3/48 . . in slots
- 3/487 . . . Slot-closing devices
- 3/493 magnetic
- 3/50 . . Fastening of winding heads, equalising connectors, or connections thereto {[\(H02K 3/52 takes precedence\)](#)}
- 3/505 . . . {for large machine windings, e.g. bar windings [\(H02K 3/51 takes precedence\)](#)}
- 3/51 . . . applicable to rotors only
- 3/52 . . Fastening salient pole windings or connections thereto
- 3/521 . . . {applicable to stators only}
- 3/522 {for generally annular cores with salient poles}
- 3/524 {for U-shaped, E-shaped or similarly shaped cores}
- 3/525 {Annular coils, e.g. for cores of the claw-pole type}
- 3/527 . . . {applicable to rotors only}
- 3/528 {of the claw-pole type}
- 5/00 Casings; Enclosures; Supports**
- 5/02 . Casings or enclosures characterised by the material thereof
- 5/04 . Casings or enclosures characterised by the shape, form or construction thereof
- 5/06 . . Cast metal casings
- 5/08 . . Insulating casings
- 5/10 . . with arrangements for protection from ingress, e.g. of water or fingers {[\(means for protecting brushes or brush holders H02K 5/14\)](#)}
- 5/12 . . specially adapted for operating in liquid or gas ([combined with cooling arrangements H02K 9/00](#))
- 5/124 . . . Sealing of shafts
- 5/128 . . . using air-gap sleeves or air-gap discs
- 5/1282 {the partition wall in the air-gap being non cylindrical}
- 5/1285 {of the submersible type}
- 2005/1287 {Details of sleeves or discs}
- 5/132 . . . Submersible electric motors ([H02K 5/128 takes precedence](#))
- 5/136 . . . explosion-proof
- 5/14 . . Means for supporting or protecting brushes or brush holders
- 5/141 . . . {for cooperation with slip-rings}
- 5/143 . . . {for cooperation with commutators}
- 5/145 {Fixedly supported brushes or brush holders, e.g. leaf or leaf-mounted brushes}
- 5/146 {Pivotally supported brushes or brush holders}
- 5/148 {Slidably supported brushes}
- 5/15 . . Mounting arrangements for bearing-shields or end plates
- 5/16 . . Means for supporting bearings, e.g. insulating supports or means for fitting bearings in the bearing-shields ([magnetic bearings H02K 7/09](#))
- 5/161 . . . {radially supporting the rotary shaft at both ends of the rotor ([H02K 5/165, H02K 5/167, H02K 5/173 take precedence](#))}
- 5/163 . . . {radially supporting the rotary shaft at only one end of the rotor ([H02K 5/165, H02K 5/167, H02K 5/173 take precedence](#))}
- 5/165 . . . {radially supporting the rotor around a fixed spindle; radially supporting the rotor directly ([H02K 5/167, H02K 5/173 take precedence](#))}
- 5/167 . . . using sliding-contact or spherical cap bearings
- 5/1672 {radially supporting the rotary shaft at both ends of the rotor ([H02K 5/1677 takes precedence](#))}
- 5/1675 {radially supporting the rotary shaft at only one end of the rotor ([H02K 5/1677 takes precedence](#))}
- 5/1677 {radially supporting the rotor around a fixed spindle; radially supporting the rotor directly}
- 5/173 . . . using bearings with rolling contact, e.g. ball bearings
- 5/1732 {radially supporting the rotary shaft at both ends of the rotor ([H02K 5/1737 takes precedence](#))}
- 5/1735 {radially supporting the rotary shaft at only one end of the rotor ([H02K 5/1737 takes precedence](#))}
- 5/1737 {radially supporting the rotor around a fixed spindle; radially supporting the rotor directly}
- 5/18 . . with ribs or fins for improving heat transfer
- 5/20 . . with channels or ducts for flow of cooling medium

- 5/22 . . Auxiliary parts of casings not covered by groups [H02K 5/06-H02K 5/20](#), e.g. shaped to form connection boxes or terminal boxes
- 5/225 . . . {Terminal boxes or connection arrangements (specially adapted for submersible motors [H02K 5/132](#))}
- 5/24 . specially adapted for suppression or reduction of noise or vibrations {(elastic means for supporting brush holders [H02K 5/14](#); elastic means for supporting bearings [H02K 5/16](#))}
- 5/26 . Means for adjusting casings relative to their supports
- 7/00 Arrangements for handling mechanical energy structurally associated with dynamo-electric machines, e.g. structural association with mechanical driving motors or auxiliary dynamo-electric machines**
- 7/003 . {Couplings; Details of shafts (means for mounting rotors on shafts [H02K 1/28](#))}
- 7/006 . {Structural association of a motor or generator with the drive train of a motor vehicle}
- 7/02 . Additional mass for increasing inertia, e.g. flywheels
- 7/025 . . {for power storage}
- 7/04 . Balancing means
- 7/06 . Means for converting reciprocating motion into rotary motion or vice versa
- 7/061 . . {using rotary unbalanced masses (for generating mechanical vibrations in general [B06B 1/16](#))}
- 7/063 . . . {integrally combined with motor parts, e.g. motors with eccentric rotors}
- 7/065 . . Electromechanical oscillators; Vibrating magnetic drives (in time-pieces [G04C 5/00](#))
- 7/07 . . using pawls and ratchet wheels
- 7/075 . . using crankshafts or eccentrics
- 7/08 . Structural association with bearings (support in machine casing [H02K 5/16](#))
- 7/081 . . {specially adapted for worm gear drives ([H02K 7/09](#) takes precedence)}
- 7/083 . . {radially supporting the rotary shaft at both ends of the rotor ([H02K 7/086](#), [H02K 7/09](#) take precedence)}
- 7/085 . . {radially supporting the rotary shaft at only one end of the rotor ([H02K 7/086](#), [H02K 7/09](#) take precedence)}
- 7/086 . . {radially supporting the rotor around a fixed spindle; radially supporting the rotor directly ([H02K 7/09](#) takes precedence)}
- 7/088 . . . {radially supporting the rotor directly}
- 7/09 . . with magnetic bearings
- 7/10 . Structural association with clutches, brakes, gears, pulleys or mechanical starters
- NOTE**
- Group [H02K 7/12](#) takes precedence over groups [H02K 7/102](#) - [H02K 7/118](#)
- 7/1004 . . {with pulleys}
- 7/1008 . . . {structurally associated with the machine rotor ([H02K 7/1012](#) takes precedence)}
- 7/1012 . . . {Machine arranged inside the pulley}
- 7/1016 {Machine of the outer rotor type}
- 7/102 . . with friction brakes
- 7/1021 . . . {Magnetically influenced friction brakes}
- 7/1023 {using electromagnets}
- 7/1025 {using axial electromagnets with generally annular air gap}
- 7/1026 {using stray fields}
- 7/1028 {axially attracting the brake armature in the frontal area of the magnetic core}
- 7/104 . . with eddy-current brakes
- 7/106 . . with dynamo-electric brakes
- 7/108 . . with friction clutches
- 7/1085 . . . {Magnetically influenced friction clutches}
- 7/11 . . with dynamo-electric clutches
- 7/112 . . with friction clutches in combination with brakes
- 7/1125 . . . {Magnetically influenced friction clutches and brakes}
- 7/114 . . with dynamo-electric clutches in combination with brakes
- 7/116 . . with gears
- 7/1163 . . . {where at least two gears have non-parallel axes without having orbital motion}
- 7/1166 {comprising worm and worm-wheel (structural association with bearings specially adapted for worm gear drives [H02K 7/081](#))}
- 7/118 . . with starting devices
- 7/1185 . . . {with a mechanical one-way direction control, i.e. with means for reversing the direction of rotation of the rotor}
- 7/12 . . with auxiliary limited movement of stators, rotors or core parts, e.g. rotors axially movable for the purpose of clutching or braking
- 7/125 . . . {magnetically influenced}
- 7/14 . Structural association with mechanical loads, e.g. with hand-held machine tools or fans (([H02K 7/006](#) takes precedence;) with fan or impeller for cooling the machine [H02K 9/06](#))
- 7/145 . . {Hand-held machine tool}
- 7/16 . . for operation above the critical speed of vibration of the rotating parts
- 7/18 . Structural association of electric generator with mechanical driving motor, e.g. turbine (if the driving-motor aspect predominates, see the relevant subclass of section F, e.g. [F03B 13/00](#))
- 7/1807 . . {Rotary generators ([H02K 7/006](#) takes precedence)}
- 7/1815 . . . {structurally associated with reciprocating piston engines (general aspects of generating sets, e.g. housing, [F02B 63/04](#))}
- 7/1823 . . . {structurally associated with turbines or similar engines}
- 7/183 {wherein the turbine is a wind turbine (adaptation of a wind turbine to an electric generator [F03D 9/002](#))}
- 7/1838 {Generators mounted in a nacelle or similar structure of a horizontal axis wind turbine}
- 7/1846 . . . {structurally associated with wheels or associated parts (dynamos arranged in the wheel hub of cycles [B62J 6/12](#))}
- 7/1853 . . . {driven by intermittent forces}
- 7/1861 . . . {driven by animals or vehicles ([H02K 7/1853](#) takes precedence)}
- 7/1869 . . {Linear generators; sectional generators}
- 7/1876 . . . {with reciprocating, linearly oscillating or vibrating parts}

- 7/1884 . . . {structurally associated with free piston engines}
- 7/1892 . . {Generators with parts oscillating or vibrating about an axis}
- 7/20 . Structural association with auxiliary dynamo-electric machine, e.g. with electric starter motor, with exciter
- 9/00 Arrangements for cooling or ventilating (channels or ducts in parts of the magnetic circuit [H02K 1/20](#), [H02K 1/32](#); channels or ducts in or between conductors [H02K 3/22](#), [H02K 3/24](#))**
- 9/005 . {Details of cooling systems with unspecified cooling medium flowing through channels in or between the conductors}
- 9/02 . by ambient air flowing through the machine
- 9/04 . . having means for generating a flow of cooling medium
- 9/06 . . . with fans or impellers driven by the machine shaft
- 9/08 . by gaseous cooling medium circulating wholly within the machine casing ([H02K 9/10](#) takes precedence)
- 9/10 . by gaseous cooling medium flowing in closed circuit, a part of which is external to the machine casing
- 9/12 . . wherein the cooling medium circulates freely within the casing
- 9/14 . wherein gaseous cooling medium circulates between the machine casing and a surrounding mantle
- 9/16 . . wherein the cooling medium circulates through ducts or tubes within the casing
- 9/18 . . wherein the external part of the closed circuit comprises a heat exchanger structurally associated with the machine casing
- 9/19 . for machines with closed casing and closed-circuit cooling using a liquid cooling medium, e.g. oil
- 9/193 . . with provision for replenishing the cooling medium; with means for preventing leakage of the cooling medium
- 9/197 . . in which the rotor or stator space is fluid tight, e.g. to provide for different cooling media for rotor and stator
- 9/20 . . wherein the cooling medium vaporises within the machine casing
- 9/22 . by solid heat conducting material embedded in, or arranged in contact with, the stator or rotor, e.g. heat bridges
- 9/24 . Protection against failure of cooling arrangements, e.g. due to loss of cooling medium, due to interruption of the circulation of cooling medium (circuit arrangements affording such protection [H02H 7/00](#))
- 9/26 . Structural association of machines with devices for cleaning or drying cooling medium, e.g. with filters
- 9/28 . Cooling of commutators, slip-rings, or brushes, e.g. by ventilating, (current collectors in general [H01R 39/00](#))
- 11/00 Structural association of dynamo-electric machines with electric components or with devices for shielding, monitoring or protection (casings, enclosures or supports [H02K 5/00](#))**
- 11/0094 . {Structural association with other electrical or electronic devices}
- 11/01 . for shielding from electromagnetic fields (means for preventing or reducing eddy-current losses in the winding heads by shielding [H02K 3/42](#))
- 11/02 . for suppression of electromagnetic interference
- 11/022 . . {Shields}
- 11/024 . . . {Suppressors}
- (Frozen)
- WARNING**
- Group [H02K 11/024](#) is no longer used for the classification of documents as of January 1, 2016. The content of this group is being reclassified into groups [H02K 11/026](#) and [H02K 11/028](#).
- Groups [H02K 11/024](#), [H02K 11/026](#), and [H02K 11/028](#) should be considered in order to perform a complete search.
- 11/026 . . Suppressors associated with brushes, brush holders or their supports
- WARNING**
- Group [H02K 11/026](#) is incomplete pending reclassification of documents from group [H02K 11/024](#).
- Groups [H02K 11/026](#) and [H02K 11/024](#) should be considered in order to perform a complete search.
- 11/028 . . Suppressors associated with the rotor
- WARNING**
- Group [H02K 11/028](#) is incomplete pending reclassification of documents from group [H02K 11/024](#).
- Groups [H02K 11/028](#) and [H02K 11/024](#) should be considered in order to perform a complete search.
- 11/04 . for rectification
- WARNING**
- Group [H02K 11/04](#) is impacted by reclassification into groups [H02K 11/049](#) and [H02K 11/05](#).
- Groups [H02K 11/04](#), [H02K 11/049](#), and [H02K 11/05](#) should be considered in order to perform a complete search.
- 11/042 . . Rectifiers associated with rotating parts, e.g. rotor cores or rotary shafts
- 11/044 . . {in motors ([H02K 11/042](#) takes precedence)}
- 11/046 . . {in generators ([H02K 11/042](#) takes precedence)}
- 11/048 . . . {Rectifiers combined with drive circuits in starter-generators}
- 11/049 . . Rectifiers associated with stationary parts, e.g. stator cores
- WARNING**
- Group [H02K 11/049](#) is incomplete pending reclassification of documents from group [H02K 11/04](#).
- Groups [H02K 11/049](#) and [H02K 11/04](#) should be considered in order to perform a complete search.

- 11/05 . . . Rectifiers associated with casings, enclosures or brackets
WARNING
 Group [H02K 11/05](#) is incomplete pending reclassification of documents from group [H02K 11/04](#).
 Groups [H02K 11/05](#) and [H02K 11/04](#) should be considered in order to perform a complete search.
- 11/20 . for measuring, monitoring, testing, protecting or switching (rectifiers [H02K 11/04](#); power electronics [H02K 11/33](#))
- 11/21 . . Devices for sensing speed or position, or actuated thereby (specially adapted for machines having non-mechanical commutating devices [H02K 29/06](#), [H02K 29/14](#))
- 11/215 . . . Magnetic effect devices, e.g. Hall-effect or magneto-resistive elements
- 11/22 . . . Optical devices
- 11/225 . . . Detecting coils
- 11/23 . . . Mechanically-actuated centrifugal switches
- 11/24 . . Devices for sensing torque, or actuated thereby ([H02K 11/27](#) takes precedence)
- 11/25 . . Devices for sensing temperature, or actuated thereby
- 11/26 . . Devices for sensing voltage, or actuated thereby, e.g. overvoltage protection devices
- 11/27 . . Devices for sensing current, or actuated thereby (overcurrent protection responsive to temperature of the machines or parts thereof, e.g. windings, [H02K 11/25](#))
- 11/28 . . Manual switches
- 11/30 . Structural association with control circuits or drive circuits
- 11/33 . . Drive circuits, e.g. power electronics ([H02K 11/38](#) takes precedence)
- 11/35 . . Devices for recording or transmitting machine parameters, e.g. memory chips or radio transmitters for diagnosis
- 11/38 . . Control circuits or drive circuits associated with geared commutator motors of the worm-and-wheel type
- 11/40 . Structural association with grounding devices
- 13/00 Structural associations of current collectors with motors or generators, e.g. brush mounting plates or connections to windings (supporting or protecting brushes or brush holders in motor casings or enclosures [H02K 5/14](#)); Disposition of current collectors in motors or generators; Arrangements for improving commutation**
- 13/003 . {Structural associations of slip-rings}
- 13/006 . {Structural associations of commutators}
- 13/02 . Connections between slip-rings and windings
- 13/04 . Connections between commutator segments and windings
- 13/06 . . Resistive connections, e.g. by high-resistance chokes or by transistors
- 13/08 . . Segments formed by extensions of the winding
- 13/10 . Arrangements of brushes or commutators specially adapted for improving commutation
- 13/105 . . {Spark suppressors associated with the commutator}
- 13/12 . Arrangements for producing an axial reciprocation of the rotor and its associated current collector part, e.g. for polishing commutator surfaces
- 13/14 . Circuit arrangements for improvement of commutation, e.g. by use of unidirectionally conductive elements
- 15/00 Methods or apparatus specially adapted for manufacturing, assembling, maintaining or repairing of dynamo-electric machines**
- 15/0006 . {Disassembling, repairing or modifying dynamo-electric machines (repairing of cooling fluid boxes [H02K 15/0093](#))}
- 15/0012 . {Manufacturing cage rotors}
- 15/0018 . {Applying slot closure means in the core; Manufacture of slot closure means}
- 15/0025 . {Shaping or compacting conductors or winding heads after the installation of the winding in the core or machine (methods or apparatus for simultaneously twisting a plurality of hairpins prior to mounting [H02K 15/0428](#)); Applying fastening means on winding heads}
- 15/0031 . . {Shaping or compacting conductors in slots or around salient poles ([H02K 15/005](#) takes precedence)}
- 15/0037 . . {Shaping or compacting winding heads ([H02K 15/005](#), [H02K 15/0087](#) and [H02K 15/0428](#) take precedence)}
- 15/0043 . . . {Applying fastening means on winding headS (fastening by applying resin, glue, varnish and similar means [H02K 15/12](#))}
- 15/005 . . {by means of electrodynamic forces}
- 15/0056 . {Manufacturing winding connections (manufacturing connectors in general [H01R 43/00](#))}
- 15/0062 . . {Manufacturing the terminal arrangement per se; Connecting the terminals to an external circuit}
- 15/0068 . . {Connecting winding sections; Forming leads; Connecting leads to terminals}
- 15/0075 . . . {for random-wound windings}
- NOTE**
 Windings consisting of cables are classified in [H02K 15/0068](#)
- 15/0081 . . . {for form-wound windings}
- 15/0087 {characterised by the method or apparatus for simultaneously twisting a plurality of hairpins open ends after insertion into the machine (for simultaneously twisting a plurality of hairpins prior to mounting into the machine [H02K 15/0428](#))}
- 15/0093 {Manufacturing or repairing cooling fluid boxes, i.e. terminals of fluid cooled windings ensuring both electrical and fluid connection}
- 15/02 . of stator or rotor bodies
- 15/022 . . {with salient poles or claw-shaped poles}
- 15/024 . . {with slots}
- 15/026 . . . {Wound cores}
- 15/028 . . . {for fastening to casing or support, respectively to shaft or hub}
- 15/03 . . having permanent magnets
- 15/04 . of windings, prior to mounting into machines ([insulating windings \[H02K 15/10\]\(#\), \[H02K 15/12\]\(#\)](#))

15/0407	. . {Windings manufactured by etching, printing or stamping the complete coil}	16/00	Machines with more than one rotor or stator {(machines for transmitting mechanical power from a driving shaft to a driven shaft and comprising structurally interrelated motor and generator parts H02K 51/00 ; permanent magnet machines with multiple rotors or stators relatively rotated for vectorially combining the excitation fields or the armature voltages H02K 21/029)}
15/0414	. . {Windings consisting of separate elements, e.g. bars, hairpins, segments, half coils}		
15/0421	. . . {consisting of single conductors, e.g. hairpins}		
15/0428	. . . . {characterised by the method or apparatus for simultaneously twisting a plurality of hairpins (for simultaneously twisting a plurality of hairpins open ends after insertion into the machine H02K 15/0087)}	16/005	. {Machines with only rotors, e.g. counter-rotating rotors (DC commutator machines or universal AC/DC commutator motors having a rotating armature and a rotating excitation field H02K 23/60)}
15/0435	. . {Wound windings}	16/02	. Machines with one stator and two {or more} rotors
15/0442	. . . {Loop windings (manufacturing of windings consisting of overlapped loops H02K 15/0464)}	16/025	. {with rotors and moving stators connected in a cascade (cascade arrangement of an asynchronous motor with another dynamo-electric motor or converter H02K 17/34)}
15/045	. . . . {Form wound coils}		
15/0457	. . . . {Random wound coils}		
15/0464	. . . {Lap windings (when on diagonally wound hollow coils H02K 15/0492)}	16/04	. Machines with one rotor and stators
15/0471	. . . . {manufactured by flattening a spiral winding}		NOTE
15/0478	. . . {Wave windings, undulated windings (when on diagonally wound hollow coils H02K 15/0492)}		Group H02K 16/00 takes precedence over groups H02K 17/00 - H02K 53/00 .
15/0485	. . . . {manufactured by shaping an annular winding}	17/00	Asynchronous induction motors; Asynchronous induction generators
15/0492	. . . {Diagonally wound hollow coils}	17/02	. Asynchronous induction motors
15/06	. Embedding prefabricated windings in machines	17/04	. . for single phase current
15/061	. . {Air-gap windings}	17/06	. . . having windings arranged for permitting pole-changing
15/062	. . {Windings in slots; salient pole windings}	17/08	. . . Motors with auxiliary phase obtained by externally fed auxiliary windings, e.g. capacitor motors
15/063	. . . {Windings for large electric machines, e.g. bar windings (windings consisting of cables H02K 15/065)}	17/10	. . . Motors with auxiliary phase obtained by split-pole carrying short-circuited windings
15/064	. . . {Windings consisting of separate segments, e.g. hairpin windings (H02K 15/063 takes precedence)}	17/12	. . for multi-phase current
15/065	. . . {Windings consisting of complete sections, e.g. coils, waves (windings for large electric machines other than those consisting of cables H02K 15/063)}	17/14	. . . having windings arranged for permitting pole-changing
15/066	. . . . {inserted perpendicularly to the axis of the slots or inter-polar channels}	17/16	. . having rotors with internally short-circuited windings, e.g. cage rotors
15/067	. . . . {inserted in parallel to the axis of the slots or inter-polar channels}	17/165	. . . {characterised by the squirrel-cage or other short-circuited windings}
15/068	. . . . . {Strippers}	17/18	. . . having double-cage or multiple-cage rotors
15/08	. Forming windings by laying conductors into or around core parts	17/185	. . . . {characterised by the double- or multiple cage windings}
15/085	. . by laying conductors into slotted stators	17/20	. . . having deep-bar rotors
15/09	. . by laying conductors into slotted rotors	17/205	. . . . {characterised by the deep-bar windings}
15/095	. . by laying conductors around salient poles	17/22	. . having rotors with windings connected to slip-rings
15/10	. Applying solid insulation to windings, stators or rotors	17/24	. . . in which both stator and rotor are fed with AC
15/105	. . {to the windings}	17/26	. . having rotors or stators designed to permit synchronous operation
15/12	. Impregnating, heating or drying of windings, stators, rotors or machines	17/28	. . having compensating winding for improving phase angle
15/125	. . {Heating or drying of machines in operational state, e.g. standstill heating}	17/30	. . Structural association of asynchronous induction motors with auxiliary electric devices influencing the characteristics of the motor or controlling the motor, e.g. with impedances or switches
15/14	. Casings; Enclosures; Supports	17/32	. . Structural association of asynchronous induction motors with auxiliary mechanical devices, e.g. with clutches or brakes
15/16	. Centering rotors within the stator; Balancing rotors		
15/165	. . {Balancing the rotor}		

- 17/34 . . Cascade arrangement of an asynchronous motor with another dynamo-electric motor or converter ([{machines with rotors and moving stators connected in a cascade H02K 16/025;}](#) control of cascade-arrangements [H02P](#))
- 17/36 . . . with another asynchronous induction motor
- 17/38 . . . with a commutator machine
- 17/40 . . . with a rotary AC/DC converter
- 17/42 . Asynchronous induction generators ([H02K 17/02 takes precedence](#))
- 17/44 . . Structural association with exciting machines
- 19/00 Synchronous motors or generators (having permanent magnets [H02K 21/00](#))**
 - 19/02 . Synchronous motors
 - 19/04 . . for single-phase current
 - 19/06 . . . Motors having windings on the stator and a variable-reluctance soft-iron rotor without windings, e.g. inductor motor
 - 19/08 . . . Motors having windings on the stator and a smooth rotor without windings of material with large hysteresis, e.g. hysteresis motors
 - 19/10 . . for multi-phase current
 - 19/103 . . . [{Motors having windings on the stator and a variable reluctance soft-iron rotor without windings}](#)
 - 19/106 . . . [{Motors having windings in the stator and a smooth rotor of material with large hysteresis without windings}](#)
 - 19/12 . . . characterised by the arrangement of exciting windings, e.g. for self-excitation, compounding or pole-changing
 - 19/14 . . having additional short-circuited windings for starting as asynchronous motors
 - 19/16 . Synchronous generators
 - 19/18 . . having windings each turn of which co-operates only with poles of one polarity, e.g. homopolar generators
 - 19/20 . . . with variable-reluctance soft-iron rotors without winding
 - 19/22 . . having windings each turn of which co-operates alternately with poles of opposite polarity, e.g. heteropolar generators
 - 19/24 . . . with variable-reluctance soft-iron rotors without winding
 - 19/26 . . characterised by the arrangement of exciting windings
 - 19/28 . . . for self-excitation
 - 19/30 . . . for compounding
 - 19/32 . . . for pole-changing
 - 19/34 . . Generators with two or more outputs
 - 19/36 . . Structural association of synchronous generators with auxiliary electric devices influencing the characteristic of the generator or controlling the generator, e.g. with impedances or switches
 - 19/365 . . . [{with a voltage regulator}](#)
 - 19/38 . . Structural association of synchronous generators with exciting machines
- 21/00 Synchronous motors having permanent magnets; Synchronous generators having permanent magnets**
 - 21/02 . Details
 - 21/021 . . [{Means for mechanical adjustment of the excitation flux}](#)
- 21/022 . . . [{by modifying the relative position between field and armature, e.g. between rotor and stator \(vectorial combination of field or armature sections \[H02K 21/029\]\(#\)\)}](#)
- 21/023 [{by varying the amount of superposition, i.e. the overlap, of field and armature}](#)
- 21/024 [{Radial air gap machines}](#)
- 21/025 [{by varying the thickness of the air gap between field and armature}](#)
- 21/026 [{Axial air gap machines}](#)
- 21/027 [{Conical air gap machines}](#)
- 21/028 . . . [{by modifying the magnetic circuit within the field or the armature, e.g. by using shunts, by adjusting the magnets position, by vectorial combination of field or armature sections}](#)
- 21/029 [{Vectorial combination of the fluxes generated by a plurality of field sections or of the voltages induced in a plurality of armature sections}](#)
- 21/04 . . Windings on magnets for additional excitation [{; Windings and magnets for additional excitation}](#)
- 21/042 . . . [{with permanent magnets and field winding both rotating}](#)
- 21/044 [{Rotor of the claw pole type}](#)
- 21/046 . . . [{with rotating permanent magnets and stationary field winding}](#)
- 21/048 [{Rotor of the claw pole type}](#)
- 21/10 . . Rotating armatures
- 21/12 . with stationary armatures and rotating magnets
- 21/125 . . [{having an annular armature coil \(\[H02K 21/14 - \\[H02K 21/24\\]\\(#\\) take precedence\]\(#\)\)}](#)
- 21/14 . . with magnets rotating within the armatures
- 21/145 . . . [{having an annular armature coil \(with homopolar co-operation \[H02K 21/20\]\(#\)\)}](#)
- 21/16 . . . having annular armature cores with salient poles [\(with homopolar co-operation \[H02K 21/20\]\(#\)\)](#)
- 21/18 . . . having horse-shoe armature cores [\(with homopolar co-operation \[H02K 21/20\]\(#\)\)](#)
- 21/185 [{with the axis of the rotor perpendicular to the plane of the armature}](#)
- 21/20 . . . having windings each turn of which co-operates only with poles of one polarity, e.g. homopolar machine
- 21/22 . . with magnets rotating around the armatures, e.g. flywheel magnetos
- 21/222 . . . [{Flywheel magnetos}](#)
- 21/225 [{having I-shaped, E-shaped or similarly shaped armature cores}](#)
- 21/227 . . . [{having an annular armature coil}](#)
- 21/24 . . with magnets axially facing the armatures, e.g. hub-type cycle dynamos
- 21/26 . with rotating armatures and stationary magnets
- 21/28 . . with armatures rotating within the magnets
- 21/30 . . . having annular armature cores with salient poles [\(with homopolar co-operation \[H02K 21/36\]\(#\)\)](#)
- 21/32 . . . having horse-shoe magnets [\(with homopolar co-operation \[H02K 21/36\]\(#\)\)](#)
- 21/325 [{with the axis of the rotating armature perpendicular to the plane of the magnet}](#)
- 21/34 . . . having bell-shaped or bar-shaped magnets, e.g. for cycle lighting [\(with homopolar co-operation \[H02K 21/36\]\(#\)\)](#)

21/36	. . . with homopolar co-operation	23/60	. Motors or generators having rotating armatures and rotating excitation field
21/38	. with rotating flux distributors, and armatures and magnets both stationary	23/62	. Motors or generators with stationary armatures and rotating excitation field
21/40	. . with flux distributors rotating around the magnets and within the armatures	23/64	. Motors specially adapted for running on DC or AC by choice
21/42	. . with flux distributors rotating around the armatures and within the magnets	23/66	. Structural association with auxiliary electric devices influencing the characteristic of, or controlling, the machine, e.g. with impedance, with switch (control arrangements external to the machine H02P)
21/44	. . with armature windings wound upon the magnets	23/68	. Structural association with auxiliary mechanical devices, e.g. with clutch, with brake (control arrangements external to the machine H02P)
21/46	. Motors having additional short-circuited winding for starting as an asynchronous motor		
21/48	. Generators with two or more outputs		
23/00	DC commutator motors or generators having mechanical commutator; Universal AC/DC commutator motors	24/00	Machines adapted for the instantaneous transmission or reception of the angular displacement of rotating parts, e.g. synchro, selsyn
23/02	. characterised by arrangement for exciting		
23/023	. . { having short-circuited brushes }	25/00	DC interrupter motors or generators
23/026	. . { having an unregular distribution of the exciting winding or of the excitation over the poles }	26/00	Machines adapted to function as torque motors, i.e. to exert a torque when stalled
23/04	. . having permanent magnet excitation	27/00	AC commutator motors or generators having mechanical commutator
23/06	. . having shunt connection of excitation windings	27/02	. characterised by the armature winding
23/08	. . having series connection of excitation windings	27/04	. having single-phase operation in series or shunt connection
23/10	. . having compound connection of excitation windings	27/06	. . with a single or multiple short-circuited commutator, e.g. repulsion motor
23/12	. . having excitation produced by current sources independent of the armature circuit	27/08	. . with multiple-fed armature
23/14	. . having high-speed excitation or de-excitation, e.g. by neutralising the remanent excitation field	27/10	. . with switching devices for different modes of operation, e.g. repulsion-induction motor
23/16	. . having angularly adjustable excitation field, e.g. by pole reversing or pole switching	27/12	. having multi-phase operation
23/18	. . having displaceable main or auxiliary brushes	27/14	. . in series connection
23/20	. . having additional brushes spaced intermediately of the main brushes on the commutator, e.g. cross-field machines, metadynes, amplidynes or other armature-reaction excited machines	27/16	. . in shunt connection with stator feeding
23/22	. . having compensating or damping windings	27/18	. . in shunt connection with rotor feeding
23/24	. . having commutating-pole windings	27/20	. Structural association with a speed regulating device
23/26	. characterised by the armature windings	27/22	. having means for improving commutation, e.g. auxiliary fields, double windings, double brushes
23/28	. . having open windings, i.e. not closed within the armatures	27/24	. having two or more commutators
23/30	. . having lap windings; having loop windings	27/26	. having disc armature
23/32	. . having wave winding; having undulating winding	27/28	. Structural association with auxiliary electric devices influencing the characteristic of the machine or controlling the machine
23/34	. . having mixed windings		
23/36	. . having two or more windings; having two or more commutators; having two or more stators	27/30	. Structural association with auxiliary mechanical devices, e.g. clutch, brake (control arrangements external to the machine H02P)
23/38	. . having winding or connection for improving commutation, e.g. equipotential connection		
23/40	. characterised by the arrangement of the magnet circuits	29/00	Motors or generators having non-mechanical commutating devices, e.g. discharge tubes or semiconductor devices
23/405	. . { Machines with a special form of the pole shoes }	29/03	. with a magnetic circuit specially adapted for avoiding torque ripples or self-starting problems
23/42	. . having split poles, i.e. zones for varying reluctance by gaps in poles or by poles with different spacing of the air gap	29/06	. with position sensing devices
23/44	. . having movable, e.g. turnable, iron parts	29/08	. . using magnetic effect devices, e.g. Hall-plates, magneto-resistors (H02K 29/12 takes precedence)
23/46	. . having stationary shunts, i.e. magnetic cross flux	29/10	. . using light effect devices
23/48	. . having adjustable armatures	29/12	. . using detecting coils { using the machine windings as detecting coil }
23/50	. Generators with two or more outputs	29/14	. with speed sensing devices {(structural association with other mechanical energy devices H02K 7/00)}
23/52	. Motors acting also as generators, e.g. starting motors used as generators for ignition or lighting		
23/54	. Disc armature motors or generators	31/00	Acyclic motors or generators, i.e. DC machines having drum or disc armatures with continuous current collectors
23/56	. Motors or generators having iron cores separated from armature winding		
23/58	. Motors or generators without iron cores	31/02	. with solid-contact collectors

31/04	• with at least one liquid-contact collector	41/00	Propulsion systems in which a rigid body is moved along a path due to dynamo-electric interaction between the body and a magnetic field travelling along the path {(electromagnetic launchers F41B 6/00)}
33/00	Motors with reciprocating, oscillating or vibrating magnet, armature or coil system (arrangements for handling mechanical energy structurally associated with motors H02K 7/00 , e.g. H02K 7/06)	41/02	• Linear motors; Sectional motors
33/02	• with armatures moved one way by energisation of a single coil system and returned by mechanical force, e.g. by springs	41/025	• • Asynchronous motors
33/04	• • wherein the frequency of operation is determined by the frequency of uninterrupted AC energisation	41/03	• • Synchronous motors; Motors moving step by step; Reluctance motors (H02K 41/035 takes precedence)
33/06	• • • with polarised armatures	41/031	• • • {of the permanent magnet type}
33/08	• • • with DC energisation superimposed on AC energisation	41/033	• • • • {with armature and magnets on one member, the other member being a flux distributor}
33/10	• • wherein the alternate energisation and de-energisation of the single coil system is effected or controlled by movement of the armatures	41/035	• • DC motors; Unipolar motors
33/12	• with armatures moving in alternate directions by alternate energisation of two coil systems	41/0352	• • • {Unipolar motors}
33/14	• • wherein the alternate energisation and de-energisation of the two coil systems are effected or controlled by movement of the armatures	41/0354	• • • • {Lorentz force motors, e.g. voice coil motors}
33/16	• with polarised armatures moving in alternate directions by reversal or energisation of a single coil system	41/0356	• • • • • {moving along a straight path}
33/18	• with coil systems moving upon intermittent or reversed energisation thereof by interaction with a fixed field system, e.g. permanent magnets	41/0358	• • • • • {moving along a curvilinear path}
35/00	Generators with reciprocating, oscillating or vibrating coil system, magnet, armature or other part of the magnetic circuit (arrangements for handling mechanical energy structurally associated with generators H02K 7/00 , e.g. H02K 7/06)	41/06	• Rolling motors, i.e. having the rotor axis parallel to the stator axis and following a circular path as the rotor rolls around the inside or outside of the stator; {Nutating motors, i.e. having the rotor axis inclined with respect to the stator axis and performing a nutational movement as the rotor rolls on the stator}
35/02	• with moving magnets and stationary coil systems	41/065	• • {Nutating motors}
35/04	• with moving coil systems and stationary magnets	44/00	Machines in which the dynamo-electric interaction between a plasma or flow of conductive liquid or of fluid-borne conductive or magnetic particles and a coil system or magnetic field converts energy of mass flow into electrical energy or vice versa
35/06	• with moving flux distributors, and both coil systems and magnets stationary	44/02	• Electrodynamic pumps
37/00	Motors with rotor rotating step by step and without interrupter or commutator driven by the rotor, e.g. stepping motors	44/04	• • Conduction pumps
37/02	• of variable reluctance type	44/06	• • Induction pumps
37/04	• • with rotors situated within the stators	44/08	• Magnetohydrodynamic [MHD] generators
37/06	• • with rotors situated around the stators	44/085	• • {with conducting liquids}
37/08	• • with rotors axially facing the stators	44/10	• • Constructional details of electrodes
37/10	• of permanent magnet type (H02K 37/02 takes precedence)	44/12	• • Constructional details of fluid channels
37/12	• • with stationary armatures and rotating magnets	44/14	• • • Circular or screw-shaped channels
37/125	• • • {Magnet axially facing armature}	44/16	• • Constructional details of the magnetic circuits
37/14	• • • with magnets rotating within the armatures	44/18	• • for generating AC power
37/16	• • • • having horseshoe armature cores	44/20	• • • by changing the polarity of the magnetic field
37/18	• • • • of homopolar type	44/22	• • • by changing the conductivity of the fluid
37/20	• • with rotating flux distributors, the armatures and magnets both being stationary	44/24	• • • by reversing the direction of fluid
37/22	• Damping units	44/26	• • • by creating a travelling magnetic field
37/24	• Structural association with auxiliary mechanical devices	44/28	• Association of MHD generators with conventional generators (nuclear power plants including a MHD generator G21D 7/02)
39/00	Generators specially adapted for producing a desired non-sinusoidal waveform	47/00	Dynamo-electric converters
		47/02	• AC/DC converters or vice versa
		47/04	• • Motor/generators
		47/06	• • Cascade converters
		47/08	• • Single-armature converters
		47/10	• • • with booster machines on the AC side
		47/12	• DC/DC converters
		47/14	• • Motor/generators
		47/16	• • Single-armature converters, e.g. metadyne
		47/18	• AC/AC converters
		47/20	• • Motor/generators
		47/22	• • Single-armature frequency converters with or without phase-number conversion
		47/24	• • • having windings for different numbers of poles

47/26	. . . operating as under- or over-synchronously running asynchronous induction machines, e.g. cascade arrangement of asynchronous and synchronous machines	2203/00	Specific aspects not provided for in the other groups of this subclass relating to the windings
47/28	. . . operating as commutator machines with added slip-rings	2203/03	. Machines characterised by the wiring boards, i.e. printed circuit boards or similar structures for connecting the winding terminations
47/30	. . Single-armature phase-number converters without frequency conversion	2203/06	. Machines characterised by the wiring leads, i.e. conducting wires for connecting the winding terminations
49/00	Dynamo-electric clutches; Dynamo-electric brakes (electrically or magnetically actuated clutches or brakes F16D 27/00, F16D 29/00, F16D 65/28; magnetic-particle clutches F16D 37/02; adapted for use as dynamometers G01L)	2203/09	. Machines characterised by wiring elements other than wires, e.g. bus rings, for connecting the winding terminations
49/02	. of the asynchronous induction type	2203/12	. Machines characterised by the bobbins for supporting the windings
49/04	. . of the eddy-current hysteresis type { (eddy current brakes cooperating with a rail B61H 7/083) }	2203/15	. Machines characterised by cable windings, e.g. high-voltage cables, ribbon cables
49/043	. . . {with a radial airgap}	2205/00	Specific aspects not provided for in the other groups of this subclass relating to casings, enclosures, supports
49/046	. . . {with an axial airgap}	2205/03	. Machines characterised by thrust bearings
49/06	. of the synchronous type { (H02K 49/10 takes precedence) }	2205/06	. Machines characterised by means for keeping the brushes in a retracted position during assembly
49/065	. . {hysteresis type}	2205/09	. Machines characterised by drain passages or by venting, breathing or pressure compensating means
49/08	. of the collector armature type	2205/12	. Machines characterised by means for reducing windage losses or windage noise
49/10	. of the permanent-magnet type	2207/00	Specific aspects not provided for in the other groups of this subclass relating to arrangements for handling mechanical energy
49/102	. . {Magnetic gearings, i.e. assembly of gears, linear or rotary, by which motion is magnetically transferred without physical contact (magnetized gearings with physical contact F16H 13/12, F16H 49/005) }	2207/03	. Tubular motors, i.e. rotary motors mounted inside a tube, e.g. for blinds
49/104	. . {Magnetic couplings consisting of only two coaxial rotary elements, i.e. the driving element and the driven element}	2209/00	Specific aspects not provided for in the other groups of this subclass relating to systems for cooling or ventilating
49/106	. . . {with a radial air gap}	2211/00	Specific aspects not provided for in the other groups of this subclass relating to measuring or protective devices or electric components
49/108	. . . {with an axial air gap}	2211/03	. Machines characterised by circuit boards, e.g. pcb
49/12	. of the acyclic type	2213/00	Specific aspects, not otherwise provided for and not covered by codes H02K 2201/00 - H02K 2211/00
51/00	Dynamo-electric gears, i.e. dynamo-electric means for transmitting mechanical power from a driving shaft to a driven shaft and comprising structurally interrelated motor and generator parts	2213/03	. Machines characterised by numerical values, ranges, mathematical expressions or similar information
53/00	Alleged dynamo-electric perpetua mobilia	2213/06	. Machines characterised by the presence of fail safe, back up, redundant or other similar emergency arrangements
55/00	Dynamo-electric machines having windings operating at cryogenic temperatures	2213/09	. Machines characterised by the presence of elements which are subject to variation, e.g. adjustable bearings, reconfigurable windings, variable pitch ventilators
55/02	. of the synchronous type	2213/12	. Machines characterised by the modularity of some components
55/04	. . with rotating field windings		
55/06	. of the homopolar type		
99/00	Subject matter not provided for in other groups of this subclass		
99/10	. {Generators}		
99/20	. {Motors}		
2201/00	Specific aspects not provided for in the other groups of this subclass relating to the magnetic circuits		
2201/03	. Machines characterised by aspects of the air-gap between rotor and stator		
2201/06	. Magnetic cores, or permanent magnets characterised by their skew		
2201/09	. Magnetic cores comprising laminations characterised by being fastened by caulking		
2201/12	. Transversal flux machines		
2201/15	. Sectional machines		
2201/18	. Machines moving with multiple degrees of freedom		